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KŌL INSCRIPTION OF SULTĀN ALTAMASH

By Dr. A. Halim, *M.A., Ph.D., Professor of History, University of Dacca ;
formerly Reader in History, Muslim University, Aligarh*

The city of Kōl (old name of Aligaṛh) and its vicinity possess some
of the oldest inscriptions of the Muslim period of Indian History. An
inscription of the year 652/1254, of the reign of Sultān Naṣīruddīn Maḥmūd
(1246–1266 A.D.), which stood at the entrance of a two-storied tower [1] at
the south-east of the cathedral mosque at Bālā-i-Qila', constructed by
Bahāuddīn Qutlugh Khān Balban Al-Shamsī, the governor of the Eastern
Provinces, is at present, fixed up in the southern wall of the Niẓām Museum,
(used now as the History Seminar Room, of the Aligarh University).[2]
The chief mosque of Jalālī, a town 14 miles east of Aligarh, a little aside
from the Grand Trunk Road (but formerly forming a link in the
high-way to the east), was repaired by Ṣābit Khān, Turkmān, the
Muḥammad Shāhī governor of Kōl Sarkār. It was originally laid out
by Sultān Ghiāsuddīn Balban, in 665/1266, during the first year of
his reign as a monarch, as is evidenced by the existence of an inscription
at the right corner opening of the mosque. Pilakhna (corruption of Pīl-
khāna, an Elephant-House, from the existence of an elephant stable belong-
ing to the Kōl governors), a township of the district, about 16 miles east
of Kōl city, has a mosque commemorating the history of its construction in
935/1528, during the reign of Bābar.[3] The Kālī Masjid of Kōl city (in
Muhalla Bani-Isrāī-lān), which stands intact and in very bold and majestic
relief, contained an inscription pointing 930/1523, as the date of its con-
struction during the reign of Sultān Ibrāhīm Lōdī.[4] The Delhi Gate of Kōl,
bore an inscription, attesting to its construction by Muḥammad Khān, son of
'Umar Khān Sherwanī, the Shiqdār of Kōl, during the reign of Sultān
Ibrāhīm Lōdī, in 931/1524.[5]
My interest in the history of Aligaṛh has been responsible for the
discovery of an inscription, which is earlier than any previously referred
to, an inscription of the reign of Sultān Shamsuddīn Altamash (607–
633/1210–1235). This inscription, described in the following lines, has an
interesting history. I came to know of the existence of an inscribed
stone-slab in the house of the late lamented Mr. Amīruddīn of Muhalla
Atash-bāzān, one of the most elevated locality in the city of Kōl-Aligaṛh,
in 1943. His father had made use of the stone-slab by fixing it up in place

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[1] Was 74 feet high at the time of its demolition, in 1861, with part of its upper
storey having given way.
[2] *Vide* Thomas, Chronicle of the Pathan Kings of Delhi, p. 129; articles in the
R.A.S.B., Cal., p. 166 of Vol. for 1872, and pp. 339ff. of Vol. for 1878; *Epigraphia
Indo-Moslemica*, 1913-14; and *Proceedings of the Indian History Congress*, Lahore,
1940, pp. 195ff., for Article entitled Balban Inscription of Kōl by the writer in colla-
boration with Dr. Muḥammad Azīz Aḥmad.
[3] See *Proceedings of Indian History Congress*, Aligaṛh Session, 1943, p. 406, for the
text of the inscription.
[4] Fuhrer, *Arch. Survey of India Report*, New Series, Vol. II, 1891, p. 2.
[5] Reported by Mr. Atkinson, in the Proceedings Volume of the *Journal of the
(Royal) Asiatic Society of Bengal*, Calcutta, 1872, p. 167 and I suppose is housed in
the Indian Museum, Calcutta.

of bricks in the verandah wall of his outer house. I was informed that his
father had purchased heaps of masonry, stone and other building materials
from the vicinity of the present Jāmaʿ Mosque, in Bālā-i Qilaʿ, in a public
auction. The letters of the inscription had become illegible due to repeated
white-washing of the walls. But Mr. Amīruddīn had the slab cleansed,
and last summer, just a few months before his death, he obliged me by
shifting the slab to the Muslim University Library. This inscription will
soon be fixed up in the Niẓām Museum opposite the Balban Inscription.
The text of the inscription is as follows:—

١ بناءِ ایں بقعۂ مبارک در عهد سلطنت، بادشاهِ اسلام شمس الدنیا والدین
دولامان لاهلِ الایمان[ن] *]

٢ در نوبت ایالت خداوند خواجۂ جهان دستور صاحب قران نظام المُلک
مَلِک مُلُوک الو [ری] *]

Translation : Line 1. The foundation of this holy place (was laid)
during the reign of the king of Islām, the sun of the world and of religion
(Shams-ud-Dunyā Waddīn), the bestower of peace upon the Faithful.

2. During the period of the governorship of his lordship, Khwāja-i
Jahān, minister of the Lord of the Two Conjunctions, Niẓām-ul Mulk, the
chief of the chief Wazīrs.

The inscription described above, is incomplete in the sense that its
latter part is severed, though it makes no difference in interpretation or
importance, except in respect of the date which was contained in the missing
end. The inscription is on ordinary yellow sandstone and in its present
dimension, measures 2 ft. 5 inches by 1 ft. 4 inches and supposing it was as
long as the Balban inscription of Kōl Tower (which is 4 ft. 10 inches by
1 ft. 6 inches), it is 2 ft. 5 inches shorter in length. The missing portion
fortunately, in the first line, contains attributes and titles of Sultān
Shamsuddīn Altamash, and in the second line, those of Niẓāmul Mulk,
the Wazīr, in addition to the date portion.

There cannot be any doubt as to the two historical personalities of
the inscription. The Sultān is named Shams-ud-dunyā Waddīn, which is
another way of expressing Shamsuddīn. Khān Jahān Niẓamul Mulk
(Muḥammad-i Abu Saʿid Junaidī) is associated as the chief Wazīr and
governor of Kōl.

Niẓamul Mulk Kamāluddīn (Muḥammad-i) Abu Saʿīd Junaidī was the
Wazīr of Altamash and held that office till the reign of Ruknuddīn, the
second son of Altamash, an incompetent youth and a thorough debauchee.
He joined the rank of the rebel nobles when the affairs of the State began to
go to the dogs, during Ruknuddīn's reign, by slipping away from Delhi
at a time when the Sultān had gone to the west to quell an insurrection.
Meanwhile, when the citizens of Delhi supported Raḍia, Niẓam-ul-Mulk did
not acknowledge her, and when two of his confederates secretly offered their
allegiance to Raḍia, Niẓām-ul-Mulk fled to the Sirmoor hills where he died
soon after.[2] A proof of the antiquity of the inscription is the style of the
script. Though the language is Persian, the Tughra style of calligraphy

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[1] Can be read as مُلُوک الو [زِرا] on account of the dot clearly visible after the
waw of الو [ری]

[2] Tab Nāṣirī, Text II, 179 also Raverty's Translation II, pp. 632ff.

is used, typical of the seventh century Hijra found in Egypt and other Middle East countries.

The question which can seriously be asked is the nature of the structure over which this inscription was placed. Since the slab was acquired through an auction along with other dismantled building materials, this question cannot be answered with certainty and definiteness. In the absence of direct evidence, the clue hinges on the interpretation of the words Buqa'-i Mubārak. This can be used in respect of a shrine of a holy man or a mosque. Khwāja Hasan Nizāmī in his *Tāj-ul-Maasīr* [1] has spoken of the Delhi mosque which was being constructed during his time, as Buqa'-i mutabarrak. Apart from the fact that the slab in question was acquired from the lot of building materials after the dismantling of the Kōl Tower (in 1861), which stood in the vicinity of the present Jāma' Masjid, there are circumstantial evidences to connect this inscription with a mosque, the first cathedral mosque built by Muslims in the city of Kōl.

Rājē Muhammad Kōlvī in his Akhbār-ul Jamāl [2] which is the local history of Aligarh up to 1728 | 1141 H.], has given a very clear account of the history of the Jāma' Masjids of Kōl-Aligarh. According to him, Qutbuddīn Aibak ordered the construction of a mosque soon after the conquest, of the city [3] in 1193 (590 Hijra), and that mosque 'having decayed', Muhammad Tughlaq constructed in its site a huge mosque [4] with seven openings, in 733/1329. Rājē Muhammad prayed in this mosque which contained an inscription commemorating its construction by Muhammad Tughlaq at the afore-mentioned date. On account of damage suffered by the mosque in an earthquake, Sabit Khān Turkmān (*alias* Ja'far Bēg) son of Muhammad Bēg, the governor of Kōl (during the reign of Muhammad Shāh) totally dismantled it, and constructed a new one which saw completion in 1728 after four years (1137 to 1141 H.) of continued work. This mosque is perched in the highest ground in the Bālā-i Qila' or the old fortified city area, and catches the eyes of travellers approaching Aligarh by road or rail. The fact that the structure connected with this inscription is referred as a holy or sacred place and also the circumstance that Altamash took great interest in mosque-building of which the Delhi and Ajmēr mosques are the finest specimens, incline me to think that the inscription appertained to the first Jāma' mosque which might have been begun by Qutbuddīn and finished by Nizām-ul-Mulk Kāmal-uddīn Junaidī, during the reign of Altamash.

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[1] Prof. Habib's Manuscript, p. 264.

[2] MS. in the Private Library of Nawab Sadr Yar Jung Bahadur at Habibganj, Aligarh District, fols. 204-206.

[3] Most probably after Qutbuddīn had come to Aligarh a second time to quell a local disturbance led by the conquered people. See Tāj-ul Maasīr. Prof. Habib's MS., pp. 323ff.

[4] Akhbār-ul Jamāl, fol. 205a.

TWO PILLAR INSCRIPTIONS

By Dr. Dines Chandra Sircar, *M.A., Ph.D., Calcutta University*

(Received September 14, 1948)

1.—Benares Stone-Pillar Inscription of the Time of Budhagupta.— Gupta Year 159

It was reported to me several years ago that a stone inscription of the age of the imperial Guptas had been discovered at Rajghat in Benares. It was secured for the Bhārat Kalābhavan at Benares and is still exhibited there. Recently I met Rai Krishnadas, founder of the Kalābhavan, in Calcutta and from him learned that the inscription remained still unpublished. He readily agreed to allow me to edit the record, and to send me a few estampages of the epigraph together with a description of the inscribed stone and the details of its discovery. My transcript of the epigraph is published here, and I thank Rai Krishnadas for his kindness in allowing me to edit the inscription.[1]

The inscription, which is not in a very satisfactory state of preservation, covers a space about 1' in length and about 4" in breadth. The size of the *akṣaras* is a little above $\frac{1}{2}'' \times \frac{1}{2}''$. There are only four lines of writing. The characters employed belong to the so-called North Indian alphabet or the Gupta script. But a point of palaeographical interest is that while the letter *h* is of the type usually known as the western variety, *s*, *l* and *m* are of the so-called eastern type. The *akṣara du* is of the early type. The language is Sanskrit; but there are errors of grammar. As regards orthography, the duplication of *y* and *v* in conjunction with superscript *r* is worth noticing. Figures and symbols for 8, 9, 20, 50 and 100 occur in the inscription.

The date of the inscription is the year 159 falling in the reign of *Mahārājādhirāja* Budhagupta (wrongly written `gutpa`). The year has no

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[1] My attention has been recently drawn by Mr. Adris Chandra Banerji to his paper entitled 'Some Sculptures from Rajghat, Benares', published in the *Journal of the Ganganath Jha Research Institute*, Vol. III, Part 1, November, 1945, in which the pillar under discussion was noticed. As regards the discovery of ancient objects from Rajghat, Mr. Banerji says, 'In 1941 in order to facilitate the regirdering of the Dufferin Bridge it was decided to direct the G.T. Road near the Kashi Railway Station of the E.I. Railway over the Rajghat plateau. The demolitions of the E.I. Railway in 1940 resulted in the finds of antiquities of various dates and the subsequent excavations carried out by Mr. S. Mukerji, at the instance of the Director-General of Archaeology in India, yielded interesting results. In order to conserve the ancient relics as far as possible to be unearthed during the conversion of the G.T. Road, Pandit M. S. Vats, deputed his sub-overseer, Pandit U. C. Sharma, to make a proper record of the finds. The work in fact resulted in a good harvest, as commencing from potsherds generally ascribed to the Mauryan period up to a Muhammadan child's tomb-stone were found. All these have now found a safe refuge in the Bharat Kala Bhavan, Benares City.' In regard to the pillar in particular, he says, 'Pillar inscribed in the 157th year of the Gupta era in the time of Budhagupta. Buff sandstone of Chunar, height 4 feet and 4½ inches approximately. It is rectangular at base up to 2 feet 4½ inches, which contains four niches in which there are four Avatāras of Viṣṇu. Above the niches is an octagonal section 5½ inches in height, superimposed on which is a sixteen-sided section 4½ inches in height. Above, base with foliage 5½ inches in height, surmounting which there is a square portion, absolutely plain and 7½ inches in height.'

doubt to be referred to the Gupta era starting from 320 A.D. The date thus corresponds to 478 A.D. which falls in the reign-period of Budhagupta (*circa* 476–95 A.D.). The actual date is the 28th day of the month of Mārgaśīrṣa.

The inscription records the erection of a stone-pillar by a lady named Dāmasvāminī in the year 159 of the Gupta era (i.e. in 478 A.D.) during the reign of *Mahārājādhirāja* Budhagupta. The name of her father seems to have been Māraviṣa who was an inhabitant of a locality called Pārvarika, while her mother's name was possibly Sābhāṭi.

The purpose of the lady in erecting the pillar is not stated in words. But such unassuming pillars raised by private individuals were usually of two types, viz. votive and monumental. Votive pillars were erected in religious establishments with a view to acquiring merit, while monumental pillars were raised in honour of one's dead relatives. Instances of votive pillars are numerous in the inscriptions discovered in the ruins of old Buddhist establishments like those at Barhut, Sanchi and Nagarjunikonda (cf. Barua and Sinha, *Barhut Inscriptions*; *Ep. Ind.*, II, pp. 95ff.; XX, pp. 1ff.; *Sel Ins.*, I, pp. 219–31). The erection of monumental pillars in honour of one's dead relatives is referred to in such records as the Suivihar inscription of the Kuṣāṇa emperor Kaniṣka I, dated in his 11th regnal year probably corresponding to 89 A.D. (*Sel. Ins.*, I, pp. 135-36) and in the Andhau inscriptions of the year 52 probably belonging to the Śaka era and corresponding to 130 A.D. (*ibid.*, pp. 167-68). It seems, however, that the pillar raised by the lady Dāmasvāminī was not a monumental but a votive one. This is possibly suggested by the word °*stambha* used in our record. The monumental pillars are known to have been called *yaṣṭi*; cf. *yaṭhi* and *laṣṭi* used respectively in the Suivihar and Andhau records. An estampage of a Gupta inscription, said to be discovered in Central India and recently shown to me, was also found to contain the words *sva-puṇy-āpyāyanārtham yaśaḥ-kīrtti-pravardhamāna-gotraśailikā bala-yaṣṭi(ḥ*) pratiṣṭhāpitā*. On the other hand, votive pillars raised in religious establishments were called *stambha* (in Prakrit *thabha* or *thaṃbha*). Again, inscriptions on the votive pillars were in some cases short, referring simply to the erection of a *stambha* by one and without specifying even the name of the monastery or temple in which it was erected. In the present state of our knowledge therefore it seems better to suggest that Dāmasvāminī raised the pillar in a religious establishment at Benares for merit; cf. also the Nalanda inscription of Rājyapāla's time edited below.

I am unable to locate the place Pārvarika mentioned in the inscription.

TEXT [1]

L. 1. स[म्व] १००(+*)५०(+*)९ मार्ग्ग-दि [२०](+*)८ मह्हा-
राज्ञाधिरा[ज]-

L. 2. बुध[गु*]त्य-राज्ये पार्व्वरिक-वास्तव्य-मार-

L. 3. [विष ?]-दुह्हिता सा भाटि(?)-दुह्हि च दामस्वा-

L. 4. मि[न्या] श्रिलास्तम्भ स्वारि[प]तः (॥*)

CORRECTED TEXT

संवत्सरे १५९ मार्गशीर्ष-दिवसे २८ महाराजाधिराज-बुधगुप्तराज्ये पार्वरिक-
वास्तव्य-मारविष-दुहिचा साभाटि-दुहिचा च दामस्वामिन्या शिलास्तम्भः स्थापितः ॥

ENGLISH TRANSLATION

On the 28th day of Mārgaśīrṣa in the year 159, during the reign of
Mahārājādhirāja Budhagupta, the stone pillar is set up by Dāmasvāminī,
[who is] the daughter of Māraviṣu (?), an inhabitant of Pārvarika, and is
also the daughter of Sābhāṭi (?).

II.—NALANDA STONE-PILLAR INSCRIPTION OF THE TIME OF RĀJYAPĀLA.—
REGNAL YEAR 24.

Very recently, Mr. D. P. Ghosh, Curator of the Asutosh Museum of
Indian Art, Calcutta University, gave me an estampage of a stone inscription
for examination. The record is engraved on a stone-pillar which is now
exhibited in the Museum; but it was secured from the collection of the
late Mr. P. C. Nahar and originally belonged to the Jain temple at Bargaon
on the site of the ancient city of Nalanda in the present Patna District of
Bihar. On a careful examination of the estampage, I found that it bears
the same inscription that was published by the late Mr. R. D. Banerji in
the *Indian Antiquary*, Vol. XLVII, p. 111. It was, however, also found
that Banerji's reading and interpretation of the record differed considerably
from those of mine. Mr. Ghosh kindly agreed to my suggestion that the
inscription should be re-edited by me. I thank him for the kindness shown
to me.

The pillar bearing the inscription is of white stone with an overall height
of 5' 7" and the shaft of which is 3' ½". The base of the pillar is 1 ft.
sq. and the capital is 10½" sq. at the base and 9½" sq. at the top; but the
writing covers only a space about 9½" × 7½" in length and breadth respectively.
The record contains five lines of writing, the size of the *akṣaras* being
about 1" × 1". The preservation of the fifth or last line of the inscription
is not satisfactory. The characters employed are of about the tenth century
and belong to the medieval East Indian script commonly called Proto-
Bengali. Letters like *g* and *j* have developed Bengali forms; but the vowel-
mark of *e*, indicated at the left end of the serif, is exceptionally short.
G is doubled in conjunction with superscript *r*.

The date of the inscription is the year 24 of the reign of king Rājyapāla
(wrongly written *Rāja°*) of the Pāla dynasty of Bengal and Bihār. The
reign-period of this king is now usually assigned to *circa* 908-40 A.D.; cf.
History of Bengal, Vol. I, ed. Majumdar, p. 125; also the Kurkihar (Gaya
Dist.) image inscriptions of the years 28, 31 and 32 of Rājyapāla's reign in
J.B.O.R.S., Vol. XXVI, pp. 246–50. The date of our inscription therefore
seems to fall somewhere in the period 930–35 A.D. The epigraph seems to
record the erection of a votive pillar at the Jain religious establishment at
Nalanda by a merchant named Vaidyanātha (wrongly written *Vaida°*),
the son of Manoratha, on the 27th day of the month of Mārga (i.e. Mārgaśīrṣa)
in the 24th year of Rājyapāla's reign. It may be pointed out that Banerji
failed to recognize the figures for 27 after *di* standing for *divase* and that
his reading and interpretation of the last line of the inscription are different.
His reading for this line is *deva-thāne paranavata* which he corrected into
devasthāne praṇamati and translated as '[Vaidyanātha] bows in the temple'.

The last two *akṣaras* are, however, °*sṭhitaḥ* which apparently suggests the word *pratiṣṭhitaḥ*. The two *akṣaras* read by Banerji as °*thāne* appear actually to be *thambha* which is the Prakrit form of Sanskrit *stambha* meaning 'a pillar'. According to my reading and interpretation, therefore, the merchant Vaidyanātha raised a pillar and did not merely 'bow in the temple'.

TEXT [1]

L. 1. [सिद्धम् ॥][2] सम्वत २४ म[र्गे]-दि २७[3]

L. 2. श्रीराजपालदेवग-

L. 3. जे वणिक-कुले मनोर-

L. 4. थ-सुतेन श्री-वैदनाथ-

L. 5. देव थ[म्भ] परि[ष्ठा]ष्ठितः[4]

CORRECTED TEXT

[सिद्धम् ॥] संवत्सरे २४ मार्ग[ग्रीर्ष]-दि[वसे] २७ श्रीराज्यपालदेवगज्ये वणिक्-कुले [जातेन] मनोरथ-सुतेन श्रीवैद्यनाथदेवेन स्तम्भः प्रतिष्ठितः ॥

ENGLISH TRANSLATION

[Let there be welfare.]

On the 27th day of [the month of] Mārga (i.e. Mārgaśīrṣa) in the 24th year of the reign of the illustrious Rājyapāla, the pillar is set up by the illustrious Vaidyanāthadeva [who is born] in a family of merchants and [is] the son of Manoratha.

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[1] From an estampage kindly supplied by Mr. D. P. Ghosh, Curator, Asutosh Museum of Indian Art, Calcutta University.
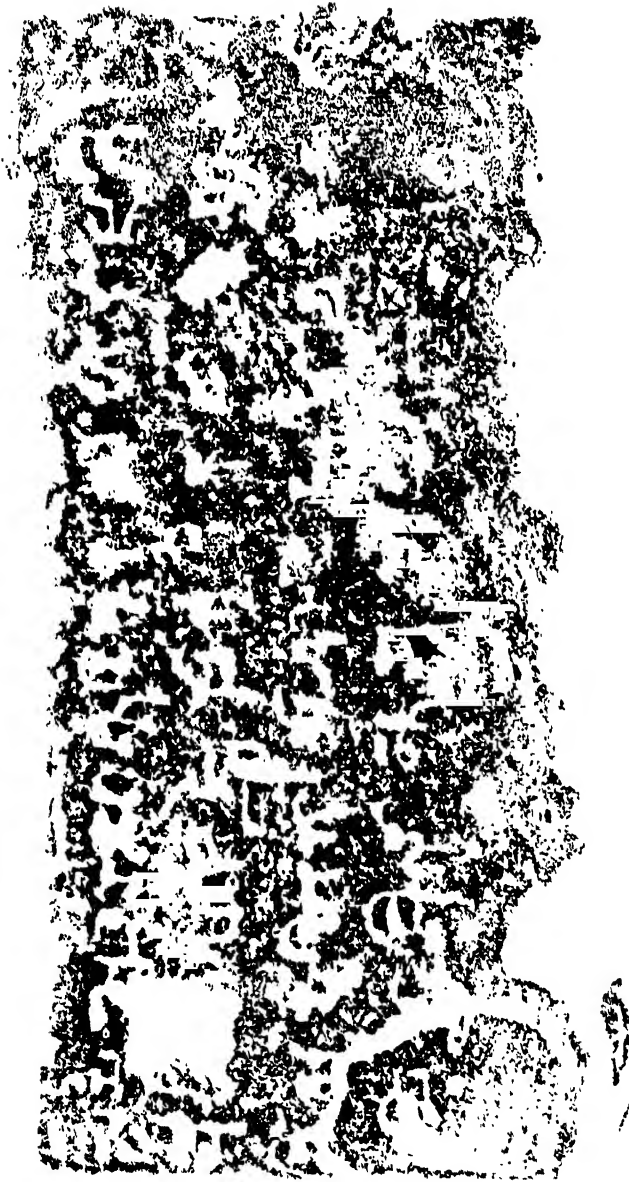
[2] Expressed by symbol.

[3] Banerji reads मार्गदिने.

[4] Banerji reads देवथाने परणवन.

PLATE I.

Nalanda Stone Pillar Inscription of Rājyapāla. - Year 24.

Bonar - Stone Pillar Inscription of Budhagupta   Year 159

SIRR-I-AKBAR [1]

By Dr. Bikrama Jit Hasrat, *M.A.*, *Ph.D.* (*Calcutta*)

1. Introduction

The *Sirr-i-Akbar* or 'the Great Secret' is a Persian translation of fifty-two [2] Upanishads by Muhammad Dārā Shikūh, which was completed in six months, in the year 1067 A.H. (1657 A.D.) [3] at Delhi. The Upanishads, as we know, is the recognized name of the philosophical treatises contained in the Vedas. The etymology and meaning of the word *Upanishad* is disputed both by Indian and European scholars; but according to the view generally accepted, it is derived from the root *sad*, to sit, preceded by the preposition *ni*, down and *upa*, near, so that the whole word would express the idea of sitting down of pupils near their teacher to listen to his confidential teachings. 'Out of this idea of secret session', observes W. Winternitz,[4] 'the meaning secret doctrine—that which is communicated at such confidential session—was developed. Whenever the word occurs, it has the meaning of doctrine or secret or esoteric explanation.' It is, however, not difficult to conclude from the above that Dārā Shikūh's title *Sirr-i-Akbar* (the Great Secret) to his translation of the Upanishads and his further explanation of the word *Upanekhat*, identifies closely to this meaning as 'the esoteric doctrine or secret explanation'; the latter being explained by

him as آیتِ توحید که سرِ پوشیدنی است *āyat-i-Tawḥid ki sirr-i-poshidnî*

ast, i.e. verse of monotheism, which is a secret to be concealed. The word as pronounced and written in Sanskrit, according to English orthography is *Upanishad*, in Duperron's Latin version it is *Oupnek'hat* and in French *Upanichat*. The Sanskrit character (ष) answering to English *sh* and French *ch* has been changed into Persian *kh* (که); and the Sanskrit terminal *d*

(द) has been changed into Persian *t* (ت) aspirated.

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[1] The writer of the present paper has edited the *Sirr-i-Akbar* from the oldest MSS. available of the text. The work which is still in the process of collation would be published in 4 volumes.

[2] The number of the Upanishads varies in different MSS. which I have used in preparing the text, but in none of these it is less than 50. MS. *A* (No. 52, in the Āsifiya Library, Hyderabad-Deccan) on which I have based my text contains 52; MS. *B* (*R.A.S.B.* Cat., p. 178) though incomplete gives the list containing 50, MS. *C* (Calcutta University Library) 50 and MS. *D* 51; while Anquetil Duperron's Latin version of Dārā Shikūh's translation (*Theologica et Philosophia Indica : Oupnek'hat id Est Secretum Tegendum*, 1801, Vol. I, p. 13) contains 50, although their number enumerated in the list is 51. Ethe has not given the number of Upanishads in any one of seven MSS. in the India Office (*Cat. of Persian MSS.*, Vol. I, Col. 1102-3); while in the British Museum, the only MS. which is complete (Add. 5616) contains 51.

[3] According to an India Office MS. (No. 1926 of the *Cat.*, Vol. I) it is stated on fol. 2a that it was finished on the 29th of Ramdān, A.H. 1067.

[4] *Indian Literature*, Vol. I, p. 242.

2. ITS CONTENTS

The *Sirr-i-Akbar* is divided into the following sections:—

(1) Preface.
(2) A List of the Upanishads translated.
(3) A Glossary of Sanskrit-Persian Terms.
(4) The Translation of the Upanishads in four parts:—

Book I. Three Upanishads from the *Rig-Veda*.
Book II. Twelve Upanishads from the *Yajur-Veda*.
Book III. One Upanishad from the *Sama-Veda*.
Book IV. Thirty-six Upanishads from the *Atharva-Veda*.

(5) The End.

3. THE TRANSLATION

Of this translation, the earliest mention has been made by Halhed, in the *Historical Fragments of the Mughal Empire*,[1] in 1782 A.D., wherein a brief account of Anquetil Duperron's Latin version of the Persian *Oupnek'hat* of Dārā Shikūh is given. To this is affixed an English rendering of the Preface. In the year 1775 A.D., Anquetil Duperron, the renowned discoverer of the *Zend-Avesta*, received a manuscript of the *Sirr-i-Akbar*, sent to him by M. Gentile, the French resident at the court of Shuja'-ud-Dawla and brought by M. Bernier. This MS. contained fifty Upanishads and comprised of 247 folios [2]; and Duperron after he had collated it with one other MS., translated it into French and Latin. The latter, under the title of *Oupnek'hat id Est, Secretum Tegendum*, with an elaborately written introduction, copious notes and annotations was published in Paris (1801) in two volumes, but the former remains unpublished to this day. Regarding the Latin version, Max Müller remarks,[3] that Anquetil Duperron treated the Persian translation, rendering it into Latin, word for word, retaining in spite of Latin grammar, the Persian syntax and all the Sanskrit words, which Dārā Shikūh had left untranslated. In his *Monitum ad Lectorem*, Duperron says,[4] that in 1656 A.D., Dārā Shikūh caused a Persian translation to be made, with the assistance of Brahmins of Benares, of the *Oupnek'hat*, a work in Sanskrit language of which the title signifies, 'the word that is not to be said,' meaning 'the secret that is not to be revealed'. The work contains the theological and philosophical doctrines and sacrificial rites of the Hindus as contained in the *Rik Beid* (Rig-Veda), *Djedir Beid* (Yajur-Veda), *Sam Beid* (Sama-Veda) and *Atharban Beid* (Atharva-Veda). It is an extract of four Vedas and gives in fifty sections, the complete system of Hindu theology, which establishes the unity of first Being, whose perfections and operations personified, became the name of principal divinities of the Hindus and demonstrates the re-union of all nature to this first cause, the Deity.

'This translation, though it attracted considerable interest of scholars,' says Max Müller,[5] 'was written in so utterly unintelligible a style, that it required the lynx-like perspicacity of an intrepid philosopher, such as Schopenhauer, to discover a thread through such a labyrinth.' But nevertheless, it appears, that this secondary translation, which was made by the very first European who went to India for the purpose of studying Oriental

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[1] Compiled by Robert Orne, London, 1782.
[2] Full details of this MS. are given by Duperron in his Latin version (*Oupnek'hat id Est Secretum Tegendum*, Vol. I, p. ii).
[3] *Sacred Books of the East*, Vol. I ~ lx
[4] *Opt. cit.* p. lviii.

religions, is of prime historical importance, for it was the first work which brought a knowledge of Indian philosophy to the West. It is not known whether Schopenhauer did actually read the Persian translation of the Upanishads, whom he 'had the courage to proclaim to an incredulous age, the vast treasures of thought, which were lying buried beneath that fearful jargon,' and that, 'which had been the most rewarding and most elevating reading which there could be possible in the world, that which had been the solace of his life and would be of his death'; but he pays a very high tribute of keen appreciation to Dārā Shikūh for his translation. At one place he remarks,[1] that Sultān Dārā Shikūh, the brother of Aurangzeb, was born and bred in India and therefore, probably understood Sanskrit as well as we our Latin; that moreover he was assisted by a number of most learned Pandits, 'all this gives me a very high opinion of his translation of the Vedic Upanishads into Persian'.

It would be interesting to note that how far Dārā Shikūh's Persian translation, exhibited a unique degree of fascination for Indian philosophy in the West. In 1882 A.D., the *Sirr-i-Akbar*, already made available to Europe by Anquetil Duperron, was carried so far as to the third remove from the original Sanskrit, for, in the same year Franz Mischel translated the Latin version into German. Whatever the shortcomings of Dārā Shikūh's Persian translation, its importance lies in the fact, that, although it was originally meant for 'the spiritual benefit of his own self, his children, his friends and seekers of Truth', [2] when the Upanishads were once translated from Sanskrit into Persian, at that time, the most widely read language of the East and understood likewise by many European scholars, they became generally accessible to all, who took an interest in the religious literature of India. It is, however, odd that the *Sirr-i-Akbar*, did not evoke much interest in India, neither at the time it was written nor at a later period; the Muslims did not take much notice of it and its study was generally confined to the Persianized Hindu court nobility of the time. Even to this day, it had been lying neglected and buried under a corner of obscurity.

Much can be said with regard to the nature and quality of the translation. Dārā Shikūh's own assertion is that he has translated 'these *Upanc-khats*, which are a treasury of monotheism, and among which the proficient even in the community (Hindu) are very few, without any worldly motive, *word for word, in a clear style*. A comparison with the original Sanskrit text, aptly bears out this statement, with the exception that at a few places, where the cryptic and philosophical sentences of the translation, need explanation in more explicit and unambiguous manner, he has most faithfully followed Śankarāchārya's commentary.[3] Apart from the inner

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[1] *Parerga*, Vol. II, p. 185.   [2] Preface to *Sirr-i-Akbar*.

[3] Though there is no mention of this fact in the *Sirr-i-Akbar*, but by an elaborate comparison of the Persian text with Śankarāchārya's commentary, I maintain, that in all the major Upanishads, Dārā Shikūh has followed his text and commentary. Śankarāchārya, who lived in the tenth century A.D., restored a critical text of nearly all the fundamental Upanishads of the Vedanta philosophy. It is still undecided as to the number of Upanishads on which he wrote his commentaries, although a long list of those ascribed to him has been compiled by Regnaud (*Philosophical de l'Inde*, p. 34) and Fitzeward (*Index of Indian Philosophical System*). But all the twelve principal Upanishads, viz. *Chāndogya, Aitereya, Kaushītaki, Brihdāran-yaka, Swetāswātara, Katha, Taittariya, Īsāvāsya, Muṛḍaka, Kena, Praśna* and *Māṇḍūkya*, are admitted on all hands to contain Śankara's commentary. It is with regard to these twelve Upanishads that I am convinced that Dārā Shikūh has followed Śankara's text and his commentary. The only references to this fact in the *Sirr-i-Akbar*, are in one passage in the *Swetāswātara-Upanishad* (Fol. 119b) where it is said:

structure and the composite and heterogeneous character of the latter,[1]
it would be found that disconnected and much repeated sacrificial rituals
and dialogues, which form a part of the *Brāhmaṇas*, have been left un-
disturbed.   An attempt has further been made, as would be found in the
Sanskrit-Persian Glossary, to adapt the sense of the text, as far as possible,
so as to make it more intelligible to the Muslims, by giving suitable words
equivalents from Islamic phraseology, of the Indian philosophical terms
and gods.   In this respect, the *Sirr-i-Akbar* not only attains the merit of
an excellent translation but also possesses the charm of an original work.
As for instance, no amount of explanation or commentary would convey
a clear idea of Indian deities like *Mahādera* as *Isrāfîl*, *Viṣṇū* as *Mikā'il*
and *Brahmān* as *Jibra'il*; or *Brahmānloka* as '*Ālam-i-Dhāt*, *Brahmloka* as
Sadrat-ul-Muntahā or *Ākāśrāṇī* as *Waḥi*, *Prāṇayām* as *Habs-i-Nafs*, *Om* or
Veda-mukha as *Ism-i-A'ẓam*.   *Om naman* as *Hū Allāh*, *Mahāpralaya* as
Qiyāmat-i-Kubra, etc.

4. The Preface

Dārā Shikūh's preface to the *Sirr-i-Akbar* forms a very interesting study.
It is a most revealing document of supreme importance, which must be read
in *toto*, for it touches many things besides his spiritual aspirations, which
led to the translation of the Upanishads.   In the following is given the
Preface in the original with a complete English rendering of the same
followed by a brief analysis of its salient features:—

دیباچه[2]

(fol. 1b) حَمدِ ذاتیکه نقطهٔ بائی بِسم الله در جمیع کُتبِ سماوی از اَسرارِ

قدیم (اوست) و الحَمدُ که اُمُّ الکِتاب[3] است، در قرآن مجید اشاره به اسم اعظم

and the *Muṇḍaka-Upanishad* (Fol. 170a): آن بزرگ شنکراچارج در تفسیرِ ابن آنت میگوید

and again at the same place: شنکراچارج در تفسیرِ ابن آنت مینوسد

تا اینجا تفسیرِ شنکراچارج بود

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[1] The reason offered by Max Müller is that it has been supposed that Śankarā-
chārya, who in writing his commentaries on the Upanishads, was chiefly guided by
philosophical considerations, but it has nonetheless, fulfilled the first and indispensable
task in a critical treatment of the text of the Upanishads.   (*Ibid.*, p. lxxi.)

[2] *A* begins with گنیش آندمه اوم سری (ॐ श्रीगणेशाय नमः) which seems to be
a later addition obviously by the Hindu scribe.   *D* opens the Preface with the
following verse:—

بسم الله الرحمٰن الرحیم،
نقطهٔ با هست چون سرِّ قدیم

C omits the Preface; while nearly all other MSS. begin with: بسم الله الرحمٰن الرحیم
The Latin version adds the superscription: '*Aum*' to the Preface.

[3] *B* and *D* both have: اوم الکتاب which reading is unsatisfactory.   Anquetil
Duperron's Latin translation (Vol. I) has: *alhzm am alketab* (inspiratio primae souratae).

اوست' و جمیع کتبِ سماوی و انبیا و اولیا همه مندرج در این اسم است
و صَلَّی الله عَلَی خیرِ خَلقَه مُحَمد آله و اصحابه اجمعین *

اما بعد چون این فقیر بی‌اندوه' محمد دارا شکوه در سنه ۱۰۵۰ه یک
هزار و پنجاه هجری به کشمیرِ جنت نظیر رفته بود' و بجاذبۀ عنایتِ الهی
و فضلِ نامتناهی' سعادتِ ارادتِ اکملِ کاملان' زبدۀ عارفان' اُستادِ اُستادان'
پیرِ پیران' پیشوائی پیشوایان' موحّدِ حقائق آگاه حضرت مُلّا شاه سلمه الله[1] دریافت ۔
و چون ذوقِ دیدنِ عارفانِ هر طائفه و شنیدنِ سخنانِ بلندِ توحید بهم رسیده بود
و اکثرِ کتبِ تصوف بنظر در آورده و رساله‌ها تصنیف کرده بود و تشنگئی توحید
که بحریست بی‌نهایت' دمبدم زیاده میشُد (fol. 2a) و مسئله‌هائی دقیق
بخاطر میرسید که حلِ آن جُز بکلامِ الهی و اسنادِ (ارشاد) ذاتِ نامتناهی امکان
نداشت' و چون قرآنِ کریم و فرقانِ عظیم اکثری مرموز است و امروز دانندۀ آن
رمز کمیاب' خواست که جمیعِ کُتبِ سماوی را بهنظر در آورد' تا از همه کلامِ الهی
که تفسیرِ خود است (؟) اگر در کتابی مجمل باشد در کتابهائی دیگر مفصل
یافته شود و ازان تفصیل آن اجمال دانسته شود ۔ نظر بر توریت و انجیل و زبور
و فرقان و دیگر مصحف انداخت' اما بیانِ توحید در آنها هم مجمل و مرموز
بود' و از ترجمۀ سهلی که اهلِ غرض (کرده) 'ودند' مطلوب معاوم نکردید *

پس درپئی آن شد که از چه جهت در هندوستانِ وحدت عیان' گفتگوئی
توحید بسیار است و علمائی ظاهری و باطنی طائفۀ قدیم هند را بر وحدت انکاری
و بر موحدان گفتاری نیست بلکه پایۀ اعتبار است ۔ برخلاف جهلائی این وقت
که خود را عُلما قرار داده اند[2] و درپئی قیل و قال و آزار و به کُفر و انکارِ
خُدا شناسان و موحدان افتاده' جمیعِ سخنانِ توحید را که از فرقانِ حمید
و احادیثِ صحیح نبوی صریح ظاهر است' رو مینمایند و راه زنانِ راه خُدا راه اند *

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[1] For the life, works and relations of Mullā Sẖāẖ with Dārā Shikūh, vide the Visva-
Bharati Quarterly, Vol. VI, Part II (New Series) pp. 134–146 and Vol. VI, Part IV
(New Series), pp. 331–345, where the present writer has discussed Dārā Shikūh's relations
with the saints of various orders.
[2] A reads: خود علمها را قرار داده اند

بعد ازین مراتب معلوم شُد که درمیانِ این قوم قدیم، پیش از جمیع کُتب

سماوی، چهار کَتب¹ آسمانی که رِک بید و جَجُر بید و سام بید و آتهرین بید باشد،

بر انبیای آن وقت که بزرگترین آنها بَرهما که آدم صفی الله است، با جمیع

احکام نازل شُده و این معنی از همین کتابها ظاهر است - و از قرآن مجید نیز

معلوم میشود که هیچ قومی نیست که بی‌کتاب و پیغمبر باشد، چنانچه

میفرماید: وَ مَا کُنَّا مُعَذِّبِینَ حَتَّی نَبْعَثَ رَسُولاً² و در آیتِ دیگر: وَ اِنْ مِّنْ

اُمَّةٍ اِلَّا خَلَا فِیهَا نَذِیْر³ و در جای دیگر میفرماید: لَقَدْ اَرْسَلْنَا رُسُلَنَا بِالْبَیِّنٰتِ

وَ اَنْزَلْنَا مَعَهُمُ الْکِتٰبَ وَ الْمِیزَانَ⁴ پس ازین مشخّص شد که الله تعالی هیچ

قومی را عذاب نکُنَد تا آنکه رسول در آن قوم مبعوث نه شُده باشد، و هیچ اُمّتی

نیست که در آن پیغمبری نه گذشته باشد، تحقیق که فرستاده است رسولان را

با معجزاتِ ظاهر، و نازل شُده است به ایشان کتابی و میزان *

و خلاصهٔ این چهار کَتب را که جمیع اَسرارِ سلوک⁵ و اشغالِ توحید صرف

در آن مذدرج است، اُپِنْکهَت می‌نامند و ابتدای⁶ آن زمان بر آن تفسیرهای

به شرح و بسط تمام (fol. 2b) نوشته اند و همیشه آنرا بهترین عبادت⁷ دانسته اند -

این حق جوی خود مبین را چون نظر بر اصولِ وحدت ذات بود، نه بزبان عربی

و سُریانی و عبرانی و سنسکرت، خواست که این اُپِنْکهَت‌ها را که گنجِ توحید

است و دانندگان او در آن قوم هم کم مانده اند، بزبانِ فارسی، بی‌کم و زیاد،

و بی‌غرضِ نفسانی، بعبارتِ راست، لفظاً بلفظاً ترجمه نموده بفهمد که این

جماعه که آنرا از اهل اسلام اینقدر پوشیده و پنهان میدارند، در آن چه سِرّ است؟

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¹ A: کتاب   ² Qur'ān: XVII, 15.
³ Qur'ān: XXXV, 24.   ⁴ Qur'ān: LVII, 25.
⁵ A: شلوک (śloka); Duperron's has selouk, translated as 'religiosi instituti'.
⁶ A: انبیای   ⁷ A: عبارت.

و چون دراین ایام بلدهٔ بنارس که دار العلوم این قوم است ، تعلق به این

حق جُو داشت ، پَنڊِتان و سنیاسیان را که سر آمدِ وقت و بید و آپنکهَت دان

بودند ، جمع ساخته ، خود این خلاصهٔ توحید را که آپنکهَت ها یعنی اسرارِ

پوشیدنی باشد و منتهایِ مطلبِ جمیع اولیاء است ، درسنه ۱۰۶۷ هزار و شصت

و هفت هجری ، بیغرضانه ترجمه نمود ، و هر مشکلی و هر سخنِ بلندی که

میخواست و طالبِ آن بود ، و جُست و نمی‌یافت ، ازین خلاصهٔ کتاب قدیم

که بی‌شک و شُبه اولینِ کُتبِ سماوی و سرچشمهٔ بحرِ توحید است و مطابق

قرآن مجید بلکه تفسیرِ آنست ، یافت *

و صریح ظاهر میشود که این آیت بعینهٔ درحقِ این کتاب است : اِنَّهُ لَقُرْآنٌ

کَرِیمٌ فِی کِتَابٍ مَّکْنُونٍ لَّا یَمَسُّهُ اِلَّا الْمُطَهَّرُونَ ، تَنْزِیلٌ مِّن رَّبِّ الْعَالَمِینَ ،[1] یعنی

قرآن کریم در کتاب است که آن کتاب پنهان است و او را ادراک نمیکند مگر

دلی که مطهر باشد ، و نازل شده از پروردگارِ عالمیان است - و مشخص و معلوم

شد که این آیت در حقِ زبور و توریت و انجیل نیست و از لفظ تَنْزِیل چنین

ظاهر میگردد که در حقِ لوح محفوظ هم نیست و چون آپنکهَت که سر پوشیدنی

است ، اصل این کتاب است (fol. 3a) و آیت هایِ قرآن مجید بعینهٔ در آن

یافته میشود ، پس تحقیق که " کتاب مَّکْنُون " این کتاب قدیم باشد ، و ازین فقیر

نادانسته‌ها را دانسته و نافهمیده‌ها را فهمیده شُد *

(ب) وقت شروع در ترجمه از مصحفِ مجید فال کشوده و سورهٔ اعراف

بر آمد که اول این آیت : المص، کِتَابٌ أُنزِلَ إِلَیْکَ فَلَا یَکُن فِی صَدْرِکَ حَرَجٌ

مِّنْهُ لِتُنذِرَ بِهِ وَ ذِکْرَی لِلْمُؤْمِنِینَ[2] - یعنی الف، لام، میم، صاد، کتابیست که

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[1] *Qur'ān*: LVI, 77, 78, 79.　　　　　　　　[2] *Qur'ān*: VII, 1, 2.

نازل کرده شُده به سوئی تو ای مُحمد صلعم ، پس نباشد در سینهٔ تو شکی ازان

کتاب ، و بیم کُنی مردمان را و پندیست مومنان را *

و بغیر از مستفید شُدنِ خود و آلِ خود و دوستانِ خود و طالبانِ حقّ

مطلبی و مقصودی نبوده ـ سعادتمندی که غرض نفس شوم گذاشته ، خالصاً

لوجه الله ، این ترجمه را که به سرّ اکبر موسوم است ، ترجمهٔ کلام الهی دانسته ،

ترک تعصب نموده بخواند و بفهمد ، بیزوال و بیخوف و بی اندوه و رستگار مؤبد

خواهد شد *

Translation

'Praised be the Being, that among whose eternal secrets, is the dot in the (ب) of the *Bismillāh* in all the heavenly books, and glorified be the mother of books. In the holy *Qur'ān* is the token of His glorious name; and the angels and the heavenly books and the prophets and the saints are all comprehended in this name. And be the blessings of the Almighty upon the best of His creatures, Muḥammad and upon all his children and upon his companions universally!'

'To proceed: whereas this unsolicitous *faqīr*, Muḥammad Dārā Shikūh in the year A.H. 1050 went to Kashmir, the resemblance of paradise, and by the grace of God and the favour of the Infinite, he there obtained the auspicious opportunity of meeting the most perfect of the perfects, the flower of the gnostics, the tutor of the tutors, the sage of the sages, the guide of the guides, the unitarian accomplished in the Truth, Mullā Shāh, on whom be the peace of God.'

'And whereas, he was impressed with a longing to behold the gnostics of every sect, and to hear the lofty expressions of monotheism, and had cast his eyes upon many books of mysticism and had written a number of treatises thereon, and as the thirst of investigation for *Tawḥīd*, which is a boundless ocean, became every moment increased, subtle doubts came into his mind for which he had no possibility of solution, except by the word of the Lord and the direction of the Infinite. And whereas the holy *Qur'ān* is mostly allegorical, and at the present day, persons thoroughly conversant with the subtleties thereof are very rare, he became desirous of bringing in view all the heavenly books, for the very words of God itself are their own commentary; and what might be in one book compendious, in another might be found diffusive, and from the detail of one, the conciseness of the other might become comprehensible. He had therefore, cast his eyes on the Book of Moses, the Gospels, the Psalms and other scriptures, but the explanation of monotheism in them also was compendious and enigmatical, and from the slovenly translations which selfish persons had made, their purport was not intelligible.'

'Thereafter he considered, as to why the discussion about monotheism is so conspicuous in India, and why the Indian theologians and mystics (*'Ulema'i ẓāhiri wa bāṭini*) of the ancient school do not disavow the Unity of God nor do they find any fault with the unitarians, but their belief is perfect in this respect; on the other hand, the ignoramuses of the present

age—the highwaymen in the path of God—who have established them-
selves for erudites and who, falling into the traces of polemics and molestation
and apostatizing from and disavowing the true proficients in God and
monotheism, display resistance against all the words of unitarianism, which
are most evident from the glorious *Qur'ān* and the authentic traditions of
indubitable prophecy.'

'And after verifications of these circumstances, it appeared that among
this most ancient people, of all their heavenly books, which are the *Rig-Veda*,
the *Yajur-Veda*, the *Sama-Veda* and the *Atharva-Veda*, together with a
number of ordinances, descended upon the prophets of those times, the
most ancient of whom was Brahmān or Adam, on whom be the peace of
God, this purport is manifest from these books.   And it can also be ascer-
tained from the holy Qur'ān, that there is no nation without a prophet and
without a revealed scripture, for it hath been said: *Nor do We chastise until
We raise an apostle* (Qur'ān: XVII, 15).   And in another verse: *And
there is not a people but a warner has gone among them* (Qur'ān: XXXV, 24).
And at another place: *Certainly We sent Our apostles with clear arguments,
and sent down with them the Book and the measure* (Qur'ān: LVII, 25).'

'And the *summum bonum* of these four books, which contain all the
secrets of the Path and the contemplative exercises of pure monotheism,
are called the *Upanekhats*, and the people of that time have written com-
mentaries with complete and diffusive interpretations thereon; and being
still understood as the best part of their religious worship, they are always
studied.   And whereas this unsolicitous seeker after the Truth had in
view the principle of the fundamental Unity of the Personality and not
Arabic, Syriac, Hebrew and Sanskrit languages, he wanted to make without
any worldly motive, in a clear style, an exact and literal translation of the
Upanekhat into Persian.   For it is a treasure of Monotheism and there
are few thoroughly conversant with it even among the Indians.   Thereby
he also wanted to solve the mystery which underlies their efforts to conceal
it from the Muslims.'

'And as at this period the city of Benares, which is the centre of the
sciences of this community, was in certain relations with this seeker of the
Truth, he assembled together the *pandits* and the *sannyāsis*, who were
the most learned of their time and proficient in the *Upanekhat*, he himself
being free from all materialistic motives, translated these essential
parts of monotheism, which are the *Upanekhat*, i.e. the secrets to be con-
cealed, and the end of purport of all the saints of God, in the year 1067 A.H.;
and thus every difficulty and every sublime topic which he had desired or
thought and had looked for and not found, he obtained from these essences
of the most ancient books, and without doubt or suspicion, these books are
first of all heavenly books in point of time, and the source and the fountain-
head of the ocean of Unity, in conformity with the holy *Qur'ān* and even a
commentary thereon.   And it becomes clearly manifest that this verse is
literally applicable to these ancient books: *Most surely it is an honoured
Qur'ān; in a book that is protected.   None shall touch it save the purified
ones.   A revelation by the Lord of the worlds* (Qur'ān: LVI, 77, 78, 79, 80).'

'It is evident to any person that this sentence is not applicable to the
Psalms or the Book of Moses or to the Gospel, and by the word "revelation",
it is clear that it is not applicable to the Reserved Tablet (*Lauh-i-Mahfūz*);
and whereas the *Upanekhat*, which are a secret to be concealed and are the
essence of this book, and the verses of the holy *Qur'ān* are literally found
therein, of a certainty, therefore, the hidden book is this most ancient book,
and hereby things unknown became known and things incomprehensible
became comprehensible to this *faqîr*.'

'At the commencement of the translation, he opened the pages of the holy *Qur'ān* to take an augury and the Sura *al-A'rāf* came up of which the first verse is thus: *I am Allāh, the best knower, the Truthful.   A Book revealed to you—so let there be no straitness in your breast on account of it—that you may warn thereby and a reminder to the believers* (Qur'ān: VII, 1, 2); and he had no intention and no purpose except for the spiritual benefit of his own self and of his children, his friends and the seekers of Truth.'

'Happy is he, who having abandoned the prejudices of vile selfishness, sincerely and with the Grace of God, renouncing all partiality, shall study and comprehend this translation entitled the *Sirr-i-Akbar* (the Great Secret), knowing it to be a translation of the words of God, shall become imperishable, fearless, unsolicitous and eternally liberated.'

When analysed, the Preface to the *Sirr-i-Akbar* throws much light on Dārā Shikūh's spiritual longings, his thirst for religious investigation and attitude towards Hinduism.   Briefly, it can be summarized as follows:—

(1) Invocations, praise of God and Muḥammad.

(2) He visits Kashmir in A.H. 1050 (A.D. 1640) and meets his spiritual teacher Mullā Shāh.

(3) He asserts that he had come into contact with saints of various orders and sects and had studied to a great extent works on mysticism.

(4) His desire for investigation for Truth made him collect into view all the heavenly books with the object of seeking illumination on many spiritual and religious matters.

(5) In the *Qur'ān*, he finds some passages allegorical and for the clarification of these, he entertains no doubt 'that there was no possibility of solution except by the word of the Lord', he therefore, studies the Book of Moses, the Gospels, the Psalms, etc., but 'the slovenly translations of interested persons' fail to satisfy him.

(6) He then turns towards Hinduism, 'where there is so much discourse on the *Tawḥid*', and finds that both in its outer and inward forms 'there is no disavowal of Divine Unity'.

Thereafter he treats with contempt 'the ignoramuses of the present age, the highwaymen in the path of God who have established themselves as erudite and often molest and harass the true lovers of Monotheism'.

(7) The *Vedas*, to him appear as 'the essence of Monotheism', and he translates the *Upanishads* 'without any worldly motive' in 1067 A.H. with the help of learned Pandits of Benares and gives his translation the title of *Sirr-i-Akbar* (Great Secret), for, he regards the *Upanishads* as Divine Secrets.

In support of his assertion he cites this verse from the *Qur'ān: Most surely it is an honoured Qur'ān; in a book that is protected. None shall touch it save the purified ones. A revelation by the Lord of the worlds.*   Commenting on the verse, he observes, that it became literally applicable to the Upanishads, which are 'secrets to be concealed' and the essence of this book and the verses of the Holy *Qur'ān* are literally found therein. 'Of a certainty, therefore,' he remarks, 'the hidden book is this most ancient book and hereby things unknown became known and things incomprehensible became comprehensible to this *faqir* (Dārā Shikūh).'

(8) He was afraid lest such bold an assertion might shock the orthodox Muslim ecclesiasts, so he adds, that he had translated the *Upanishads* for his own spiritual benefit and for the religious advancement of his children, his friends and the seekers of Truth, and not for the general public.

5. Dārā Shikūh's approach to Hindu Philosophy

We have briefly outlined elsewhere Dārā Shikūh's interest in Hinduism and his approach towards Indian philosophy.[1] Two things are clear from the study of his works on Hinduism and his translations from Sanskrit. *First* his persuit of Indian religious thought was intuitive with a spiritual background; it was neither academic, nor intellectual, nor, as some think, it had any political motive. As he himself observes, it was a part of ' his desire for investigation of the Truth'.[2] *Secondly*, its comparative value was confined, unlike Badāūnī and Abul Faḍl to Islamic thought only— mostly in the details of technical terms and not of any major speculative problems. Thus in the first place we find that his ' word for word' translation of the Upanishads was made ' for his own spiritual benefit and for the religious advancement of his children, friends and the seekers of the Truth'.[3] Similarly he remarks in the *Majma'-ul-Baḥrain* that his researches (in comparative study) were according to his own intuition and taste, for the benefit of the members of his own family and that he had no concern with the common folk of either community.[4] He does not find disavowal of the Truth in Hinduism and the Vedas appear to him as the essence of monotheism. The monotheistic philosophy of the Upanishads he thinks, is in conformity with the holy *Qur'ān* and a commentary thereon.[5] And he comes to the conclusion that in the Upanishads, ' the verses of the holy *Qur'ān* are literally found'.[6]

6. His works on Hinduism and translations from Sanskrit

Dārā Shikūh's translations from Sanskrit include that of the Upanishads, entitled the *Sirr-i-Akbar* (wr. 1067 A.H.), the *Bhāgwat-Gīta* (wr. between 1065-67), and a translation of the *Yoga-Vāsishṭa* made at his instance. His other works on Hinduism are the *Majma'-ul-Baḥrain*, a comparative study of Hinduism and Islam; and the *Mukālama* or Seven Dialogues on comparative mythology with a Hindu saint, named Lāl Dās. The *Risāla'i Ḥaq Numā*', though a treatise on Ṣūfic practices, shows distinct signs of the influence of the Indian Yoga philosophy. Dārā Shikūh claims that he had read a Persian translation of the *Yoga-Vāsishṭa* by Shaikh Ṣūfī—probably by Ṣūfī Sharîf Qubjahānî *ent.* the *Tuhfa'i Majlis*, based on the *Yogavāsishṭha-sāras*—prior to A.H. 1066, when he ordered a retranslation of the work. Some of the physical exercises detailed in the *Risāla*, e.g. the *Ḥabs-i-dam*, the *āwurd-burd*, the astral healing, the centres of meditation in the heart and brain, etc. bear a close resemblance to the Hindu *Tāntric* meditations. The *sālik's* journey through the four worlds of *Nāsūt*, *Jabarūt*, *Malakūt* and *Lahūt*, for instance, is compared by him to the Indian *Avasthātman* or the four worlds of *Jāgrat*, *Swapna*, *Saśupati* and *Turiya*.[7] The *Majma'-ul-Baḥrain*, written in 1065 A.H. prior to the translation of the Upanishads, shows clearly that by that time Dārā Shikūh had acquired considerable knowledge of Hindu—Yogic and Vedantic—philosophy, together with Sanskrit technical vocabulary of Indian mythology and cosmology, etc. which would enable him to make a comparative study of the same with their equivalents from Islamic thought. Thus we find, that he has dealt with the identical conceptions of Elements, Senses, Devotional Exercises, Soul,

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[1] *Vide* the *Visva-Bharati Quarterly*, Santiniketan, Vol. V, Part III (New Series), p. 275-290.
[2] *Sirr-i-Akbar*; Introduction.   [3] *Ibid.*
[4] *Vide Bib. Ind.*, p. 30.   [5] *Sirr-i-Akbar*: Introduction.
[6] *Ibid.*   [7] *Majma'-ul-Baḥrain*, Bib. Ind., p. 46.

Air, Sound, Vision of God, Skies, Earth, Resurrection, etc. as found in both the religions. The *Mukālama Bābā Lāl wa Dārā Shikūh* shows the same comparative spirit and his knowledge of Indian mythology and some aspects of the speculative philosophy of the Hindus.

7. HIS KNOWLEDGE OF SANSKRIT

Dārā Shikūh's knowledge of Sanskrit language, notwithstanding the fact that he employed a large number of Sanskrit pandits in the translation of the Upanishads, appears to be very considerable. It is not known as to how many Sanskrit works he had read in the original. Stray references in some contemporary works allude to his keen appreciation of Sanskrit poetry. A delightful story tells how being pleased with the Sanskrit poetry of his favourite poet Jagannāth Miśra, Dārā Shikūh promised to give him anything he asked for.[1] Many contemporary Sanskrit poets, including Kavîndracarya, Kavî Harîrām and others have showered great praises on him for his learning and patronage of Sanskrit poetry.[2] Nothing, however, is known of the actual scope of his studies in the field of Sanskrit literature and philosophy, either from contemporary Sanskrit writers or Persian historians. Unless such evidence is forthcoming, his knowledge of Sanskrit literature can only be based on the internal evidence of his works on Hinduism—his intimate acquaintance of Hinduism, particularly Hindu mythology as evidenced from the *Mukālama*; of traces of Hindu gnosticism from the *Risāla'i Haq Numā'*, of the technical Sanskrit philosophical vocabulary from the *Majma'-ul-Bahrain*; of the Vedantic and philosophical terminology, cosmogonic myths, legends, mystic interpretations and the symbolicisms in the intricate Āraṇyakas and Brāhmaṇas from the *Sirr-i-Akbar*. P. K. Gode of the Bhandarkar Oriental Research Institute claims to have discovered a Sanskrit work (?) of Dārā Shikūh, entitled the *Samudrasaṅgama* (Mingling of the Two Oceans) in the form of a MS. dated 1708 A.D. I do not know on which basis he claims it to be a Sanskrit work of the prince. It would be a rare find if the work does not happen to be a Sanskrit translation of the *Majma'-ul-Bahrain* (Mingling of the Two Oceans).

8. SANSKRIT SCHOLARS ASSOCIATED WITH DĀRĀ SHIKŪH

Dārā Shikūh was associated with many Sanskrit scholars and it can be presumed that he gained much knowledge of Hinduism from that contact. In the Preface to the *Sirr-i-Akbar*, he observes that the city of Benares 'the centre of the sciences of this (Hindu) community' was 'in certain relation with him'[3] Bernier tells us that 'a large staff of Benares Pandits' was presumably brought to Delhi for the purpose of helping him in the translation of the Upanishads.[4] It is, however, difficult to ascertain the names of the Sanskrit scholars and their exact share in the translation. Nearly all Persian and Sanskrit sources are silent in this respect and the meagre information like that of Mirza Muḥammad Kāẓim that 'he was constantly in the society of Brahmans, jogis and sannyasis'[5] does not

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[1] *Mediæval Indian Mysticism*, London, p. 143 *sq*.
[2] *Vide* the *Kavindracandrodaya* (Poona, 1939): An anthology of addresses presented to Kavîndracarya, the poet-scholar of the house of Dārā Shikūh, by 69 pandits of Benares and Prayag, for the poet's successful persuasion of Emperor Shāh Jahān to abolish the pilgrim tax on Allahabad and Benares. For a complete list of the names of the pandits, many of whom refer to Shāh Jahān and Dārā Shikūh in most eulogizing language, *vide* preface to the work (p. xv *ff*.).
[3] *Opt. cit.*   [4] *Travels*, p. 323, n 3 *ff*.   [5] *'Ālamgīrnāma*.

lead us anywhere. From the chroniclers of the Mughal period, we gather that at the Delhi Imperial court many eminent Sanskrit scholars were employed and maintained by the Emperors Akbar, Jahāngîr and S̲h̲āh Jahān.[1] Among those, who were at the court of S̲h̲āh Jahān were Pancharāj of Benares and Phatan Miśra, former *protégés* of Jahāngīr; Harnāth on whom S̲h̲āh Jahān conferred the title of *Mahāpātra*, Kavīndracarya Saravatî on whom the Emperor conferred the title of *Sarva-vidyānidhāna*; Vāmasidha Miśra, and Jagannāth (Miśra?) of whom it is said that he 'was once weighed with silver at the Emperor's order, and the money was given to him as a reward'.[2] Jagannāth was also given the title of *Mahākabrā'i* (poet-laureate) by the Emperor. Another Benares Pandit (probably Kavīndracarya, *infra*.) was granted a pension of Rs.2,000. Other Sanskrit scholars who were directly in the pay of prince Dārā S̲h̲ikūh included:

(1) Banvalî Dās, with the *nom de plume* of *Valî*, a muns̲h̲î of Dārā S̲h̲ikūh. He was a bi-lingual scholar in Persian and Sanskrit and remained in the service of the prince for a long time. His works include the *Rajarali*,[3] a historical work on the Delhi kings from Yudhistira to S̲h̲āh Jahān and a *mathnawi*.[4]

(2) Jagannāth Miśra, the eminent Sanskrit poet and scholar on whom S̲h̲āh Jahān bestowed the title of *Panditrāja*. He was attached to the court of Dārā S̲h̲ikūh, who was a great admirer of his poetry. Among his works is the *Jagatsimha* containing eulogies of Dārā S̲h̲ikūh and the *Āsif-vilāsa* devoted to the praise of Āsif K̲h̲ān, brother of Nūr Jahān. So attached was the Pandit to the prince that after the latter's execution in 1659 A.D., he left the Mughal court and retired to Muttra.

(3) Chander Bhān Brāhman, another muns̲h̲î of Dārā S̲h̲ikūh, who translated for him the *Mukālama* into Persian.

(4) Kavindracarya Sarasvatî of Benares, whose connection with the Mughal court and his great influence with S̲h̲āh Jahān and Dārā S̲h̲ikūh is established from the Sanskrit anthology *Kavindracandrodaya*. Gode has identified him with Bernier's 'most celebrated pandit in all Indies', who 'belonged to the household of Dārā S̲h̲ikūh'.[5] He was an honoured person at the court and led a deputation of Benares Pandits before the Emperor to seek the abolition of Pilgrim Tax on Benares and Allahabad. S̲h̲āh Jahān conferred upon him the title of *Sarva-vidyānidhāna* and also gave him a pension of Rs.2,000.

9. The Number of the Upanishads

The number of the Upanishads translated by Dārā S̲h̲ikūh in the *Sirr-i-Akbar*, is fifty-two; but their original number as given by various scholars is not the same. According to Weber,[6] so far it can be relied upon, it is two hundred and thirty-five. Both in the *Mahāvakyamuktāvali* and Muktikā-Upanishad, it is one hundred and eight: Max Müller[7] counts

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[1] *Bibliography of Mughal India* (Karnatak Publishing House), Appendix III, pp. 154–65, on the *Sanskrit Writers of Mughal Period*. Among those who lived during S̲h̲āh Jahān's reign the names of 63 writers are recorded. Some of these, at least, appear to have connection with the Mughal court.

[2] *Tad̲h̲kira'i 'Ulemā'i Hunūd* (Cawnpore), p. 31.

[3] Rieu: II, 855a iii.   [4] Sprenger: *Oude. Cat.*, p. 589.

[5] *Kavindracarya Sarasvati at the Mughal Court: vide* the Annals of Sri Venkateswara Oriental Institute, Vol. I, part 4.

[6] *History of the Sanskrit Literature*, p. 155.

[7] An alphabetical list published in 1865 in *Zeitschrift der Deutschen Morgenlandischen Gesellschaft*, XIX, p. 137–158.

them as one hundred and fifty-nine; and Haug gives this number as one hundred and seventy, but apart from the exact determination of the total number of the Upanishads, it is admitted on all hands, that out of these twelve form as the source for the history of the earliest Indian philosophy. These called by W. Winternitz [1] as 'the Vedic-Upanishads', viz. *Aitereya, Bṛihdāraṇyaka, Chāndogya, Taittiriya, Kaushitaki, Kena, Katha, Śwetāsvatara, Praśna, Īśāvāsya, Māṇḍūkya, Muṇḍaka,* have all been included by Dārā Shikūh in the *Sirr-i-Akbar.* The remaining, whatever their true number, are classified as 'the non-Vedic-Upanishads', only few of them having real traditional connection with the Vedic schools, mostly contain the religious doctrines rather than philosophical ideals of a much later period. Of this category Dārā Shikūh has included forty in his translation. As I have already remarked, this number varies slightly in different MSS.[2] of the

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[1] *A History of Indian Literature,* Vol. I, p. 239.

[2] Full details of the MSS. used, are given later on, while Anquetil Duperron's Latin version, based on a MS. transcribed decidedly earlier than 1775 A.D. contains only fifty Upanishads in the following order:—

1. Oupnek'hat *Tschandouk* ó Sam Beid.
2. Oupnek'hat *Brchdarang* ó Djedjr Beid.
3. Oupnek'hat *Mitri* é Djedjr Beid.
4. Oupnek'hat *Mandek* ex Atharban Beid.
5. Oupnek'hat *Eischavasieh* é Djedjr Beid.
6. Oupnek'hat *Sarb* ex Atharban Beid.
7. Oupnek'hat *Narain* ex Atharban Beid.
8. Oupnek'hat *Tadiw* é Djedjr Beid.
9. Oupnek'hat *Athrb* ex Atharban Beid.
10. Oupnek'hat *Hensnad* ex Atharban Beid.
11. Oupnek'hat *Antrteheh* é Rak Beid.
12. Oupnek'hat *Kok'heuk* é Rak Beid.
13. Oupnek'hat *Santaster* é Djedjr Beid.
14. Oupnek'hat *Pors* ex Atharban Beid.
15. Oupnek'hat *Dehanbandhu* ex Atharban Beid.
16. Oupnek'hat *Maha* ex Atharban Beid.
17. Oupnek'hat *Atma Pra Boudeh* ex Atharban Beid.
18. Oupnek'hat *Keioul* ex Atharban Beid.
19. Oupnek'hat *Schat Roudri* ó Djedjr Beid.
20. Oupnek'hat *Djog Schak'ha* ex Atharban Beid.
21. Oupnek'hat *Djoqtau* ex Atharban Beid.
22. Oupnek'hat *Schiw Sanklap* é Djedjr Beid.
23. Oupnek'hat *Athrb Schauk'ha* ex Atharban Beid.
24. Oupnek'hat *Atma* ex Atharban Beid.
25. Oupnek'hat *Brahm Badia* ex'Atharban Beid.
26. Oupnek'hat *Aubrad Bandeh* ex Atharban Beid.
27. Oupnek'hat *TiJjbandeh* ex Atharban Beid.
28. Oupnek'hat *Karbhch* ex Atharban Beid.
29. Oupnek'hat *Djabal* ex Atharban Beid.
30. Oupnek'hat *Mahanaraṁ* é Djedjr Beid.
31. Oupnek'hat *Mandouk* ex Atharban Beid.
32. Oupnek'hat *Schekl* ex Atharban Beid.
33. Oupnek'hat *Tschchourka* ex Atharban Beid.
34. Oupnek'hat *Prahm Hens* ex Atharban Beid.
35. Oupnek'hat *Arank* ex Atharban Beid.
36. Oupnek'hat *Kin* ex Atharban Beid.
37. Oupnek'hat *K'hiouni* ex Atharban Beid.
38. Oupnek'hat *Anandbli* ó Djejr Beid.
39. Oupnek'hat *Bharkbli* é Djedjr Beid.
40. Oupnek'hat *Bark'heh Soukt* ó Djedjr Beid.
41. Oupnek'hat *Djounka* ex Atharban Beid.
42. Oupnek'hat *Amrat Lānkoul* ex Atharban Beid.
43. Oupnek'hat *Anbratnad* ex Atharban Beid.
44. Oupnek'hat *Tachhakli* é Djedjr Beid.
45. Oupnek'hat *Tark* ex Atharban Beid.
46. Oupnek'hat *Baskal* ex Rak Beid.
47. Oupnek'hat *Ark'hi* ex Atharban Beid.

text, which I have utilized, between fifty and fifty-two. In the following is given the list and the order in which they appear in MS. *A* on which I have principally based my text:

Book I. From the *Rig-Veda*: (3). (*Fol.* 1a–26b.)

    (1) Aitereya-Upanishad.
    (2) Kaushitaki-Upanishad.
    (3) Vāśkala-Upanishad.

Book II. From the *Yajur-Veda*: (12). (*Fol.* 27–143b.)

    (4) Śivasaṅkalpa-Upanishad.
    (5) Śatarūdriya-Upanishad.
    (6) Bṛihadārṇyaka-Upanishad.
    (7) Maitri-Upanishad.
    (8) Śwetāsvātara-Upanishad.
    (9) Īśāvāsya-Upanishad.
    (10) Tadeva-Upanishad.
    (11) Mahānārāyana-Upanishad.
    (12) Bhṛigavallî-Upanishad.
    (13) Purushasūkta-Upanishad.
    (14) Ānandaballî-Upanishad.
    (15) Chhāgeleya-Upanishad.

Book III. From the *Sama-Veda*. (*Fol.* 144a–168b.)

    (16) Chāndogya-Upanishad.

Book IV. From the *Atharva-Veda*. (*Fol.* 169b–253a.)

    (17) Muṇḍaka-Upanishad.
    (18) Sarva-Upanishad.
    (19) Nārāyaṇa-Upanishad.
    (20) Atharvaśirah-Upanishad.
    (21) Haṃsanānda-Upanishad.
    (22) Praśna-Upanishad.
    (23) Dhyānbindu-Upanishad.
    (24) Mahā-Upanishad.
    (25) Ātmaprabodha-Upanishad.
    (26) Kaivalya-Upanishad.
    (27) Yogaśikha-Upanishad.
    (28) Yogatattva-Upanishad.
    (29) Atharvaśikha-Upanishad.
    (30) Ātma-Upanishad.
    (31) Brahmavidyā-Upanishad.
    (32) Amritavindu-Upanishad.
    (33) Tejovindhu-Upanishad.
    (34) Garbha-Upanishad.
    (35) Jāvala-Upanishad.
    (36) Māṇḍūkya-Upanishad.
    (37) Piṅgala-Upanishad.
    (38) Ćūlika-Upanishad.

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    48. Oupnek'hat *Pranou* ex Atharban Boid.
    49. Oupnek'hat *Savnk* ex Atharban Boid.
    50. Oupnek'hat *Narsing'heh* ex Atharban Boid.
(*Oupnek'hat id Est Secretum Tegendum*, Vol. I, p. 13.)

(39) Paramahaṃsa-Upanishad.
(40) Āruṇika-Upanishad.
(41) Kena-Upanishad.
(42) Kaṭhaka-Upanishad.
(43) Kshurika-Upanishad.
(44) Mṛityulangula-Upanishad.
(45) Amritanāda-Upanishad.
(46) Taraka-Upanishad.
(47) Praṇava-Upanishad.
(48) Ārsheya-Upanishad.
(49) Śaunaka-Upanishad.
(50) Naṛsiṇha-Upanishad.
(51) Vāmautaravāṇî-Upanishad.
(52) Gopālautaravāṇî-Upanishad.

10. The Transliteration

The inaccuracy of the transliteration of Sanskrit words into Persian is the chief defect of the *Sirr-i-Akbar*, but perhaps, Dārā Shikūh's aim was not altogether philological, and so no uniform method of transliteration has been followed. Indianized forms of letters, e.g. ﻜﮯ, *kh*; ﻜﮯ, *gh*; ﭼﮯ, *ch*; ﻨﮯ, *th*; ﺖ, *ṭ*; ﭨﮯ, *ṭh*; ﺑﮯ, *bh*, etc. which do not exist in Persian have been freely used. No distinction has either been made between the nasals, viz. ञ *ñ* (*med. palat.*); ङ, *ṅ* (*gutt.*); ण, *ṇ* (*ling.*) and न, *n* (*dent.*) and all have been transliterated as ن, *n*. In many cases it is not possible to distinguish between hard and sonant consonants. More often letters have either been omitted, added or interchanged, so as to give a more convenient Persianized pronunciation, e.g. addition of ن, *n* in the terminal and interchanging of ब, *b*, ب with व, *v*, و as in اتهربن for *Atharva*; substitution of ज, *j*, ج, for य, *y*, ی as in جبر for *Yajur*; of त, *t*, ت for द, *d*, د as in اوپنکهت for *Upanishad*; of क, *k*, ک for ग, *g*, گ as in رگ for *Rig*; of स, *s*, س *s*, for श, *ś*, ش as in بهوت آکاس *Bhūtākāsa*, etc.

Even these glaring inaccuracies form an inconsistent process, which has further been worsened by the orthographical mistakes made by various scribes, who had probably no knowledge of Sanskrit and have very often transformed the original word into something quite unrecognizable. So far as possible, I have identified all the Sanskrit words and given in the footnotes their correct reading. The following table of transliteration, though not quite perfect in itself, may to some extent, help in this respect:—

क, *k*, ک e.g. in ارک, *arka* or in برهم لوک *Brahmāṇloka*.

ख, *kh*, ﻜﮯ e.g. in کهنڈپرلی *Khaṇḍaparalaya*.

ग, *g*, گ e.g. in هرن گربه *Hiraṇyagarbha*, or سرگ *Swarga*; often interchanged with ک, e.g. in کرتش *gritsa*.

घ, *gh*, ﻜﮯ e.g. in گهرت *ghrit*.

च, *ch*, چ e.g. in مریچ, *marīchi*; اردهرچ, *ardharcha*.

छ, *ch* (*palat.*), چھ, e.g. in چھاندوگ, *Chāndogya*.

ज, *j*, ج, e.g. in جیوآتما, *jivātman*; جاگرت, *jagrit*.

झ, *jh* (*palat.*) جھ.

ञ, *ñ* (*med. palat.*), ن, e.g. in یاچن, *yāchña*.

ण, *ṇ* (*nas. ling.*), ن, e.g. in پرانایام *prāṇayām*; or نارائن, *Nārāyaṇa*.

ङ, *ṅ* (*nas. gutt.*), ن, e.g. in آنگرس, *āṅgrisa*.

न, *n* (*dent.*), ن, e.g. in نراکار, *Nirākāra*.

य, *y*, ی, but more often as ج, e.g. in جوگتت, *Yogatattva*.

श, *ś* and ष, *sh*, ش or س e.g. in آکس بانی *Ākāśavānī*; پرش *Purusha*, etc.

त, *t*, ت, e.g. in تموگن, *tamoguṇa*.

थ, *th* (*dent. asp.*), تھ, e.g. in پاگاتھ, *Pāgātha*; أدگیتھ, *Udgītha*; sometimes as ت, *t*, e.g. in أکت *Uktha*.

द, *d*, د, e.g. in دیو, *Deva*; درس پورنماس, *Darśapūraṇmās*; sometimes as ت, *t*, e.g. in أپنکھت, *Upanishad*.

ध, *dh* (*dent. asp.*), دھ, e.g. in بدھی, *Buddhī*; سمادھی, *Samādhī*.

ल, *l*, ل, e.g. in لوکپالن, *Lokapālan*.

ळ, *l* (*semivocalis mollis*), ل.

स, *s*, س, e.g. in سپن, *swapna*; سالج *Sālajya*.

ट, *ṭ*, ٹ or ت, e.g. in ورات, or ورأت, *Virāṭa*.

ठ, *ṭh* (*dent. asp.*) تھ.

ड, *ḍ* (*med. ling.*) ڈ, e.g. in برهمانڈ, *Brahmāṇḍa*.

ढ, *ḍh* (*med. asp.*) ڈھ.

र, *r*, ر, e.g. in راجسو, *Rājsūya*.

प, *p*, پ, e.g. in پامانی, *pāvamānī*; پرهت, *Prahuta*.

फ, *ph* (*Lab. asp.*), پھ.

ब, *b*, ب, e.g. in برهم, *Brahmāṇ*; بریهتی, *Brihati*.

व, *v*, و, e.g. in وایو, *vāyū*; very often interchanged with ب, *b*, e.g. in بیسوآنر, *Vaiśwanara*; بجر, *Vijara*; بید, *Veda*; بامدیو, *Vāmadeva*, etc.

भ, *bh*, بھ, e.g. in بیبھردراج, *Bibharadraga*; بھوت لوک, *Bhūtloka*.

ह, *h*, ४, e.g. in اههٔ, *aha*; اناهت, *Anāhita*.

अ, *a*, ـَ.

इ, *i*, ـِ.

अ, *a*, ا, e.g. in انترجامى, *Antrayāmin*.

आ, *a*, آ, e.g. in آپ, *āp*.

इ, *i*, ٳ, e.g. in اندريانى, *Indriyāni*.

ऊ, *u*, اُ, e.g. in اُكت, *Uktha*; اُردان, *Udāna*.

II. THE TEXT

With regard to the Persian text, I have endeavoured, so far it was practicable, to compare the major Upanishads with the Sanskrit original and if still at a few places, it remains cryptic, disconnected and unsatisfactory, it is because the translator, who has rendered into Persian portions of Śankarāchārya's classical commentary, has not distinguished the text of the Upanishads from the former. He has mixed up the both, without any thought of proper classification and arrangement of each separately. This intermixed and disjointed character of narrative, which constitutes a very substantial defect of the translation, has further been intensified by the fact that each *adhyāya* with its various *khaṇḍas* has not been classified as in the original Sanskrit text. The metrical portions of the Sanskrit text have also been treated in the same manner and the *ślokas*, *triṣṭubhs* and *anuṣṭubhs* have been mixed up with the non-metrical portion. The *Brāhmaṇas*, mostly containing a collection of utterances and discussions of learned priests upon sacrificial rites, cosmogonic myths and ancient legends, have been incorporated fully and often repeated. This does not in any way minimize the value of the work, but makes the text extremely unpalatable.[1] Not too often the *Āraṇyakas*[2] have been omitted in the Persian translation, as for instance, in the *Aitereya-Upanishad* the first *Āraṇyaka* has been entirely left out, while the second and the third *Āraṇyakas* known as the *Mahāitereya* have been retained.

The translation at some places is too literal and very vague, but it is faithful to the original, and nowhere Dārā Shikūh has tried to take liberty with the text. The scope of the present paper being limited. I cannot do better than give a few passages from the original Sanskrit and their Persian translation by Dārā Shikūh in order to illustrate my remarks. From the translation, its simple and unaffected style would be manifest. In many cases, the original Sanskrit words, which due to philosophical and technical considerations, have been left untranslated, make things more comprehensible than their mere equivalents in Persian would have done.

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[1] Both Sylvian Levi and W. Winternitz call these *Brāhmaṇas* as ' priestly pseudo-science'. Even Max Muller remarks that however interesting the *Brāhmaṇas* may be to the students of Indian literature, they are of small interest to the general reader. The greater portion of them is simply twaddle, and what is worse, theological twaddle. No person, who is not acquainted beforehand with the place which the *Brāhmaṇas* fill in the history of Indian mind, could read more than ten pages without being disgusted (cited in the *History of Indian Literature*, Vol. I, p. 187).

[2] The *Āraṇyakas* or 'forest texts' as distinguished from sacrificial or ceremonial rites contained in the *Brāhmaṇas*, are hardly distinguishable from the Upanishads. They are in fact, component parts of the *Brāhmaṇas*, but contain only ' the mysticism and symbolism of sacrifice and priestly philosophy'.

Sanskrit

ओम्‌। उषा वा अश्वस्य मेध्यस्य शिरः। सूर्यश्चक्षुः, वातः प्राणः, व्यात्त-
मग्निर्वैश्वानरः, संवत्सर आत्माश्वस्य मेध्यस्य। द्यौः पृष्ठम्‌, अन्तरिक्षमुदरं, पृथिवी
पाजस्यम्‌, दिशः पार्श्वे, अवान्तरदिशः पर्शवः, ऋतवोऽङ्गानि, मासाश्चार्धमासाश्च
पर्वाणि, अहोरात्राणि प्रतिष्ठा, नक्षत्राण्यस्थीनि, नभो मांसानि। ऊर्ध्वं सिकताः,
सिन्धवो गुदाः, यकृच्च क्लोमानश्च पर्वताः, ओषधयश्च वनस्पतयश्च लोमानि, उद्यन्‌
पूर्वार्धः, निम्लोचञ्जघनार्धः, यदि्िम्भते तद्विद्योतते, यदिधूनुते तद्रस्तनयति, यन्मेहति
तद्वर्षति, वागेवास्य वाक्‌॥

(Bṛihad. Upan. I, 1, 1.)

Persian

سرِ آن اسپ پاک صباح است ، و چشم او آفتاب ، و پرآنِ آن باد ، و دهن
کُشاده آن آتشِ بیسوانَر یعنی حرارتِ غریزی که در کل عالم است ، و بدنِ او
یک سالِ تمام ، و پُشتِ او بهشت ، شکم او فضا ، و سُم او اینِ زمین ، و پهلوهای
او جهات ، و استخوانهای او پهلوی کنجهای جهات ، و اعضای باقیماندهٔ او
فصلها ، و مفاصل او ماهها و نصف ماهها (که آنرا پچهه گویند) و پاهای او شب
و روز چهار قسم ، (اول شب و روز برهما ، دوم شب و روز فرشتها ، سیوم شب و روز
عالم ارواح ، چهارم شب و روز آدمیان ، این چهار قسم هر چهار پایِ اوست) ،
و استخوانهای باقی او ستارههای ثوابت ، و گوشتِ او ابر ، و غذای او ریگ ،
و رگهای او دریاها ، و جگر و سپرز او کوهها ، و موهای او درختها ، و نصف
پیشِ بدن او نصف اول روز ، و نصف آخرِ بدنِ او نصف آخرِ روز ، و خمیازهٔ او
درخشیدنِ برق ، و تکانیدن او غرشِ ابر ، و شاشِ او باران ، و شهیهٔ او گویائی *

(fol. 34a بِرِهد آرنک اُپنِکهَت)

Sanskrit

अथ यदिदमस्मिन्‌ ब्रह्मपुरे दहरं पुण्डरीकं वेश्म दहरोऽस्मिन्नन्तराकाशस्तस्मिन्‌
यदन्तस्तदन्वेष्टव्यं तद्वाव विजिज्ञासितव्यमिति॥१॥ तं चेद्ब्रूयुर्यदिदमस्मिन्‌ ब्रह्मपुरे
दहरं पुण्डरीकं वेश्म दहरोऽस्मिन्नन्तराकाशः किन्तदत्र विद्यते यदन्वेष्टव्यं यद्वाव
विजिज्ञासितव्यमिति॥२॥ स ब्रूयाद्‌ यावान्‌ वा अयमाकाशस्तावान्‌ एषोऽन्तर्हृदय

आकाश उभे अस्मिन् द्यावाप्टथिवी अन्तरेव समाहिते उभावग्निश्च वायुश्च
सूर्याचन्द्रमसावुभौ विद्युच्चयाणि यच्चास्येहास्ति यच्च नास्ति सर्वं तदस्मिन्
समाहितमिति ॥ ३ ॥   तं चेद्ब्रूयुरस्मिंश्चेदिदं ब्रह्मपुरे सर्वं समाहितं सर्वाणि च
भूतानि सर्वे च कामा यदेतज्जरामाप्नोति प्रध्वंसते वा किं ततोऽतिग्रिष्ध्यत इति ॥ ४ ॥
स ब्रूयान्नास्य जरयैतज्जीर्यति न वधेनास्य हन्यत एतत् सत्यं ब्रह्मपुरमस्मिन् कामाः
समाहिता एष आत्मापहतपाप्मा विजरो विम्ट्यर्विश्योको विजिघत्सोऽपिपासः
सत्यकामः सत्यसंकल्पः ॥ ५ ॥

<div align="right">(Chāndogya-Upanishad, VIII, 1, 1–5.)</div>

<div align="center">Persian</div>

<div align="center">بیانِ شهرِ خُدا</div>

<div dir="rtl">

اندرین برهم پُور یعنی شهرِ خُدا که تن است ، حُجرهٔایست خورد، مانندِ

گل نیلوفر ۔ و درو آکاشِ لطیف است ، و آنکه در آن آکاشِ لطیف است

آنرا باید جست و دانست *

اگر کسی پرسد که درین شهرِ خُدا که حُجرهٔ خورد است مانندِ گُل نیلوفر

و درو آکاشِ لطیف است ، درمیانِ آن چیست که او را باید جست

و دانست ؟ جواب باید گفت که آنقدر آکاشی که بیرون است ، همانقدر

آکاش درون آن حُجرهٔ خورد هم است ، و آسمان و زمین هر دو درو گنجیده

است ، و آتش و باد و آفتاب و ماه و برق و ستارگان و هرچه در اینجاست و در

اینجا نیست ، همه در آن آکاشِ لطیف است *

و اگر کسی گوید که درین شهرِ خُدا که تن است و درو آکاش لطیف است

که اینهمه درو گنجیده است و همه چیزها دروست و همه آرزوها دروست ،

چون این شهرِ خُدا که تن است پیرشود و نابود شود چه چیز باقی میماند؟

او را چنین جواب باید گفت که از پیری تن آن آکاشِ لطیف پیر نمی‌شود ،

و از کُشتنِ تن او کُشته نمی‌شود ۔ همان حق است این شهرِ خُدا که همه چیز درو

</div>

گنجیده است ، و آن آتما است از همه بدی‌ها دُور ، و پیری و مرگ و بیماری

و اندوه و آزارِ خوردن و آشامیدن ندارد ـ راست آرزو است و راست عزم *

(fol. 163b : أُپنِکهَت چهاندوک)

Sanskrit

आत्मा वा इदमेक एवाग्र आसीन्नान्यत् किञ्चन मिषत् स ईक्षत लोकान्नु
सृजा इति स इमाँल्लोकानसृजत अम्भो मरीचिर्मरमापः अदोऽम्भः दिवं परेण
प्रतिष्ठान्तरिक्षं मरीचयः पृथिवी मरो या अधस्तात्ता आपः स ईक्षतेमे नु
लोकालोकपालान्नु सृजा इति सोऽद्भ्य एव पुरुषं समुद्धृत्यामूर्च्छयत् तमभ्य-
तपत्तस्याभितप्तस्य मुखं निरभिद्यत यथाण्डं मुखाद् वाग् वाचोऽग्निः ।

(*Ait. Upan.* I, 1, 1–3.)

Persian

اول از همه پیدائش ، آتما یگانه بود و هیچ نبود ـ آتما خواهش کرد که

پیدائش عالم کُنم ـ اینهمه عالمها پیدا کرد و اول این چهار چیز پیدا کرد : أَنبهه ،

مَریچ ، مَرو و آپ ـ أَنبَهه آبیست که جای‌ی بودن آن بالای‌ی بهشت است ، و مَریچ

عالم فضاست که پائینِ بهشت است ، و مَرو عالم زمین است که میرندها درو

میباشند ، و آپ آبیست که در زیرِ جمیع طبقاتِ عالم زمین است *

باز آن آفرینندهٔ خواهش کرد که این عالم را که پیدا کرده است ،

نگهبانان هم پیدا کُنَد تا بی‌نگهبانان عالم ابتر نگردد ـ ازین جهت خواهش کرد

که لوکپالان را که نگهبانانِ عالم اند ، پیدا کُنَد ـ از میانِ آب هیکلی شخصی

بی‌حواس بر آورد و برای‌ی او آفریننده خواهش کرد که دهنی پیدا شود مثلِ

بیضه که بشکند ـ دهنی شگافته شُد و ازان دهن گویائی بهم رسید و از گویائی

موکلِ گویائی که آتش است ، ظاهر شُد *

(fol. 11b : اِیتَریه أُپنِکهَت)

Sanskrit

द्वा सुपर्णा सयुजा सखाया समानं वृक्षं परिषस्वजाते ।
तयोरन्यः पिप्पलं स्वाद्वत्ति अनश्नन्नन्यो अभिचाकशीति ॥

(*Muṇḍaka-Upanishad*, III, 1.)

Persian

در پرندهٔ خوب اند و هر دو همنشین اند و بیکدیگر یارانند و در یک درخت

میباشند ۔ و یکی ازان دو میوهٔ آن درخت را شیرین دانسته میخورد و دیگر

نمیخورد و می‌بیند *

مراد ازین دو پرندهٔ که یکی میخورد و دیگر نمیخورد و می‌بیند ، (اینست) :

آنکه میخورد جیو آتما است و آنکه نمیخورد پرم آتما است ' و مراد از درخت بدن '

و مراد از میوهٔ آن درخت که شیرین دانسته میخورد نتیجهٔ اعمال است ۔

و آن پرندهٔ که میوهٔ آن درخت میخورد بسبب نادانی از حقیقت خود واقف

نیست و از همین جهت در فکر و آزار است ۔ وقتیکه بر حقیقت پرندهٔ که

نمیخورد و می‌بیند مطلع شود ، او هم از خوردن باز ماند و مثل او شود ' یعنی

از قید عمل فارغ و بیفکر و بی اندزه میگردد *

(مُندَک اُپنَکهَت از اَتهَرَبَن بِید fol. 173b)

12. MSS. USED FOR THE PREPARATION OF THE TEXT

MSS. of the *Sirr-i-Akbar* are not rare, but out of a large number of them, I have made a very critical selection:—

(1) MS. *A.* For the basis of my text, I have principally used MS. 52. (*Cat. of the Āṣifīya Library*, Vol. II, p. 1540), Foll. 253; $24\frac{1}{2} \times 15$ cm.; 15 lines, 9 cm. long; written in plain and clear *Nasta'līq*; with chapters and Sanskrit names written in bold letters and marked in red, transcribed by one Asharfī Lal b. Kewal Rām b. Pratīt Rā'i b. Sukhī Lāl, dated 1166 A.H. 1157 Fasil, 1807 Bikrami, 1750 A.D.[1] in the H.E.H. the Nizam's State Library, Hyderabad-Deccan. It was the arrangement and classification of the Upanishads grouped under each of the four Vedas, which made the task more convenient, for in no other MS. such arrangement exists. This MS. which through the kindness of the Vice-President of the Library, I had at my disposal for more than 6 months at Santiniketan, I found in close agreement with MS. *C*, with the exception of the afore-mentioned classification of chapters and a few minor variations in the method of transliteration of Sanskrit names.

(2) MS. *B* No. E/103, dated 1210 A.H. in the collection of the Royal Asiatic Society of Bengal (*Cat. of Persian MSS.*, p. 178), which though incomplete is quite good in other respects. The order of the Upanishads in this MS. as compared with *A* is as follows:—

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[1] This date of transcription is wrongly given as 1067 A.H. in the *Catalogue of the Āṣifīya Library*, Vol. II, p. 1540, in the case of all the three MSS. (Nos. 1, 2 and 52) which are in the Library's collection. This date is in reality the date of the composition of the work as stated in the preface of the *Sirr-i-Akbar* (fol. 2b, MS. *A*). In the colophon of MS. 52 (fol. 253a) someone has tried to scratch out the original date of its transcription in order to make the MS. look earlier. The real date seems to be 1166 A.H. = 1157 Faṣlī = 1807 Bikrami = 1750 A.D.

16, 6, 7, 4, 9, 18, 19, 10, 20, 21, 2, 8, 22, 23, 24, 25, 26, 5, 27, 28, 4, 29, 30, 31, 32, 33, 34, 35, 11, 36, 37, 38, 43, 39, 40, 41, 42, 14, 12, 13, 44, 15, 46, 48, 49, 50.

(3) MS. *C* in the Calcutta University Central Library, whose Librarian very kindly lent it to the Department of Islamic Culture, Santiniketan, for my use for more than a year, is a beautiful specimen of ornamental calligraphy.   It is written on fine hand-made paper and contains Foll. 310, $27\frac{1}{2} \times 15$ cm.; 15 lines $11\frac{1}{2}$ cm. long, in plain *Nasta'liq*.   Each chapter is decorated with ornamental flowery designs in gold red and blue, each line is intercepted with tri-coloured bold lines, each page contains marginal flowery embellishments and each chapter opens with a verse (decidedly a later addition) inserted within a bunch of flowers.   There is no colophon, hence the name of the scribe and the date of its transcription (which appears to be a recent one) could not be ascertained.   The translator's preface is also missing and in the end, there is an additional chapter which ends abruptly.   The MS. contains 50 Upanishads and is otherwise complete and perfect.   The order is as follows:—

16, 6, 7, 17, 31, 41, 43, 34, 32, 9, 22, 39, 4, 20, 40, 18, 29, 30, 36, 24, 25, 26, 5, 27, 28, 42, 14, 12, 13, 38, 8, 10, 12, 45, 33, 23, 21, 3, 15, 19, 35, 37, 44, 11, 46, 48, 47, 49, 50.

13. The Glossary

The most remarkable feature of the *Sirr-i-Akbar*, as pointed out above, consists in its aptness of translation of Sanskrit philosophical terms or giving their nearest equivalents from Islamic phraseology.   In this Dārā Shikūh has been chiefly guided by his own understanding of Indian mythology, cosmogony, symbolical interpretation of the ritualistic and sacrificial rites and has attempted, so far as it was conceivable, to give an identical or a more easily comprehensible term from the Islamic conception of the same.   This he has accomplished more thoroughly in his *Majma'-ul-Bahrain* or ' the Mingling of the Two Oceans'.   I have selected, at random, some of these terms, which would amply bear out the ingenuity of the translator in this respect: [1]

97b. اسمِ بزرگ (Om:) اوم

8b. حرکتِ دهندهٔ همه ' (aśva:) اسو ، اَشْو
34b. ذاتِ اسپ ترکی است

99b, بیزوال (amrita:) آبِ حیات أَمْرِت
164b.

15b. درختِ طوبیٰ (Ilya:) آل

165a. درختِ بهشت (aśvattha:) اَشْوتها

104a. آوازِ مُطلَق (anāhata:) اناهَد

آییست! که جایِ بودنِ آن (ambhas:) اَنبَهَ
11b. بالایِ بهشت

آنکه درمیانِ دل (antrayāmin:) اَنترَجامی
128a, 4a. باشد و سِرِّ دل بداند

سرورِ محض (ānanda:) 150a; خوشحالی آنند
134b.

عینِ سرور (ānandsvarūpa:) آنند سروپ
119b.

زگ ; زبدهٔ اعضاء (āṅgirasa:) آنگرس
(aṅga) اعضاء ; رس (rasa:) زبده 38b.

3b. مَشغُولی (upāsana:) اوپاسنا

164b, 146a, جهالت و نادانی (avidyā:) اوِدیا
40b.

حالت 13a. ‏(awastha): أَوَستها

عالمِ بیداری (Jagrat) اوستهای جاگرت

—— خواب (swapna): حالتِ خواب سُپن

—— آرام (Sashupat) حالتِ سُشُپت بخواب

—— (Turīya): حالتِ بزرگترین نُریا 114b.

طریقِ نشستن وقتِ مَشغُولی (āsana): آسن 3b.

باطل و دروغ (a-sattva): أَسَت 40a

هزار آیت بید (uktha): أُکت 5a.

بیخواهش (akāma): أَکامَ 79b.

نادان (Ajñāni): اگیانی 165a.

حوضِ کوثر در بهشتِ سُوم (Āra): آر 165a. خندقی که از خواهش و غضَب و حرص و شهوت ساخته شده است 15b.

قراءت باهنگ (udgītha): أُدگیتهه 3b, 144a.

Etymological explanation: أُد (ud) and عالمِ فضا (gī): گی ؛ عالمِ بهشت زمین (tha): تهه 145a sq.

(ātman): آتما جان جانها 3a, 24b.

(Paramātman): پَرَم آتما جانِ بزرگ 23a, 24b.

(Jivātman): جیو آتما روح متعلق شده ببدن 3a, 13a.

(Bhūtātmān): بهوت آتما روح حیوانی 3a.

(Lingātman): لنگ آتما آتمائیکه در بدن لطیف است 55b.

(aśva-medha): اشومید ، اشمید اسپِ قربان 60a.

(āhāra-śuddhi): آهار شُدهی خورشهای حلال 163a.

(āśa): آشا آرزوی نایافته 161b.

(Iśa): ایش صاحب همه ؛ (Iśāvāsya): ایشاباس پوشیده (vāsya): باس 125a.

(aparajit): أپرأجِت شهر برهما 165a.

(ativadin): اتوادِن بنهایت سخن [انکه] رسیده است 162a.

(āp) آپ آبیست که در زیر جمیع طبقات عالم زمین است 11b; 99b.

(a-Brāhmaṇa): آبراهمن غیر عارف 149a.

(Upanishad): أینکهت آیت توحید که سر پوشیدنی است 2a, 3b, 169a.

(Brihati): برهتی نام بزرگ همه و زنها ؛ هزار آیت بید 7b; 10a.

(Brahmān): برهما جبرئیل ؛ آدم صفی اللّه 2a; 3b.

(Brahma): برهم آفریدگار 3a, 151a.

(Brahmapura): برهمپور شهر خُدا 163a.

(Brahmagiri): برهمگر کوهِ خُدا 8a.

(Brahmaloka): برهم لوک عالم ذات 82a, 117b.

(Brahma-Chakra): برهم چکر چرخِ خُدا که در گردش است

(Brahmāṇḍa): برهماند کُرهٔ عالم 4a, 64a.

(Brahmavidyā): برهم بدیا علم توحید 131b; معرفتِ برهم 150a.

(Vaiśvanara): بیسوانر حرارتِ عزیزیِ کُل عالم 3b.

(Vijarā): بِجَر حوضِ کوثر 15b.

(Vidhātri): بدهاتر سازندهٔ همه 100a.

(Vyāpak): بیاپک محیط و بسیار بزرگ 81a.

(Bhūtākāśa): بهوت آکاس محیط عناصر اربعه 3a, 7b.

(Varuna): بَرُن آب موکل 8a, 120b, 127a.

(Brihaspati): برهسپت مُشتری 112b.

(Vishṇū): بشن میکائیل 3a, 132a.

(Vasiṣṭha): بششت پناهِ همه

(Viswamitra): بسوامتر دوستدار همه عالم 9a.

(Bharga): بهرگ سوزندهٔ گناهان 99a.

(Bala): بل قُوّت 160b.

———

(Prajāpati): پرجاپت صورتِ کُل عالم 6a, 130a.

(Paramgati): پرم گت حالت بزرگ 108a.

(prāṇa): پران نفس

(prāṇayām): پرانایام حبس نفس 3b.

(prakṛiti): پرکرت اعتدال سه صفت 3b, 115a.

(Prāṇav): پرنو پروردگار مُطلّق، نام اللّه 98b.

(pralaya): پرلی قیامت 4a.

(mahāpralaya): مهاپرلی قیامت کبری 4a.

(Khaṇḍpralaya): کهند پرلی قیامت صغری 4a.

(Paramānanda): پرم آنند سُرور بزرگ 76b.

———

(Jyoti): جوت نور ذات 40a.

(Yajña): جگ قربان 3a.

(Jivātman): جیو آتما روح متعلق شده ببدن 3b.

(Yoga): جوگ یک کردن دو چیز را 4a.

(Yogi): جوگی عارف وسنیاسی 101b.

(Yama): جم ملک الموت 126b, 113a.

(6 Yoga): شش جوگ

(۱) (praṇayām): پرانایام حبس نفس

(۲) (Pratyāhāra): پرتیاهار ضبطِ حواس از بیرون و اندرون

(۳) (Dhyāna): دهیان بیک تصور بستن چیز خاص

(۴) (Dhāraṇa): دهارنا مضبوط ساختن تصور در آن چیز

(۵) (Tarka): ترک یقین درست کردن

(۶) (Smādhi): سمادهی درو محو شدن 123b.

———

(Tyat): تت هُو 65b.

(Tamo): تمو راست دانستن کثرت 40a، موت نم 40a. و دوئی

(Tamoguṇa): تموگن صفت افنا 95a.

(Turiya): تُریا عالم لاهوت که عالم ذات است 120a.

(tapas): تپس ریاضت 3a, 134b.

———

(Dhyāna): دهیان تصور بستن بیک 3b؛ چیز خاص 103b.

(Dhārna): دهارنا مضبوط ساختن تصور 103b.

(Dhātri): دهاتری دارندهٔ همه 100a.

———

(rik): رک آیت 145a.

(Rajoguṇa): رجوگن صفت ایجاد 3b.

———

(Sāmān): سام آیت 144b; Ety. Exp.: سا = گونائی (۱)م = پران 39b.

(Sālaja): سالج نام شهر که اشاره ازین به فردوس اعلی است 15b.

(Sapta-riṣhi): سپت رکهیشر بنات النعش 53a.

(Sattva-guṇa): سَتو گن صفت ابقا 3b.

(Swapnanta): سپن انت 157a.

(Swampita): سوامپت یافتن خود 157a.

(Sriṣṭī): سرشت پیدائش 41ab.

(Sashupata): سُویت، سکهویت، سُکهپت
عالم جبروت که حالتِ خواب نارام است

155a; حق مُطلَق 99b; (Sat): سَت
162a. راستی

161b. (حافظه) یاد :(Smara) سمَر

100a. پادشاهِ کل عالم :(Samrāj) سَمرآج

(Sañjam): سَنجَم ضبط حواسِ بیرونی

(Sannayāsa): سَنیاس تَرک کُل 4a, 19b,
133a. تَرک ماسوایِ اللّه

(Soma): سوم آبحیات

154a. نُورِ اعلی :(Sutejas) سُوتیجَس

169b شَریعت :(Sastra) شَاسِر
آواز مرکب از الفاظ :(Sabda) شبد
104b. آوازِ مطلق :(a-sabda) اشبد
آنتِ بید :(Sloka) شلوک

(Kapala-Jañanin): کپل گیانی مجمع ارواح
عارف بزرگ; 3a که روح محمدی باشد
12a ff.

(guna): گُن کاهی 36b 1

(Jañana): گیان معرفت 14a, 147b, 126a.

(Jañanin): گیانی عارف 4a.

(Loka): لوک عالم 3a.
(Swargaloka): سورگ لوک عالم بهشت
58b, 164b.
— بهو (Bhūloka): عالم زمین 50b.
—— برهما (Brahmaloka): سدرة المنتهی
3a. که مقام جبرئیل است

عالم ملائک (Gandharvaloka) گندهروپ —
76a. نغمه خوان

مدت خواندنِ یک حرفِ :(mātra) ماترا
3b. مُفرد

ارادتِ ازلی که سبب نمودِ بی بود :(Māyā) مایا
3b. است

عالمِ فضا که بانین دهشت (Marichi): مریچ
11b. است

(Muktī): مُکت رستگاری 73b, 81a.

(man): مَن ابو البشر آدم 136b.

169a آدم اول ابو البشر است :(Manu) مَنُو

(Mahāvāk): مَهاباک منفرد بس بزرگ

136 اسرافیل (Mahūdeva): مهادیو

(Nāda): ناد آوازِ مطلق 3b.

(Nirguṇa): نرگُن مطلق 108a.

(Nakshatra-mandala): نچهَتر منڈل سِتاره‌ها
65a.

131b. آتمایِ بزرگ :(Nārāyana) نارائن

39a. صورت کل عالم :(Vratā) ورات

دانائی :(Vijñāna): وگنان، [وجنان] وگنان
160a.

154a. صورت عالم :(Viśwarūpa) وشَواروپ

مجمع عناصر :(Hiranyagarbha): هرن گربه
136b. بسیط

فضایِ که :(Hrdy-ākāśa): هردی آکاس
70ab. درمیان دل است

100a, 119b. جیو آتمایِ عالم :(Hamsa) هنس

3a. انداختنِ چیزها در آتش :(Homa) هوم

ALLOCUTION POUR LA SOCIÉTÉ ASIATIQUE

By Prof. Louis Renou

It is not without a certain amount of emotion that today I address you, the members of the R.A.S.B., on behalf of the Academie des Inscriptions et Belles Lettres of Sorbonne, of the Institut de Civilization Indienne, and on behalf of the Société Asiatique de Paris, that young sister-institution of the R.A.S.B.

I moved about in those beautiful halls hung with the pictures of the great precursors of our studies, resembling the *Citraśālas* described in the Sanskrit dramas. Your library is rich in precious manuscripts and inscriptions. All your activities, from the glorious days of William Jones, Colebrooke, Prinsep, R. Mitra, was brought vividly before my eyes. Those famous names have been like music to our ears, from the day our interest was awakened in oriental studies.

In homage to those great men I would like to recount today the progress of Indological studies in France. The foundation of the Asiatic Society in Calcutta and the works published under its auspices brought about the birth of Indianism in Europe, and particularly in France. The Sanskrit texts translated by Wilkins and Jones, the early volumes of the old 'Asiatic Researches', were quickly made known to the Western world through their German and French translations. In short, it is Calcutta which gave the impetus to Orientalism (in those days one did not talk as yet of Indianism or Indology).

Certainly there existed researches on Indianism in France before that date. Voyagers and missionaries had a more or less fair knowledge of Sanskrit, and ancient Indian civilization. But the learning, buried under masses of obscure publications which were not transmitted from master to disciple, had remained a dead letter. The first collection of Indian manuscripts to arrive in Europe was that of the Bibliothèque Royale de Paris (now the Bibliothèque Nationale). It goes back to 1731 and contains an important lot of Vedic texts. But the whole remained unknown and undeciphered for about three-fourths of a century. Our great writer of those times, Voltaire, who was greatly interested in ancient India, believed that the Veda was a forgery of the missionaries. He mistook Sanskrit (Sanskritan or Sanskrutan, as it was then called) for a document. Even Anquetil du Perron, who was perhaps the first Westerner to explore India with the true feelings of a scholar, was unable to learn Sanskrit, as its secret was jealously guarded by the Brahmans. He was unable to learn anything about the Vedas and could have access to the Upanisads only through a Persian version of the sixteenth century.

But from 1800 things changed suddenly in response to the call of Herder and Goethe. The name of ancient India began to figure among the great laws of humanism along with those of the other peoples of antiquity, Egyptians, Jews and Arabs. The École des Langues Orientales, newly established in Paris, grouped around the great personality of Sylvestre de Sacy, an elite of researchers who came from all the corners of Europe. It is in Paris, long before London or Berlin, that Indianism was born in the Occident. The Germans, Klaproth, Lassen (who were to be the founders of Indological studies in Germany), the brothers Schloegel (both great enthusiasts of Indian thought), Bopp (who was to write, taking Sanskrit as a pivot, a comparative grammar of Indo-European languages)

all these men were united in Paris in their thirst for knowledge. The
Asiatic Society of Paris was the first, as you are aware, to be instituted in
Europe, many years before that of London. And when we celebrated
its centenary, 27 years ago, we did not forget the words of friendship which
were addressed by your Society. The first teaching of Sanskrit to be
instituted in Europe was in the College de France. A royal decree in
1816 created a professorship of 'History of Sanskrit' which was conferred
on Louis de Chezy. All Sanskritists should read the study that Sylvain
Lévi wrote on what he calls the entry of Sanskrit into the College de France,
published in the volume commemorating the fourth centenary of that
institution. In it we see how step by step scientific research developed
and intelligent interest awakened in an atmosphere entirely impregnated
by romantic reverie and musings.

It is hard for us to imagine nowadays when we have so many
instruments of work and rich libraries, what must have been the task of
deciphering of Sanskrit in those early days. In our countries deprived of a
living tradition, it was indeed a question of deciphering perhaps less
spectacular than that of hieroglyphics and cuneiform but demanding
without doubt more varied talents. Chezy relates in the preface of his
magnum opus (French edition of *Sakuntalā*) what his difficulties were.
He explains how he had to constitute for his own use a dictionary and a
grammar and how great was his joy when he was able to penetrate, after
a long and laborious work, into the sense of the glorious lyrical verse of the
Sanskrit dramas.

However, Chezy, in spite of his great merits, was only an amateur.
A great philologist was needed to establish the study of Sanskrit on a
sound basis. This philologist was Éugene Burnouf who succeeded Chezy
in 1832. His name is intimately connected with the glorious achievement
of the period. He counted among his students or friends all the orientalists
of his time. The historian Michelet, Renan the historian of religions,
went to his lectures eagerly and regularly. He was in communication with
your Society, as has been proved by our friend, Dr. Kalidas Nag. Among
his German pupils we must make mention of Rudolph Roth, who introduced
Vedic studies in Germany, and Max Müller who had, among other merits,
that of reviving comparative mythology. It was at the instance of Burnouf
that Max Müller went to London in 1846 and undertook the collation of
the manuscripts of the *Ṛk Saṃhitā* and *Sāyaṇabhāṣya* a task which he
had started the preceding year in Paris, but had been obliged to discontinue
due to insufficient material. In the same year Roth published his little
book 'Zur Litteratur und Geschichte des Weda' which was to open up a
new field for Vedic studies.

At that period Burnouf was already ailing and was near the end of
his career. Founder of Avestic Philology he was also the initiator of the
scientific study of Buddhism. At the age of 22, in collaboration with
Lassen he proved in his book 'Essai sur le Pali' that Pali was a language
derived from Sanskrit according to a strict process of evolution. His
'Introduction to the history of Buddhism in India' opened for us the whole
domain of Mahāyāna. He obtained from Hodgson, British Resident of
Katmandu, and who was one of the first members of your Society, the
copy of Nepali manuscripts which enabled him to write his synthesis.

But Burnouf was not able to lay the foundations in France of Vedic
studies, although all his teaching and so many of his notes printed or in
manuscript refer to them. History repeated itself, and 100 years after, the
same ill luck that had weighed on Anquetil du Perron, prevented Burnouf
from accomplishing this task, and the sceptre of those studies passed to
the Germans for many years.

However, we must mention among his French pupils the name of Langlois, who translated the *Harivaṃśa* and *Ṛg-Veda*. His translation of the *Ṛg-Veda* was drawing to its end when that of Wilson began to appear. Mention must also be made of Regnier, who published before Max Müller the first edition of the *Ṛk-prātiśākhya*, and of Barthelemy St. Hilaire who was the first to publish a work on the philosophy of Sāṅkhya.

It is only in the years immediately following the war of 1870 with the desire for regeneration called forth by defeat, that we see a brilliant resumption of study in our country. The establishment of the 'École des Hautes Études' at Sorbonne was intended to give France a research institution comparable with the seminars which had been the strength of the German Universities. Valuable philological works, Kaccāyana's Pāli Grammar translated by Senart and the *Bhāminīvilāsa* translated by Berzaigne, date from that time. Barth's description of the *Religions of India*—merely an item for a dictionary—is an attempt not yet surpassed, to summarize the whole religious development of the country, omitting no factual detail and yet, with all that detail preserving the synthetic character of the work. Even today, seventy years later, this handbook can still be usefully consulted.

Berzaigne's magnum opus, *Vedic Religion according to the Hymns of the Rgveda*, also dates from the eighties. It may be considered today that there is an arbitrary element in that work and that it is based on philological material to some extent out-dated. Nevertheless it remains the only comprehensive and systematic attempt up to our time, to grasp the very foundation of the speculative philosophy of the Veda, the essence of the thought of the old *ṛsis*. The romantic ideal of the primitive Veda, a sort of spontaneous adoration of natural phenomena, gives place to a religion, in which the mythical element is explained through rituals.

On the other hand, Senart carried on the tradition of Burnouf. In his book on Buddha, he endeavoured to show how much of the legend had become attached to the biography of the founder. He demonstrated that those legends were partly of Vedic origin and partly common to Hinduism. The same scholar was also responsible for an excellent edition of the *Mahāvastu*, which is still unsurpassed. Lastly, a further and most important contribution made by this scholar is the first masterly interpretation of the body of Aśoka's inscriptions, according to the work of the first decipherers. The considerable work which has since been done in this field has consisted mainly of improvement on Senart's recensions and interpretations.

It was by chance, that a few years before his death, Berzaigne had had time to chalk out a course of research, which was destined to be pregnant with consequences of great importance. The French penetration into Indo-China made possible the discovery of a vast quantity of epigraphic literature in Sanskrit in that country. Berzaigne began to classify it with a view to publication and his work was completed after his death by Barth and Senart. These old writings prove that Indo-Chinese civilization was derived from India and that Brāhmanic culture flourished in Indo-China in the early centuries of our era. This fact, important in itself, fell within the framework of still wider research, largely the work of French savants.

Sinological research took a completely new lease of life at the end of the century with Chavannes, who was followed by Pelliot. Fifty years earlier, the French scholars were responsible for the discovery of the accounts of the Chinese pilgrims Fa-hien and Hiuen-Tsang, which are of inestimable value for the study of Indian history. The Sinologists' work on Buddhism in the Far East, and the expeditions to Central Asia (the most famous being the one which went to Tun-Huang in 1908, its full harvest has by no

means yet been garnered)—the ultimate object of all that activity, whether consciously or unconsciously was to restore India to her central position in Asiatic history and to re-establish India as the link between the great civilizations, and as the leaven of culture.   The basis for the idea of *Greater India*, on which emphasis has been so rightly laid by U. N. Ghoshal, K. Nag and other Indian scientists, was to a large extent laid by these exploring scholars, ceaselessly devoted to the task of discovering the ancient history of India, from the starting point of China, Tibet or South-East Asia.   The attraction of the North-West Frontier regions through which all the invading hordes had passed, can be similarly explained.   Foucher's research on *the Graeco-buddhist art of the Gandhara* introduced a new chapter in the history of art, to be supplemented later by his study of Buddhist iconography.

Sylvain Lévi, who died in 1935, and who will probably be remembered by many of you (his journey to India was as recent as 1928) was the most famous of our research workers since Burnouf.   His written works are as voluminous as they are varied, and yet by no means give a complete picture of him as a man of scholarship, nor of the charm and critical alertness of his mind, his linguistic gifts and his qualities of heart.   Only the dullest could be unresponsive to his glowing personality and inspiring ideas.   How can I sum up in a few words his contribution to our knowledge ?   His early career seemed to foreshadow that of a classical student of Indian civilization, with the *Theatre Indien*, his first attempt to give a complete account of Sanskrit drama from the point of view of dramatic theory, dramatic practice and literary history.   Secondly, there was the small book on the *Brāhmaṇas*, the legacy of Berzaigne's ideas, in that book, Sylvain Lévi showed that the only true divinity in those texts was sacrifice and that a sort of 'totalitarian' doctrine had been built up around and for ·sacrifice.   Sylvain Lévi's expedition to India in 1897 put into shade the famous expeditions of Bühler, Peterson and Kielhorn, in the importance of discovery of manuscripts as has been admitted by a scholar like Leumann.   Thus, by force of circumstances as well as by vocation, Sylvain Lévi became the historian and philologist of Buddhism.   The importance attributed to Buddhism is a characteristic of French scholarship as a whole.   It may be considered exaggerated; Indian humanism is in no way connected with Buddhism, and Indian spiritual philosophy has few links with it.   So far as antiquity is concerned, however, it is only through an interest in Buddhism that the history of India can be profitably approached and that India can be drawn out of her 'splendid isolation'—this was Sylvain Lévi's primary concern.   Thus he was led to begin the study of Buddhism in the North on a comparative basis, i.e. by dealing concurrently with Sanskrit, Tibetan and Chinese.   This method bore fruit in India itself in the work of P. Ch. Bagchi, who was Sylvain Lévi's favourite Indian pupil, as also in that of many other scholars.   All the present day Indianists in France have been the disciples of Sylvain Lévi.   I do not wish to enumerate all those who have made a name for themselves or of those whose new works we await.   The total number is evidently not considerable; there are very few openings in this branch for us to hope to be able to keep amongst us young people who are attracted by more advantageous careers, unless they experience an unconquerable call from within.

Nevertheless, of about 30 students who take up the study of Sanskrit each year, we count about one quarter who wish to continue it and undertake research.   We give them all encouragement in their choice.   It is hoped that the French people will be attracted more and more towards Indian culture by the lectures delivered at the Institut de Civilization Indienne for the benefit of newcomers and by the reports that we publish about your

publications.   The mission of a French Indianist is twofold, viz. to promote
scientific research and to spread the knowledge and love of India.

What differentiated the Frenchmen from others in the study of
Indology has been their love of linguistic precision.   They inherited it
from that great linguist Meillet, who in all his works had given its right
place in Sanskrit.   It occupies also an important place in the Buddhistic
studies of Sylvain Lévi and Burnouf.   The Belgian school of Indianism
is very close to ours.   La Vallée Poussin was a disciple and friend of Sylvain
Lévi, and his pupil Lamotte is today a master in Mahāyānic studies.   It is
also due to Sylvain Lévi that the Tibetan scholars and Sinologists remained
in close touch with Indianism.   The archaeological excavations carried on
by Frenchmen in Afghanistan and Indo-China, the Sanskrit epigraphy in
Cambodia has enlarged our field of studies by anticipating what you
yourselves term 'Greater India'.

I cannot retrace for you, even briefly, the history of the Asiatic
Society of Paris.   It is the whole history of French Orientalism.   We have
advanced far from those days when it was possible for one man to describe
at one sitting the whole of the movement of Oriental studies, as had been
done by Jules Mohl and Darmesteter in the famous reports published
annually in the *Journal Asiatique.*

I wish to stress, however, the fact that Indianism was given a fair deal
in the publications and communications of our Society.   The most illustrious
of our presidents, Ernest Renan, was greatly attached to its study.   Since
1920 the presidentship of the Asiatic Society has fallen on two Indianists,
Senart in 1920, Sylvain Lévi in 1928, then in 1935 Pelliot, though a Sinologist
but very well-informed about all things concerning India.   The present
president is Jacques Bacot, who through the medium of Buddhism, is also
doing the work of an Indianist.

These men whom I have seen carrying on their duties had each a very
different character: Senart was a sort of 'grand seigneur' whose severe
judgment was attenuated by his refined courtesy.   Sylvain Lévi was capable
of drawing conclusions of general interest from the slightest remarks passed
by members.   He gave his views with his usual generosity, unsparing how-
ever in his remarks which were slightly ironical.   In Paul Pelliot, whose
memory was faultless, we come across precise details, chronology, scru-
pulously exact philology.   All members who spoke at the meetings of the
Society were anxious to obtain his approbation.   His death in full
maturity has deprived our Society of a support so badly needed in the
difficult times we are passing through.   Speaking of Pelliot I would like to
mention a little fact: he made it a point of carrying on during the last war
the monthly meetings and publications of the Society, without asking the
permission of the Germans.   The day came when the publication of the
Journal Asiatique was forbidden.   Yet he carried it on by making a change
of pure form.   You may notice in our collection that for two years the
title *Journal Asiatique* was changed to the title 'Mélanges Asiatiques',
which was destined to deceive the German censorship on the continuity of
our work.

I regret that I declined to accept the presidentship that was offered
to me ; I feared I could not give enough time to the Society.   My consolation
rests on the thought that the functions of president lie on the shoulders of
Monsieur Bacot, whose devotion and competence ensure the continuance of
our tradition.

A few moments ago I referred to certain difficulties.   The financial
situation of our country, the anxiety that exists in Europe, hinder the
progress of oriental studies as of so many others.   The French Indianist
feels isolated ; Germany has been reduced to silence ; England, who during

the course of the nineteenth century did not do perhaps as much as she could have, is only just beginning to reconstitute her team of workers. France has an important rôle to play; she is well prepared for it, thanks to the care she has always had of incorporating Indian culture in the great currents of humanism.

To do full justice to this rôle we must make closer the links that connect us to India. Book-learning and culture is more than ever insufficient. I cannot deal with this problem as completely as one should, it has already attracted much attention, but we are reduced today to the position of merely expressing hopes and wishes for a speedy solution. We would like to receive many more of your publications, but this desire comes at a moment when we are obliged to cut down our expenses and subscriptions. We also wish that our publications reach you more easily. An exchange of Professors between India and France, as exists already between certain European countries, is a necessity for the spread and understanding of each other's culture. Quite naturally and even more so is the exchange of students necessary. In spite of the entirely temporary difficulty which you now experience in learning the French language, the intellectual benefit of a stay in Paris is such that it ought to convince the most hesitant among you. The form of administration in the French Universities freely allows foreigners to conduct research individually under the most favourable conditions, and to satisfy all their curiosities. But in order to render material life more easy in Paris, why should not your Government build an Indian hostel in our Cité Universitaire, as so many other countries have done?

It ought to be easy to institute an exchange of lecturers between your Universities and ours. I can also visualize, why not, a learned man of yours, possessing the training of a Pandit, who would instil in the minds of our students the methods of traditional interpretation.

The translations of French literary works in India and Indian works in France should be freed from the anarchy of the publishers. An Institute of Indian Studies should be created in India, preferably in Calcutta. We would then see French students and professors imparting their knowledge of French civilization to yours, and at the same time initiating themselves in your methods of work and thus completing their training as Indianists. What France has achieved in Rome, Athens and Cairo could be accomplished with greater benefit in India under a form adapted to the country and circumstances. Scientific research in your country is not easy to follow. Why would you not draw up a critical and analytical bibliography of all the numerous works on Indology that are published in your country? International collaboration can take diverse forms, all rich in fulfilment, as soon as they pass from the stage of talks and speeches to that of reality.

I came in person to India with the hope of participating in the Thesaurus of Sanskrit which is now being drawn up in Poona. I reckon that this gigantic project will rally the strong forces of your nation, and that all Indian Universities will make it a point of co-operating in the project. Let this be the sign and example of what a collective work can do for us all. I am happy to think that the French Indianist will not be entirely a stranger to it.

I conclude with the hope that in future we may have occasion more often of working together, and of showing each other that sympathy which at the beginning of Orientalism appeared in a manner so vivid between our two sister societies of Calcutta and Paris.*

* Paper read at the Society on 20th January, 1949.

CHALCOLITHIC PHASE IN SOUTH INDIAN PREHISTORY

By B. B. LAL

(Communicated by Dr. N. P. Chakravarti, O.B.E., M.A., Ph.D. (Cantab))

It has often been said that there was no Copper or Bronze Age in South India and that the discovery and use of these metals, in this part of the country, was synchronous with and not anterior to that of iron. Writing in 1905, Vincent Smith opined that in Southern India the Neolithic Period, during which every-day tools and weapons were made of stone, highly finished, and often finely polished, passed *directly* into the Iron Age.[1]

The case was again emphatically made out by Robert Bruce Foote in 1916, in the following words: 'That the Iron Age in peninsular India was not preceded by a Bronze Age, as in Crete, Greece and so many other Western countries, was probably due to the land-loving character of the neolithic people for, had they possessed any sea-faring inclination, they would have certainly sailed across the Bay of Bengal, reached the Tenasserim coast and there become acquainted with the tinstone (cassiterite) of that region. As copper is found plentifully in India, the art of making an alloy must soon have followed. As it fell out, however, the discovery of the alloy was not made in India till after the art of iron smelting had been acquired, and iron weapons and tools had largely come into use.'[2]

True, when Smith and Foote wrote, there was hardly any evidence available to think otherwise. But since then some new discoveries have been made and the entire question needs a re-examination.

The following discussion will show that prior to the use of iron, both copper and bronze *had been used* in South India.

The first evidence in this direction was obtained in 1938-39. While blasting a huge boulder at a hill-side in the vicinity of Kallūr, a village in the Raichur district of the Hyderabad State, the labourers accidentally came across three copper swords (pl. III).[3] When the matter was reported to the Archaeological authorities of the State, they realized the significance of this chance-discovery, particularly because these swords resembled the ones previously found at Fatehgarh in the United Provinces (pl. IV).[4] Consequently, the area near that hill and around the village of Kallūr in general was surveyed and some neolithic and early metallurgical sites were located. Besides, a small-scale excavation was also carried out at the foot of a hill called Yammigudda.[5]

Although the digging was not stratigraphical and thus lacked in scientific precision, the results achieved were indeed very important. In

[1] *Indian Antiquary*, Vol. XXXIV, 1905, p. 229.

[2] *Indian Prehistoric and Protohistoric Antiquities: Notes on their Ages and Distribution* (Government Museum, Madras, 1916), pp. 24-25.

[3] *Annual Reports of the Archaeological Department, Nizam's Dominions, for 1937-40* (Calcutta, 1942), pp. 23-24, pl. V.b.

[4] *Indian Antiquary*, op. cit., p. 232, pl. III.

[5] In Kanarese, the local language, the word 'Yammi' means a buffalo and 'gudda' means a hill. This name, buffalo-hill, is self-explanatory, since on a boulder on the hill are carved two buffaloes. These carvings are commonly believed to be prehistoric.

association with an old furnace were discovered a broken axe of copper, a lump of copper pyrites and a few other copper fragments, presumably pins (pl. V, *a* and *b*).[1] These copper objects were further associated with polished stone axes and microlithics. Thus, the picture revealed was of that phase of microlithic-neolithic culture when copper (and presumably bronze)[2] had also come into use, though in a restricted degree.[3]

This incidentally raises the question whether or not these copper implements were locally manufactured. The close association of a lump of copper pyrites and other copper objects with the furnace suggests, though not conclusively, an answer in the affirmative.[4] There was, however, another important piece of evidence. At a place, a little higher up the same hill, was found 'a queer rough stone about 4 feet by 4 feet which had assumed the shape of a big saucer as ores had been crushed and pounded on it for a very long time. Traces of copper-oxide were very prominent on this stone'.[5] This latter evidence adds a lot of weight to the former, and it seems very likely that copper ores were worked upon locally to produce implements and other objects, and that these were not just imports to this site.

The evidence from Kallūr, though remarkable in so far as it opened a new and significant chapter in the prehistory of the Deccan, did not prove the anteriority of copper and bronze to iron in a stratigraphical sequence and this left a shadow of doubt behind.

But the 1947 excavations at Brahmagiri in the Chitaldrug district of Mysore State yielded definitive evidence in this direction.[6] Here, in a cutting called Br-21, a copper chisel (pl. VI) was obtained from a middle stratum (layer 13) of the Stone Axe culture (pl. VII).[7] Again, a thin bronze rod, probably a pin, was found in association with an urn-burial belonging to an early level of the same culture (pl. VIII).[8] This Stone Axe culture was characterized by the use of polished stone axes and microliths but *no* iron was associated with it. Iron appeared at a much later stage, namely, with the intrusion of the Megalithic culture but not before.

There was further corroborative evidence from another cutting, called Br-17. This area was occupied only during the Stone Axe culture, and a copper rod was obtained from one of its low levels.[9] The cutting did not yield any iron object.

These cuttings, thus, showed in a conclusive manner that both copper and bronze had preceded iron.

The position regarding the use of bronze needs some further clarification, especially in view of Foote's remarks that the discovery of the alloy was not made in India till after the art of iron-smelting had been acquired and iron weapons and tools had largely come into use (above).

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[1] *An. Rep. Arch., Dept. Nizam's Dominions*, op. cit., p. 27a pl. XII *a* and *b*.

[2] No analysis of these objects has been done.

[3] 'A lump of iron ore containing mica in enormous proportion was also found.' But since the digging was not done stratigraphically, it is doubtful if the iron ore actually lay in the same layer as the copper objects. If soil-deposits are not horizontal—and this is not unusual—objects found at the same depth may not necessarily be contemporaneous. It should further be noted that no iron object as such was recorded.

[4] This could have been definitely discovered if the ashes from the furnace were examined and found to contain copper slags.

[5] *Annual Report of the Archaeological Department, Nizam's Dominions*, op. cit., p. 27.

[6] *Ancient India*, No. 4 (July 1947–Jan. 1948), pp. 202 and 267.

[7] Ibid., Section at Br-21, p. 205.

[8] The same figure.

[9] Ibid., p. 204.

The analysis of the bronze rod or pin from Brahmagiri (referred to above) showed that as much as 9% of tin was used in the alloy. This leaves no room for a doubt that the technique of preparing an alloy for bronze was not known. It will, however, be admitted that like copper, bronze was also used in a very restricted degree. The Kallūr examples, as stated above, have not been analyzed. But it is not unlikely that some of them, when analyzed, might show similar results.

Now to the date of, and period covered by, this Chalcolithic Phase of South Indian Prehistory.

At Brahmagiri, the Chalcolithic culture (called the Brahmagiri Stone Axe culture in the original Report) was represented by a 7-foot thick occupational deposit and was overtaken towards its end by the Megalithic culture. The beginning of this latter culture at Brahmagiri can be dated to the 3rd century B.C., and it follows, therefore, that the preceding Chalcolithic culture continued (at least at Brahmagiri) till about the same period, namely, the 3rd century B.C. That being the upper limit for it, it is for any one to guess the period taken during the accumulation of the 7-foot deposit [1] of the Stone Axe culture. But on general grounds,[2] it seems reasonable to assume that Chalcolithic phase of the Brahmagiri Stone Axe culture began somewhere about 700 B.C.

The copper objects found in the trial excavations at Kallūr (referred to above) yielded no evidence as to their date. But the swords with characteristic 'antennae' hilts certainly call for consideration, because of their similarity with those found at Fatehgarh. The date of the latter has been guessed to be in the neighbourhood of 1000 B.C. (there is no definite evidence to go by),[3] and if this dating is somewhere near precision, the southerly imports at Kallūr may be placed broadly in first quarter of the 1st millennium B.C.

In passing, reference may also be made to a terracotta cylinder seal from Maski (pl. IX).[4] It was just a surface-find, and, as such, has no stratigraphical value. However, its general resemblance with the Babylonian seals[5] seems to suggest a Chalcolithic context. May be, it was associated with some Chalcolithic phase of South Indian Prehistory. But, one swallow does not make a summer, and much cannot be said on the basis of a single find of this kind in South India.

From the foregoing discussion it would now be clear that towards the later part of the Neolithic Age in South India there was a phase when copper and bronze implements were used alongside polished stone axes and microlithics. These metal (copper and bronze) implements were neither produced on a very large scale, nor did they replace their counterparts in the stone, which they only supplemented. There was not an exclusively copper or bronze age in South India but *a stage has to be recognized in South Indian Prehistory when bronze and copper had begun to be used but iron was still unknown.* Within broad limits, this Chalcolithic phase can be placed in the first three quarters of the 1st millennium B.C.

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[1] Only Phase IB has been taken into account, since no bronze or copper was obtained from Phase IA.

[2] This point has been discussed in foot-note No. 1, *Ancient India*, No. 4, p. 201.

[3] Piggott, in *Antiquity*, Vol. XVIII, No. 72, Dec. 1944, pp. 173 ff.

[4] *Annual Report of the Archaeological Department, Nizam's Dominions*, for 1936-37 (Calcutta, 1939), p. 15 and pl. XIII *a*.

[5] I have not made a detailed comparison of the Maski seal with those found in the Middle East, but one similarity may be pointed out here, namely, the representation of the head-gear by means of indentations. Cf. W. H. Ward, *The Seal Cylinders of Western Asia* (Washington, 1910), Nos. 574, 709, 738, 761 and 901.

The evidence discussed above is significant and definitive, but to get a more comprehensive picture, further evidence must be awaited, which scientific excavation at a few other late Neolithic-microlithic sites of the type of Brahmagiri is likely to yield.

Note.—Plates III, V (*a*) and (*b*) and IX have been reproduced from the *Annual Reports of the Archaeological Department, Nizam's Dominions;* pl. IV from the *Indian Antiquary* and pls. VI–VIII from the *Ancient India.*
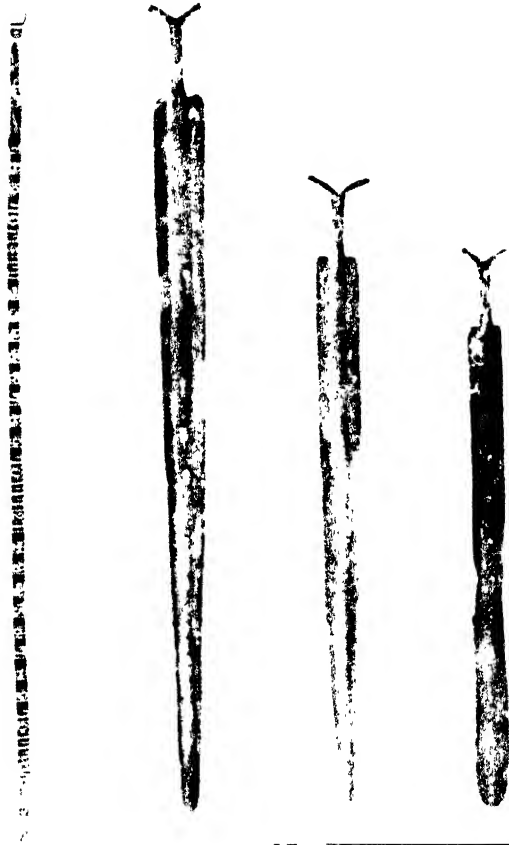
opper Swords from Kallūr (Hyderabac
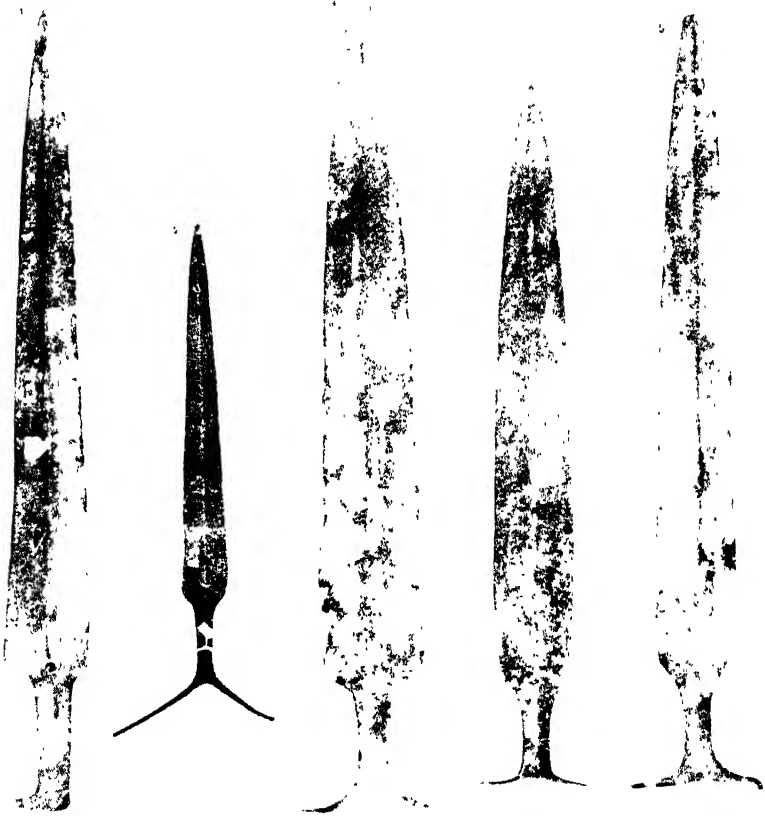
Copper Swords from Fatehgarh (U.P.)
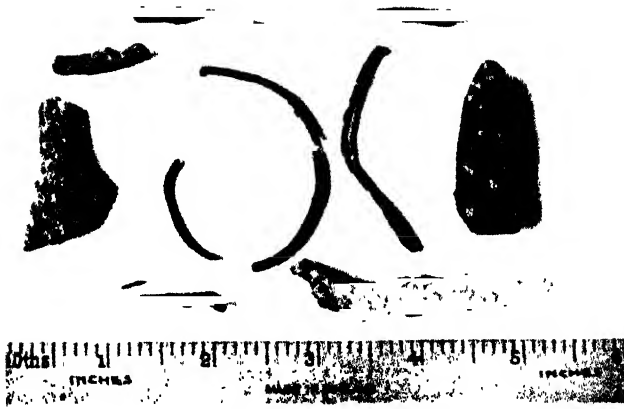
(a) Copper objects including a fragmentary axe: Kallūr.
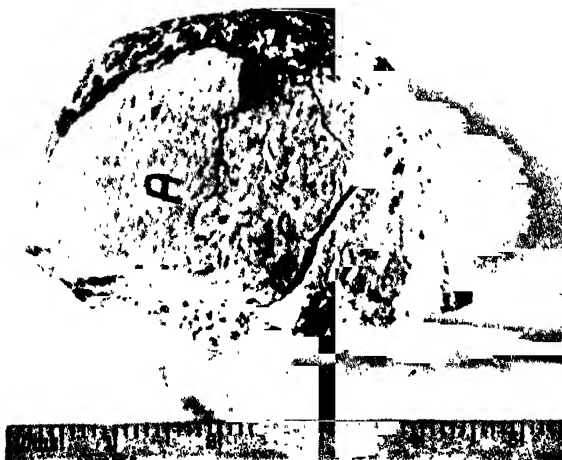
(b) A lump of copper pyrites from Kallūr.

Copper Chisel from Brahmagiri (Mysore State)

BRAHMAGIRI, 1947: SECTION BR. 21
SHOWING INTERRELATIONSHIP OF CULTURES

SOUTH-WEST

NORTH EAST

III ANDHRA CULTURE

POST HOLE

POST HOLE

① ② ③ ④ CHUNAM ⑤ ⑥

II MEGALITHIC CULTURE

⑦ CHUNAM

STONE-COURSE A

⑧

⑧A

⑧B

STONE-COURSE C

⑨

⑨A

IB STONE AXE CULTURE (LATER)

STONE COURSE

⑨B

⑩

⑪ MIXED CHUNAM ⑫

WALL 8

⑬

⑭ PIT

⑭A

⑮

⑭

⑮

⑯

⑰-BURNT CHUNAM

⑱

BURIAL URN T 36

IA STONE-AXE CULTURE

NATURAL SOIL

SCALE OF FEET

SCALE OF METRES

0   2   4   6   8   1   0
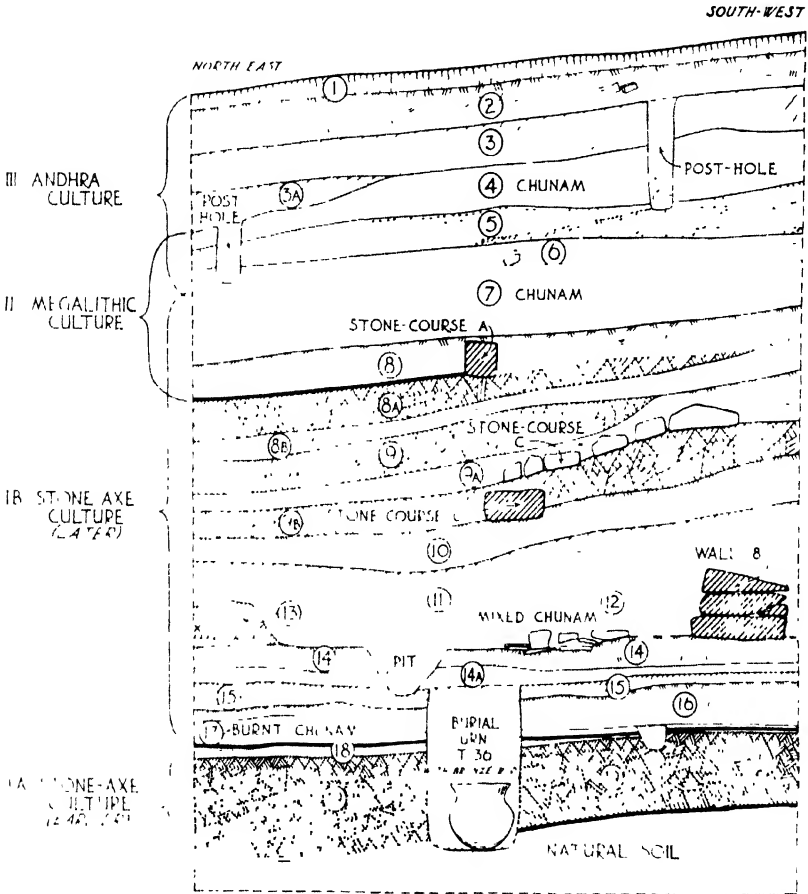
Copper and bronze rods from Brahmagiri (Mysore State).

Terracotta Cylinder Seal from Maski (Hyderabad)

THREE ANCIENT INSCRIPTIONS FROM TIBET

By H. E. RICHARDSON, C.I.E., O.B.E.

(*Received on March 10, 1949*)

(For ease of reading I have rendered Tibetan names phonetically but on the first appearance of each Tibetan word I have given a literal transcription where this differs from the phonetic form.)

The first of the inscriptions, of which the texts and translations are given below, comes from a do-ring (rdo-ring(s))—a long stone pillar—near a small lha-khang (chapel) between Ramagang and Liu Dzong, some two miles south-west of Lhasa on the south bank of the Kyi Chhu river.

The lha-khang, surrounded by some poor buildings inhabited by nuns who now occupy the site, stands in the centre of an area about 150 yards square at each corner of which is a large chhö-ten (mchhod rten), or stupa, of earth. The chhö-ten at the north-east corner shows the remains of a covering of thick rectangular red bricks, once coated with a blue-green glaze of which fragments still remain. The do-ring stands in the middle of the east side of the perimeter bounded by the chhö-tens and just outside it. It is on a considerably lower level than the existing lha-khang and its lower part stands in a hollow of the sand from which it has recently been excavated. It is approximately 14½ feet in height, 2½ feet in breadth, and 1½ feet in thickness. It is surmounted by a fluted stone canopy (rgya-bub) on top of which is a carved stone representing a jewel (nor-bu). I am told that it stands on a sort of stone chest finely decorated with a carved pattern of mountains and clouds; but this is now buried in the sand and I have not seen it. The pillar faces north and south and the inscription is on the south face; the other faces are not inscribed. In the courtyard of the lha-khang a stone, similar to the nor-bu on the pillar, is lying together with what appears to be the base of another pillar.

It is believed that there is an 'inner do-ring' buried somewhere inside the enclosure; but no trace of it is visible. The present lha-khang is recent and the only signs of old construction are the remains of a thick mud wall on its west side. An earthen image of the Jo-wo Rimpochhe—the Lord Buddha as a prince—which was shown to me is said to have come from the old Tsuk Lak Khang (gtsug lag khang).

The inscription is in good condition. Only the last two lines are damaged to any extent. It apparently dates from the time of King Tri De Song Tsen (Khri lde srong brstan) and mentions the founding by him of Kar-chung Tsuk Lak Khang (skar-chung).

I have given a copy of the inscription to Professor Giuseppe Tucci of the University of Rome, a pre-eminent scholar of Tibetan history, religion and art, who was recently on a visit to Lhasa. His first reaction was that the detailed references to religion are unique if they really date from the ninth century A.D. and that the inscription may have been put up in the eleventh or twelfth century when, with the revival of Buddhism, there was an effort to glorify the early kings as the benefactors of Buddhism. Professor Tucci may have altered that opinion as the result of detailed study of the inscription; and for reasons which follow I am inclined to think that the inscription is a genuine product of the ninth century A.D.

I have had the benefit of consulting De-chhen Chhö-khor Yong-dzin Rimpochhe, a learned incarnate Lama of the Druk-pa (hbrug-pa) sect, who was responsible for the discovery of the do-ring some twenty years ago. He tells me that he did this partly by his study of history and partly by inspired intuition, for which Lamas of the older sects are famous. According to him, Ramagang was a religious site from early days as there is a record that the Guru Rimpochhe, Padma Sambhava, used to stay there.

The Lha-khang is now called Sang-gye Gompa (sangs rgyas) and the name Kar-chung is unknown anywhere in the neighbourhood. The Rimpochhe says that, before the occupation of the site by nuns, it was inhabited by monks of the Ka-gyu-pa (bkah rgyud pa) sect who first settled in Trip valley a little further east, but finding that place too lonely and exposed to robbers, they moved to what is now Sang-gye Gompa. Some of the prayers used by the nuns seem to have been taken over from their Ka-gyu-pa predecessors.

The chhö-tens are, to all appearances, of great age and so are the remains of the mud walls on the west side of the site. It seems unlikely that a body of monks who were apparently too small to protect themselves from robbery and were unable to build more than a very humble lha-khang, could have made such large chhö-tens. Moreover, from their shape and condition and from the state of the glazed bricks, the chhö-tens appear to have been built much longer ago than within the last two or three hundred years which is the time the Rimpochhe assigns to the migration of the monks from Trip. It is also interesting that in descriptions of the building of Sam-ye (bsam yas) Gompa, the oldest of the great monasteries of Tibet, in the eighth century A.D. there is mention of four chhö-tens of white, red, blue and black respectively; and I believe that a chhö-ten covered with blue tiles still survives there. The practice of making coloured chhö-tens thus seems to be very old and I have not seen similar glazed coverings elsewhere.

From the wording of the inscription, with its references to foundations by earlier kings, with Tri De Song Tsen's name at the beginning as the person responsible for the inscription, and with the record of the building by him of Kar-chung Tsuk Lak Khang as the last in the series of foundations, it seems reasonable to assume prima facie that the do-ring was set up in front of his own foundation. The total burial of the do-ring in sand also seems to be evidence of considerable age.

Historical references to Kar-chung are, as usual in Tibetan written records, conflicting. The Gyalpo Kathang (rgyal po bkah thang) which is in part, of great antiquity and which purports to have been written at the command of Tri De Song Tsen, tells in a passage on folio 39 about this foundation as follows: 'Afterwards (he built) U-ru Klungs Shod Tsuk Lak Khang; in the form and pattern of a star: the altar of Skar-chhung rdo-rje dbyings'. The account also says that eight chhö-tens were made. U-ru is the old name for the Kyi Chhu valley area. Lung-shö is the present name of a district some 50 miles to the north-east of Lhasa. De-chhen Chho-khor Rimpochhe thinks that the passage quoted ought to read 'U-ru Lung-sho Tsuk Lak Khang *and* Kar-chhung'; but this seems doubtful. On the basis of this passage, since the discovery of the do-ring at Sang-gye Gompa and the claim by De-chhen Chhö-khor Rimpochhe that the site is Kar-chung, the monks of Tsa Potrang (rtsa pho brang) in Lung-sho have asserted that Tsa Potrang is the original Kar-chung. I have visited the place and found that it is apparently an ancient palace and not a Tsuk Lak Khang. It is, however, interesting that there is an annexe, consisting of

a small secular building, called Dorje Ying (rdo rje dbyings) but there is no trace of any chhö-tens or of any do-ring there.

Pu-tön Rimpochhe (Bu-ston) who wrote his *History of Religion* in 1323, says that Tri De Tsen Se Na Lek (sad na legs), who is clearly identifiable with Tri De Song Tsen, built Skar-chhung rgya sde. The Tep Ther Mar-po (Deb ther dmar po), written in 1538, says that Tri De Song Tsen built the Tsuk Lak Khang of dkar-chhung at rgyal-sde.

These are the earliest mentions I have found; but the fullest account is given in the Religious History of Pao Tsuk Lak (dPao gtsug lag) a Ka-gyu-pa monk of Lho-brak. De-chhen Chhö-khör Rimpochhe says that he was contemporary with the eighth incarnation of the Karmapa Rimpochhe who lived in the ninth rab-chung (rab byung) or Tibetan cycle of sixty years. These cycles began in 1024 A.D. and that would give the lifetime of Pao Tsuk Lak as between 1504 and 1564. In his history, when giving an account of the Chinese Emperors, Pao Tsuk Lak gives his last specific mention to the Cheng-te regnal period of the Ming dynasty (1506–1522). He also gives the date of the completion of his work as the Male Wood Mouse year, and states that he took thirty-eight years writing it. This would make the probable dates as between 1526 and 1564, which agree with De-chhen Chhö-khör Rimpochhe's statement. His work is of particular importance in connection with this inscription, for not only does he mention the founding by Tri De Song Tsen of Kar-chung (skar-chhung in one passage and dkar-chhung in another) in Kyi sho (skyid shod) but he also quotes almost verbatim long passages of the text appearing on the do-ring now standing at Sang-gye Gompa. He does not state that the text was inscribed on a do-ring but describes what he quotes as the words of an oath which Tri De Song Tsen made all his ministers take in amplification of a similar oath taken in the time of his father King Tri Song De Tsen (Khri srong lde brtsan). The terms were written on fine paper in letters of gold. Earlier, Pao Tsuk Lak gives a long account, in the form of quotations, of Tri Song De Tsen's oath and he reproduces exactly the text of the do-ring at Sam-ye on which the oath was inscribed in short. I have appended a copy and translation of that inscription. The fact that he specifies the existence of a do-ring at Samye and quotes it verbatim while he does not mention a do-ring at Kar-chung, and that his rendering of Tri De Song Tsen's oath differs to some extent from the inscription at Sang-gye Gompa and is not a verbatim transcription such as is his quotation from the Samye do-ring, makes it possible that his source of information about Tri De Song Tsen's oath was some wirtten record similar to that of his other quotations in connection with Tri Song De Tsen's oath. The do-ring at Sang-gye Gompa may have been buried in sand even in the time of Pao Tsuk Lak which might account for the difference in the spelling of the name Kar-chung which is given by Pao Tsuk Lak as skar-chhung and dkar-chhung as against skar-chung in the inscription itself.

From points of style and language there is evidence of the antiquity and royal origin of the inscription. The kings are described as 'Thrül kyi Lha-tsenpo (hphrul gyi lha btsan po), an honorific title appearing in an indubitably royal inscription of the ninth century A.D.—that on the do-ring in front of the Tsuk Lak Khang of Lhasa which contains the treaty between Tri Ral-pa-chen and the Chinese Emperor Mu Tsung. I shall say more about that inscription later on. The title also appears in two inscriptions recently discovered by me at U-ru Sha-i Lha-khang, some 50 miles north-east of Lhasa. These inscriptions were also set up by Tri De Song Tsen and provide further evidence that this king was a supporter of Buddhism and a writer of inscriptions. The Sha-i Lha-khang do-rings will form the

subject of a later article and it must suffice to say here that they record the
royal patronage of a comparatively small religious institution and contain
interesting historical matter but no such general injunctions about supporting
religion as appear on the Sang-gye Gompa do-ring. Against these uses of
'Thrül kyi Lha-tsen po' on royal inscriptions may be set the terminology
of other ancient inscriptions at or near Lhasa. That on the do-ring at
Shö, below the Potala, which was set up in the time of King Tri De Tsuk
Ten (Khri lde gtsug brtan) in the eighth century A.D. describes the kings
only as 'Tsen-po'. Such also is the usage in the inscription from Tsur-bu
Gompa which is the third text given by me below. Evidence of age is
provided by the appearance of the archaic form known as 'da-drag'—a
terminal 'd' used after n.r. and l which has, according to Csoma de Koros,
the significance of a past tense. This use is said to have been abolished
by Tri Ral-pa-chen in his reforms of Tibetan spelling; and it is noticeable
that the da-drag does not appear on Ral-pa-chen's inscription at Lhasa
nor in the inscription from Tsur-bu which is also dateable to his reign, but
it does appear on the Sho do-ring of the eighth century and on the do-rings
at Sang-gye Gompa and Sha-i Lha-khang which relate to Ral-pa-chen's
father Tri De Song Tsen. Other old forms are the use of 'my' where
modern Tibetan uses only 'm', e.g. myi for modern mi; and the inverted
form of the letter ki-ku. These two usages were not abolished by Ral-pa-
chen and they appear in his inscription at Lhasa but have vanished by
the time of the next batch of inscriptions at Lhasa in the eighteenth century
and probably disappeared centuries before that. The similarity of word-
ing between the Sam-ye inscription and that at Sang-gye Gompa is also
noticeable.

It is, of course, possible to argue that the stylistic antiquity simply shows
skilful imitation and that Pao Tsuk Lak's book version of the oath of Tri
De Song Tsen is merely a free adaptation from the inscription at Sang-gye
Gompa; and to deduce that the inscription was forged in the eleventh or
twelfth century to emphasize the benefits to religion conferred by the early
kings. But if this were so, it is surprising that Tri De Song Tsen should be
chosen for glorification. Later historians, except for Pao Tsuk Lak, pass over
him lightly and his name is almost unknown in Tibet today. No tradition of
veneration attaches to him as it does to his father Tri Song De Tsen; and
one might have expected that attempts to fake evidence would have con-
centrated upon the more famous name.

Further, I think that, in the absence of anything but vague doubts
based on the unprecedented nature of the detailed references to religion at
so early a date, and in the presence of such arguments as I have given to
set against those doubts, the suggestion of the deliberate forgery of such
an inscription in the eleventh or twelfth century is not acceptable. Such acti-
vities are quite uncharacteristic of the Tibetans with their profound reverence
for the written word. They may have been ready to accept and embroider
legends and traditions about the ancient kings; I doubt if they would
have erected counterfeit inscriptions.

It is certain that the early kings supported Buddhism and built temples;
and it is not surprising to find some reference to the content of their faith
in the simple injunctions about religious duties which appear on the in-
scription under examination. The evidence seems to me to favour the belief
that the do-ring now at Sang-gye Gompa was actually set up by King Tri De
Song Tsen who reigned from 804 to 816 A.D.

Whether the present site of the do-ring is in fact Kar-chung is perhaps
open to argument. Pao Tsuk Lak, who appears to have been a careful
historian, says that Kar-chung was in Kyi-shö. Kyi Shö is the name of the

valley of the Kyi Chhu from Lhasa downwards with special reference to the sunny parts as opposed to the shady parts which are called Trip.

The name rgyal-lde or rgya-sde, which appears in other writers, may simply mean 'The Royal Estate'. Francke, in his edition of the *Ladakh Chronicles*, tries to identify rgya-sde with a district in Ladakh but this is most improbable.

The Chronicle of the Fifth Dalai Lama, which gives an account of the founding of Kar-chung (dkar-chhung) tells that it was built at rgyal-sde after much discussion about choosing its site, and after ruling out a proposal to build it on the great Northern Plain. This eliminates any possible suggestion that rgya-sde could refer to the north-eastern province of that name.

The mention of U-ru Lung-shö in the Gyalpo Kathang is, therefore, the main objection to holding that the present Sang-gye Gompa is the old site of Kar-chung. Against that may be set the existence of the do-ring at Sang-gye Gompa which is apparently an old site, the reference in the inscription to Kar-chung, and the improbability that so large a pillar would have been removed from anywhere else to its present position. The second pillar believed to be buried at Sang-gye Gompa may contain a more detailed account of the founding of Kar-chung, and it is to be hoped that it may some day be unearthed. Without that confirmation it remains a possibility that the reference to Kar-chung is incidental and that the site is that of some other foundation by Tri De Song Tsen of which no historical mention has survived; but the probabilities lead me to think that the site is actually Kar-chung and that the inscription may reasonably be described as 'The Kar-chung Inscription'.

The principal historical interest of this inscription is that it contains the earliest reference to Buddhist religious duties in any detail.

The specific mention of foundations by earlier kings are also of interest, and I have not seen in any Tibetan history which I have read the attribution of any religious foundation to King Dü Song (hdus srong). Ling Tri-tse (Gling Khri tse) which is ascribed to him in the inscription, is said by Pu-tön Rimpochhe to have been founded by Tri De Tsuk Ten. (Khri lde gtsug brtan.) The fact that it was necessary to renew the oath to support Buddhism taken in Tri Song De Tsen's time indicates the strength of the opposition to the religion which culminated in its overthrow by Lang Darma (Glang Dar-ma). It is a traditional account in Tibetan histories that when Tri Song De Tsen was young his ministers suppressed religion. This is supported to some extent by a passage in the Sho do-ring which relates that Tri De Tsuk Ten was murdered by two ministers who also tried to kill Tri Song De Tsen. On the question of Tri Song De Tsen's successors and their dates the inscription throws no light beyond confirming that Tri De Song Tsen was Tri Song De Tsen's son. This is stated by most Tibetan historians but there are some exceptions who say that Tri De Song Tsen was the name of Ral-pa-chen. In the Kar-chung inscription the writer, Tri De Song Tsen, refers to Tri Song De Tsen as his father. And in the inscription on the Tsuk Lak Khang do-ring at Lhasa which was set up by King Tri Tsuk De Tsen (Khri gtsug lde brtsan), who is identifiable from Chinese records as well as from Tibetan histories as Ral-pa-chen, the writer refers to his father, Tri De Song Tsen.

In passing it may be noted that the inscription on the do-ring in front of the Lhasa Tsuk Lak Khang, which Dr. Waddell in an article in the *Journal of the Royal Asiatic Society* for April, 1911, ascribes to Tri Song De Tsen and to the year 783 A.D. is beyond doubt the record of the treaty between Tri Tsuk De Tsen Ral-pa-chen and the Chinese Emperor Mu-

tsung in the year 821/822 A.D. This ascription, which was originally made by Dr. Bushell in the *J.R.A.S.* for 1880, is proved by a copy of the text taken in 1921 by the late Sir Charles Bell, from which the exact date of the inscription is amply clear. The passage containing the date appears to have been buried in sand when Dr. Waddell took his copy in 1904 and this helped to lead to a wrong interpretation. I have examined the text carefully and hope to publish Sir Charles Bell's version and translation as well as that of the Shö do-ring, at a later date.

The second inscription below comes from a do-ring in the courtyard of Sam-ye Gompa. The text was obtained by Sir Charles Bell in 1921 and has not been published before. Although the name of no king is given in it, it is ascribable to Tri Song De Tsen who founded the monastery some time between 763 and 787 A.D., and it is so ascribed by Pao Tsuk Lak in his history as mentioned above. I have included this inscription mainly to show its similarity to that at Sang-gye Gompa; but it is worth noting how its existence tends to confirm the reliability of Pao Tsuk Lak. In the last sentence of the inscription it is stated that 'the detailed text of the oath exists separately'. In Pao Tsuk Lak's history there are long quotations from not one but two oaths taken by Tri Song De Tsen, in addition to the verbatim rendering of the inscription on the do-ring at Sam-ye. The quotations include a reference to the suppression of Buddhism by the king's ministers during his minority. The language of the quotations contains several archaisms which do not appear elsewhere in Pao Tsuk Lak's writing, and they look genuine. The fact that Pao Tsuk Lak took trouble to go to original sources is shown by his exact rendering of the inscription on the do-ring; and his history may therefore prove to be of great value.

The third inscription given below comes from Tö Lung Tshur-bu Gompa, the chief monastery of the Karmapa sect. I saw the do-ring, which stands in the courtyard of the monastery, in 1946 but did not secure a copy of the inscription until 1948. The text has not been published before and I have seen no mention of the existence of an inscribed do-ring at Tsur-bu.

Tshur-bu Gompa was founded about 1187 A.D. but the inscription relates to the founding of Chang-bu Tsuk Lak Khang (lchang bu) of which no other mention is traceable; and it refers to King Tri Tsuk De Tsen who ruled from 816 to 836 A.D. The name Chang-bu is now unknown in the To Lung valley and it seems probable that Tshur-bu Gompa was built on or near the site of the pre-existing Chang-bu Tsuk Lak Khang and that the do-ring was preserved in the new monastery.

The founder of Chang-bu may have been related to King Tri Tsuk De Tsen as he came from the family of Tshhe Pong (Tshhes Pong) from which Tri Song De Tsen, Tri Tsuk De Tsen's father, took one of his queens; but the appearance in his name of the word 'Shang', which may mean 'uncle' probably does not connote relationship. Shang is a frequently recurring clan name; and the word is also found in the title Shang Lön (blon) which Dr. Laufer in his 'Bird Divination in Tibet' (*Toung Pao*, Vol. XV, 1914) identifies with the Chinese title 'Shang' meaning 'President of a Board of Ministers'. In the present case it most probably refers to the founder's clan.

The inscription, which may be dated between 816 and 836, is included in order to show the difference in style from that of royal inscriptions such as that on the do-ring at Sang-gye Gompa; but its content is not without interest.

The translations of the Sang-gye Gompa and Chang-bu inscriptions have been made with the help of Dechhen Chhökhor Rimpochhe, Tshatrul Rimpochhe, Rai Saheb Pemba Tsering, Extra Assistant Political Officer,

Indian Mission, Lhasa, and Sera Geshe Lobsang Chhodak, whose assistance I wish to acknowledge with all gratitude.   There are some difficult passages in the inscriptions and it is not claimed that the translations are free from error.   It is hoped that scholars of Tibetan will offer criticism and suggestions.

The translation of the Sam-ye inscription was made by Sir Charles Bell with the help of the Instructor in Logic and History to the Thirteenth Dalai Lama.

INSCRIPTION AT SANG-GYE GOMPA (? KAR-CHUNG)

1   ༄༅། །འཕུལ་གྱི་ལྷ་བཙན་པོ་ཁྲི་ལྡེ་སྲོང་བཙན་གྱི་རིང་

2   ལ། །དུས་པའི་ཆོས་ཤུན་དུ་བརྟན་བར་གཙིགས་

3   བརྟན་པ། །

4   ༄༅། །འཕུལ་གྱི་ལྷ་བཙན་པོ། སྲས་ ¹ ཁྲི་སྲོང་བཙན་གྱི་

5   རིང་ལ། །སངས་རྒྱས་ཀྱི་ཆོས་མཛད་དེ། །ར་སའི་གཙུག་

6   ལག་ཁང་ལས་སྟྩོགས་པ བརྩིགས་ཤིང་། །དཀོན་མཆོག་

7   གསུམ་གྱི་རྟེན་བཙུགས་པ་དང་། །སྲས་ཁྲི་འདུས་སྲོང་གི་

8   རིང་ལ། །སྲོང་གི་ཁྲི་ཙེ་ལས་སྟྩོགས་པར། གཙུག་ལག་

9   ཁང་བརྩིགས་སྟེ། །དཀོན་མཆོག་གསུམ་གྱི་རྟེན་བཙུགས་

10 པ་དང་། །སྲས་ཁྲི་ལྷ་གཙུག་བཙན་གྱི་རིང་ལ། །བྲག་མར་གྱི་

11 ཀུ་ཙུ་དང་། མཆིང་ཕུར་གཙུག་ལག་ཁང་བརྩིགས་ཏེ་དཀོན་

12 མཆོག་གསུམ་གྱི་རྟེན་བཙུགས་པ་དང་། །ཡབ་ཁྲི་སྲོང་ལྡེ་

13 བཙན་གྱི་རིང་ལ། །བྲག་མར་གྱི་བསམ་ཡས་ལས་སྟྩོགས་

14 པ། །དབུར་མཐར་གཙུག་ལག་ཁང་བརྩིགས་ཏེ་དཀོན་

15 མཆོག་གསུམ་གྱི་རྟེན་བཙུགས་པ་དང་། །ལྷ་བཙན་པོ་ཁྲི་

16 ལྡེ་སྲོང་བཙན་གྱི་རིང་ལ་ཡང་། །སྐར་ཅུང་གཙུག་ལག་ཁང་

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¹ Line 4. Myes = the modern mes.

17 ལས་སྟོགས་པ་བརྟགས་ཏེ། །དགོན་མཆོག་གསུམ་གྱི་རྟེན་

18 བརྟགས་པ་ལས་སྟོགས་པ། །གདུང་རབས་རྒྱུད་ཀྱིས།

19 འདི་ལྟར་སངས་རྒྱས་ཀྱི་ཆོས་མཛད་པ་འདི། །ནམ་དུ་ཡང་མ་

20 ཞིག །མ་བདང་ན། །ལེགས་པ་དཔག་དུ་སྱིད་པར་འགྱུར། །

21 བདང་སྟེ། ཞིག་གམ། སྱིད་པར་གྱུར་ན། །ཕྱུག་པ་གང་ས་སྱིད་

22 པར་འོང་བས། །ད་ཕྱིན་ཆད་ནས་ནས་ཤ་ཞར། འཕྲལ་གྱི་ཧ་

23 བཅན་པོ། །ཡབ། ཁྲི་སྲོང་སྟེ་བཙན་གྱི་རིང་ལ། །དགོན་མཆོག

24 གསུམ་གྱི་རྟེན་བརྟགས་པ་དང་། །སངས་རྒྱས་ཀྱི་ཆོས་མཛད་པ་

25 གྱི་གདང་མ་ཞིག་པར། །གདུང་རབས་རྒྱུད་ཀྱིས་ཡི་དས་བཙའི་

26 ཞིས་འབྱུང་བ་ལས་སྟོགས་པ། །བཙན་པོ་ཡབ་སྲས། །རྗེ

27 བློན་ཀུན། ཀྱིས་དབུ་སྲུང་དང་བྲོ་བོར་ཏེ། །གཙིགས་ཀྱི་ཡི་གེ་དང་

28 རྟ་རིངས་ལ་བྲིས་པ་བཞིན་དུ་ཡང་མཛད་དོ། །འདི་ལྟར་ཡབ་

29 སྲས། གདུང་རབས་རྒྱུད་ཀྱིས། །དགོན་མཆོག་གསུམ་གྱི་རྟེན་

30 བརྟགས་ཞིང་། སངས་རྒྱས་ཀྱི་ཆོས་མཛད་པ་འདི། །གཅེས་སྐྱེས་ཙ

31 ལ་ཡང་། སྱིག་གོ་ཞེའམ། མ་ལེགས་སོ་ཞེས། མོ་དང་སྐྱི་ལྱས་ལས་

32 སྟོགས་སྟེ་ཚེའི་ཕྱིར་ཡང་རུང་སྟེ། སྱི་གཞིག་གོ། སྱི་སྤང་དོ། །དེ་སྐད་

33 ཅེས། ཚེ་ཆུང་སྲས་གསོལད་ཀྱིས་ཀྱང་། དེ་ལྟར་སྱི་མཛད་དོ། །བཙན་

34 པོ་དབོན་སྲས། །སྐུ¹་ཆུ་དུར་བཤུགས་པ་ཡན་ཆད། །ཆབ་སྱིད་ཀྱི

35 སམན་བདག་མཛད་པ་མན་ཆད་ཀྱང་། །དགེ་སྟོང་ལས། དགེ་བའི་

36 བཤེས་ཉེན་བསྐོས་ཏེ། ཆོས་ཕུགས་སུ་ཚོ་ཆུད་ཆུད་དུ་བསྩལབ་ཅིང་། །བོད་

37 ཡོངས་ཀྱིས་ཀྱང་ཆོས་སྤྱོབ་ཅིང་སྤྱད་པའི་སྐྱོ་སྱི་གཅད། །ནམ་དུ་ཡང་བོད་ཡ

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¹ Line 34. Chhu ngur. The first letter looks like Tsh; but close examination shows that is due to damage and the reading given is correct.

38 རབས་མན་ཆད། །བོད་འབངས་ལས་ཕར་པར་གཟུང་པའི་སྐོ་སྐྱི་བགག།

39 པར། དྲ་པའི་རྣམས་ལས་ཕར་པར་བཅུད་དེ། །དེའི་ནང་ནས་

40 ནས་པ་ལས། །བཙམ་ལྔན་འདས་ཀྱི་རིང་ལུགས་ཏག་དུ་བསྐོ་

41 ཞིང་། །བཙམ་ལྔན་འདས་ཀྱི་རིང་ལུགས་བྱེད་པའི་རྣམས་ཚོས་འཚོར་

42 ནས་བྱིའི་ཚིག་གི་བཀའ་ལ་ཡང་བདགས་སྟེ། །ཚོས་འཚོར་གྱི་ལས་དང་

43 དབང་བྱེད་ཚིང་དགི་བའི་བཞེས་ཉིན་བྱེད་པར་བསྐོ་ནི། །རབ་དུ་བྱང་བའི་

44 རྣམས། །ཉེ་ཡབ་སྲས་ཀྱིས་མཚོས་གནས་སུ་གནང་བ་བཞིན་དུ་བྱས་

45 སྟེ། །བཙན་པོ་འི། པོ་བྲང་ན་དགོན་མཚོག་གསུམ་གྱི་རྟེན་བཙུགས་ཞིང་

46 མཚོད་པ་ཡང་། །ཀུ་དུ་སྐྱི་སྲང་སྐྱི་བསྐར་ཞིང་མཚོད་གནས་སུ་བགྱིའི།

47 མཉེར་ན། །བཙན་པོ་འི། པོ་བྲང་དང་། བོད་ཁམས་ན། དགོན་མཚོག །
    གསུམ་སྐྱེད་   -

48 པ་དང་སྲུང་བའི་ཐབས་ཆེ་ཡང་སྐྱི་མཛད་དོ། །ཡབ་སྐྱེས་དབོན་སྲས་

49 གང་གི་རིང་ལ་ཡང་རུང་སྟེ། དགོན་མཚོག་གསུམ་གྱི་ཀྱེན་བཅད་པའི་རྣམས་

50 ཀྱང་ས་དམའས་[1]ས་ཞིག་པའི་ཚོས་སུ་ལྔ་རོས་ཀྱི་ཁྲིས་ཡིག་གི་མགོ་ནན་ལས་

51 འབྱུང་བ་བཞིན་དུ་ཆེས་[2]མཛད་དོ། །ད་ཕྱིན་ཆད་གདུང་རབས་རེ་རེ་ཞིང་ཡང་

52 བཙན་པོ་ཡབ་སྲས་ཀྱིས། འདི་བཞིན་དུ་ཡི་དམ་བཅའ། །དེ་ལས་མནའ་ཁ་

53 དབུད་པ་དག་སྐྱི་བགྱི་སྐྱི་བསྐུར་བར། །འཚིག་རྟེན་ལས་འདས་པ་དང་འཚིག་

54 རྟེན་གྱི་སྐྱ་དང་སྐྱི་མ་ཡིན་པ་ཐམས་ཆད་ཀྱང་། དབང་དུ་གསོལ་དེ། །བཙན་པོ་

55 ཇེ་བྲིན་ཀུན་ཀྱིས་ཀྱང་ད[3]བུ་སྐྱང་དང་བྲོ་བོར་རོ། །གཅིགས་བརྣ[4]ནད་བའི་

56 ཨི་གི་བཞིན་མོ་ནི། །ཡབ་ཀྱི་རིང་ལ་གཙིགས་ཀྱི་ཡི་གི་ཉིས་བའི་ལྱང་

57 ³བཞག་གོ ། །

TRANSLATION OF THE INSCRIPTION FROM SANG-GYE GOMPA

A [4]solemn undertaking to maintain the Excellent Religion for ever, made in the time of the [5]Divine King of Miracles, [6]Tri De Song Tsen.

The establishment of the Religion of Sang-gye, and the [7]Images of the Three Precious Ones set up by building the [8]Tsuk Lak Khang of [9]Ra Sa, [10]and its appurtenances, in the time of the Ancestor [11]Tri Song Tsen: and

[1] Line 56. The words yap kyi are damaged but comparison of several rubbings makes this reading clear enough.

[2] Line 56. The end of the line is damaged and I first read it as klad, which word is used in Pao Tsuk Lak's History in connection with this oath; but photographs taken while this article was in proof make the reading zla la, meaning 'as a pair to' or 'together with' most probable. Cf. inscription No. 3B below.

[3] Line 57. This is badly damaged; but from the traces of letters bshag seems almost certain. The last word looks like Om but is more probably Go.

[4] 'Solemn Undertaking'. 'gtsigs' is used in phrases in other inscripitons of the eighth and ninth centuries such as 'gtsigs gyi yi-ge', 'gtsigs gnang-wa', 'gtsigs chhen-po' and seems to imply the record of a sworn or exceptionally important charter, deed, or undertaking. Some Tibetan scholars see a connection between 'gtsigs' and 'brtsigs' (to build); and they stress that the word connotes both permananee and reverence. The modern meaning of 'gtsigs' is 'prized' or 'important'. 'brnan pa' conveys the meaning done firmly or urgently.

[5] 'Divine King of Miracles.' (hprhul gyi lha btsan-po.) The Chhos Rgyal or Religious Kings of Tibet are said to have had magic or miraculous powers such as that of levitation. Such powers are particularly ascribed to King Song Tsen Gam Po (Sromg brtsan sgam po) but the origin of the title is probably earlier. It is applied to O De Pur Gyal (O lde spu rgyal) the divine, first king of Tibet, in the Lhasa Tsuk Lak Khang inscription. It appears from Dr. Bushell's translation of the Chinese version of the inscription on the Tsuk Lak Khang do-ring (J.R.A.S., 1880) that the Chinese translation of this title was 'The All Wise'.

[6] Tri De Song Tsen. Also known as Se Na Lek Jing Yon. The third son of Tri Song De Tsen. Reigned from 804 to 816 A.D.

[7] The Three Precious Ones are the Lord Buddha, the Religion, and the Clergy. 'rten' means a 'container'. The containers of Buddha are images; of the Religion, books; and of the Clergy, the monks themselves. I have retained the word 'Images' which is used by Sir Charles Bell to translate this phrase which appears in other inscriptions also, as 'containers' or 'vehicles' seem rather clumsy.

[8] Tsuk Lak Khang. The House of the Crown of the Head and the Hands. The Crown of the Head is said to signify Buddha; and the Hands, the Sacred Books and the Monks. The term may be applied to any chapel but is generally restricted to the larger and more important chapels and temples such as the Jo Khang at Lhasa and the main temple at Sam-ye.

[9] Ra Sa. The Place of the Goat, is the old name of Lhasa and is connected in later histories with a legend about the filling of the marsh on which the Tsuk Lak Khang stands, with earth carried on the backs of goats. There is in a remote corner of the Tsuk Lak Khang a small lump of stone in which Tibetans see the rang chung (rang byung)—i.e. self-formed image—of a goat.

[10] Las stogs pa, which I translate as 'appurtenances', is the equivalent of the modern las sogs pa meaning 'et cetera'.

[11] Tri Song Tsen. This is Song Tsen Gam Po, the greatest of the Religious Kings, who ruled from about 620 to 650 A.D. The absence of the epithet Gam Po, 'The Profound', which appears in most later histories, is interesting. If the inscription were a later forgery it would probably have been used.

the Images of the Three Precious Ones set up by building the Tsuk Lak Khang at Tri Tse in Ling, and its appurtenances, in the time of the Ancestor [1] Tri Dü Song: and the Images of the Three Precious Ones set up by building the Tsuk Lak Khangs at Kva Tsu and Chhing Phu in Tra Mar, and their appurtenances, in the time of the Ancestor [2] Tri De Tsuk Ten: and the Images of the Three Precious Ones set up building the Tsuk Lak Khang on the border of the Central Province, Sam-ye in Tra Mar, and its appurtenances, in the time of the Father Tri Song De Tsen: and the Images of the Three Precious Ones set up by building Kar-chung Tsuk Lak Khang, and its appurtanances, in the time of the Divine [3] King Tri De Song Tsen: and all such like: these acts for the establishment of the Religion of Sanggye by [4] each succession of the Royal Family in this way, if they are never destroyed and never abandoned, there will come about blessings without measure; but if they are abandoned or destroyed and brought to nothing, sins without number will come. So, from henceforth let them continue for ever.

In the time of the Divine King of Miracles, my Father, Tri Song De Tsen such sort of oaths were taken by the succession of the Royal Family never to destroy or abandon the Images of the Three Precious Ones which have been set up, and the established Religion of Sang-gye. [5] The King, Father and Son, the Nobles and Ministers, all having taken a solemn oath, acted also in accordance with the letters of the undertaking and [6] the writing on the do-ring.

In the same way, hold in affection, whatever may befall, this Religion of Sang-gye established through the setting up of Images of the Three

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[1] Tri Dü Song (Hdus srong). Known also as Du Song Mang Po Je (rje) or Rhlung Nam. Reigned from 679 to 704 A.D. I have seen no other attribution to him of any religious foundation. Pu Ton Rimpochhe attributes. Do Me Ling Chhu Tri Tse (mdo smad ling chu khri rtso) to his successor. If this is the same place it is apparently in Kham—East Tibet.

[2] Tri De Tsuk Ten. Known also as Me Ag Tshom (Mes ag tshhoms). The son and successor of Dü Song. The last syllable of his name is spelt 'brtan' on the Lhasa Sho do-ring, and 'brtsan' on the Lhasa Tsuk Lak Khang do-ring. His foundations at Ka Tsu and Chhing Phu survive in the Sam-ye district which is covered by the name Tra Mar (brag mar). Chhing Phu (Mchhing Phu) is the burial place of Lhacham Pema, the sister of Tri Song De Tsen.

[3] Tri Song De Tsen. Succeeded in 755 A.D. The date of his death is a minor puzzle of Tibetan history but may be put tentatively at 797 A.D. The foundation by him of Sam-ye Gompa is the subject of long poetical accounts in Tibetan histories. Dbung mthar. Ung meaning 'centre' is perhaps an old spelling of Ü (dbus), the present name of Central Tibet.

[4] It is interesting that there is no mention of Tri De Song Tsen's immediate predecessor, Mu Ne Tsen Po. This may confirm Tibetan tradition that Mu Ne's reign was short. It may also indicate that it was unpopular. He is said to have gone in for a communistic experiment of dividing up the land equally among rich and poor. If there was any such experiment it was probably aimed at the power of the feudal nobility. He was poisoned by his mother who disapproved of his marriage to another of his father's widows. The title Tri, The Enthroned, which is applied to other Tibetan kings almost as part of their names, never seems to be applied to Mu Ne.

[5] The King, Father and Son. This may be a formal expression covering the King and his Nobles; but it may also refer to the custom mentioned by Dr. Petech in his 'Study on the Chronicles of Ladakh' (Calcutta, 1939), by which the heir apparent, on reaching the age of 13, was formally associated with the throne. It is noticeable that Tibetan histories frequently attribute the age of 13 or so to the kings on their accession. This is often against the probabilities and other evidence. There may therefore have been a custom of treating the heir apparent after his coming of age, as the Son King.

[6] 'The writing on the do-ring.' This probably refers to Tri Song De Tsen's inscription on the Sam-ye do-ring.

Precious Ones by my Father and Ancestors. And if people, looking to the casting of lots or to dreams or for whatever reason may be, say [1]'It is a sin' or 'It is not good', do not abandon it; do not destroy it. And those who say such things, whether great persons or small affirm them, let them not do so.

And the Kings, Grandsons and Sons, from the smallest children upwards and from the Rulers of the Land downwards, having appointed teachers of religion from among the Clergy, should learn religion as much as they can imbibe into their minds; and when all Tibet is learning religion they should not destroy the door to practising it. And for ever, from the nobles downwards, let men be appointed as teachers of religion, guiding the faithful to deliverance from destiny in order not to close the door of deliverance from destiny for the people of Tibet, and having established lastingly, through those of them who are most able, the ancient rule of Him Who Has Passed Away Victoriously, those who carry out the ancient rule of Him Who Has Passed Away Victoriously, adhering to the command that they should do whatever proceeds from the preaching of Religion, performing the duties and exercising the powers of the preaching of Religion. [1]And those who have become monks, continuing always according to the ordinance for religious services given by us, Father and Son, and setting up Images of the Three Precious Ones in the King's Palace, let them perform religious services, not letting the offerings of worship decrease and not [2]restricting them.

In short, in the King's Palace and in the Land of Tibet let nothing be done in any way whatsoever to destroy or abandon the Three Precious Ones. And in whatever time may be, of the Father, the Ancestors, and the Descendants, by the religious law of not lessening at all the [2]support of the Three Precious Ones, [18]let them in future act according to the writings of the Household of the Divine Race which have been since the beginning.[4]

And henceforth, in each generation, the Kings, Father and Son, shall pledge themselves in this way. [5]In order that such vows may not be unfulfilled and may not be changed, the gods that have passed from the world, the gods of the world, and all spirits, having been taken as witnesses, the King, Nobles and Ministers, all have undertaken and sworn the oath.[5]

The writing in detail of the solemn undertaking is set up in amplification of the letters of the undertaking written in the time of my Father.

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[1] This passage is rather diffuse and difficult. Dechhen Chhökhor Rimpochhe thinks it implies a progressive advance in religious merit until the stage of fitness to be a religious teacher is reached; but it is difficult to fit this into the grammatical construction or to bring it out in translation. 'dgo wai bshes nyen' is the equivalent of the modern dge bshes--Ge She. 'Chhos hkhor.' There is some difference of opinion among my helpers about the meaning of this phrase, some holding that it refers to places of pilgrimage. I am, however, told that the phrase is frequently applied to the preaching of the Lord Buddha—especially to his first sermon at Sarnath—and I have accepted that interpretation.

[2] 'bskar shing.' The meaning is not quite clear. In modern Tibetan bskar wa means 'to weigh', 'to criticize' or 'to separate'.

[3] 'rkyen behad pa' means, I am told, offerings for the support of a religious institution. The phrase appears also in the Tshur Bu inscription.

[4] This passage is not clear. 'Lha ris', which appears also in the Tsur Bu inscription is said by some of my helpers to mean The Royal Family, and by others to mean Monastic Property. The former meaning seems more applicable here although the latter seems more appropriate in the Tshur Bu inscription. The reference here may be to the sacred books which are said to have fallen from heaven on to the roof of the palace of King Tho Tho Ri, to whom later histories assign a date about 120 years before Song Tsen Gam Po.

[5] This passage is almost identical with the wording of the Sam-ye inscription.

INSCRIPTION AT SAM-YE

༄༅། ། ༄༅། །རས་དང་། བྲག་མར་གྱི་

གཙུག་ལག་ཁང་ལས་སྟོགས་

པར། དགོན་མ་ཆོག །གསུམ་

གྱི་རྟེན་བཅུགས་པ་དང་། སངས་

རྒྱས་ཀྱི་ཆོས། མཛད་པ་འདི།

ནམ་དུ་ཡང་སྤྱི་གཏང་མར་ཞིག

པར་བགྱིའོ། ཨོ་བྱད་སྤྲར་ར།

པན་ཡང་། དེ་ལས་ཀྱི་དགྲི་སྟི་

བསྐྱང་བར་བགྱིའོ། དན་ཕྱིན

ཅད། གདུང་རབས་རེ་རེ་ཞིང་ཡང་

བཙན་པོ་ཡབ་སྲས་ཀྱིས་འདི།

བཞིན་ཡི་དམ་བཅའོ། དེ་ལས

མནན་ཁ་དབུད་པ་དག་ཀྱུང་།

སྲི་བགྲི་སྲི་བསྐྱར་བར། འཇིག

རྟེན་ལས། འདའས་པན་དང་།

འཇིག་རྟེན་གྱི་ལྷ་དང་སྲི་མ་ཡིན

པན། ཐམས་ཅད་ཀྱུང་དཔང་དུ།

གསོལ་ཏེ་བཙན་པོ་ཡབ་སྲས་དུ

ཨེ་བློན་ཀུན་གྱིས་དབུ་སྙུང་དང་པོ།

པོར་རོ། གཙིགས་ཀྱི་ཡི་གེ་ཞིབ

མོ་གཅིག་ནི་གད་ན་མཆིས་སོ།

¹Translation of the Sam-ye Inscription

The Tsuk Lak Khangs of ²Ra Sa and ³Tra Mar and their appendages, where the Images of the Three Precious Ones have been placed and the religion of Buddha established, shall never be let go or allowed to be demolished.   ⁴The property ⁵assigned to them shall also not be diminished or wasted by neglect.

Henceforth in every generation the Kings, Fathers and Sons, shall undertake this.   In order that such vows shall not be unfulfilled ⁶the gods that have passed away from the world, the gods of the world, and ⁷all demons have been invoked to bear witness.⁸   And the King, Father and Son, that is to say, the King, Ministers and all have undertaken and sworn the oath.   ⁹An agreement in detail exists separately.

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¹ The pillar on which the inscription is stands in the courtyard of Sam-ye Gompa and is well preserved. It is said to be about seven feet high. I have not seen it myself but I imagine that it must contain examples of the reversed ki-ku, although these have not been reproduced in the copy taken by Sir Charles Bell. In his copies of other inscriptions he has converted the reversed ki-ku into the ordinary form.

² Ra Sa. See note on Kar-chung inscription.

³ Tra Mar. The old name for the district in which Sam-ye is situated. The name Sam-ye, i.e. Beyond Thought, may have been given later; it appears in the Kar-chung inscription. Tibetan histories also describe the monastery as 'Mi hgyur lhun gyis grub pai gtsug lag khang'. The monastery has three stories in three different styles, one Tibetan, one Indian and one Chinese. It has suffered frequently from fire and has been much rebuilt and added to. It is said that there were formerly several do-rings in the neighbourhood which have now been buried in the sand which is constantly being piled up by the prevailing strong winds. Tri Song De Tsen was born in Tra Mar near the site of Sam-ye.

Tra-Mar apparently means 'Red Rock' as there are several reddish rocks in the neighbourhood; but the spelling is brag mar not brag dmar.

⁴ Yo pyad (Yo-che) means both landed and moveable property.

⁵ spyard. The final d is the 'da-drag'. The use is obsolete and is said to have been abolished by King Ral-pa-chen. 'Da-drag' means the strong or strengthening d; its use has been examined by Laufer in his ⸢Bird Divination in Tibet' and he concludes that although it was probably in the beginning a formative element of grammatical character by the ninth century it had become simply of euphonic use.

⁶ 'Those who have passed away from the world' means such as Buddha, who have attained Nirvana.

⁷ Mi ma yin. 'Not human beings'; here applied to demons, etc. There are also good Mi ma yin. See S. C. Das, *Tibetan Dictionary*, p. 595.

⁸ 'To bear witness' dphang du in line 17 of the text is apparently a mistake of the copyist, or of the writer, for dpang du. d is not used as a prefixed letter before ph. The correct form is given in the Kar-chung inscription; but it is possible that in early times there was less strictness in the use of pa and pha. In the inscription on the Sho do-ring the form pho for po appears, e.g. in chhon pho for chhen po.

⁹ The agreement in detail said to exist separately, is quoted by Pao Tsuk Lak in his Religious History. His information appears to come from old records at Sam-ye. He quotes at length the archaic language of two vows which he says were taken by Tri Song De Tsen and were written in gold on fine paper. He also gives a list of the ministers who signed these deeds. The quotations contain injunctions never to abandon religion similar to those in the Kar-chung inscription, and also accounts of the religious acts of the King's predecessors, and mention of the suppression of Buddhism by his ministers when he was young. Pao Tsuk Lak states that the second oath, which he quotes, was written in short on the Sam ye do-ring.

INSCRIPTION AT TSHUR-BU (A)

༄༅། །ཞང་ཆོས་པོང་སྤུག་བཟང་ཅུ་སྟོས།
སྟོད་ཀྱི་ལྱང་བྱར། གཙུག་ལག་ཁང་བརྩིགས་
པའི་ལོ་རྒྱུས། །རོ་རིངས་ལ་བྲི་བར། །བཙན་
པོ་འི་བཀའ་གནང་སྟེ་བྲིས་པའ།༔།

༄༅། །བཙན་པོ་ལྷ་སྲས་ཡབ་མྱེས་ཀྱི་སྐུ་རིང་ལ།
དམ་པའི་ཆོས་བཙེས་ནས། །གདུང་རབས༔
སུ་དམ་པའི་ཆོས་ཀྱི་གཏུང་ཞིང་མཛད་པར༔
ཆོས་གཞིགས་དང་། བཀའ་ལྱང་སྐུ་ལད་པ་
ལས་འབྱང་བ་བཞིན། །ཞང་ཆོས་པོང་ཅུ་སྟོས།
དམ་པའི་ཆོས་ཅུམས་སུ་བྲངས། །བཙན༔
པོ་ལྷ་སྲས། ཁྲི་གཙུག་ལྡེ་བཙན་འཕྲུལ་གྱི༔
བཀའ་དྲིན། །ཞང་ཅུ་སྟོ་ལ་ཆེར་སྐུ་ལད་པས༔
།བཀའ་དྲིན་ཆེན་པོ་བསབ་པའི་ཕྱིར། །
བཙན་པོ་སྐུ་ཡོན་དུ་བསྔོས་ཏེ། །སྨོན་ལམ༔
རྒྱ་ཆེར་བཏབ་ནས། །སྟོད་ལྱངས་ཀྱི་ལྱང་བྱར༔
།གཙུག་ལག་ཁང་བརྩིགས་སྟེ། །དཀོན
མཆོག་གསུམ་གྱི་རྟེན་བཙུགས། །དགེ
སྤྱོང་བཞི་གནས་པར་སྦྱར་ནས། །ཀྱེན་ཀྱི་
བྱན་དང་། ཞིང་འབྲོག་དང་། ལྷ་ཆ་དང་། ཟོར་རྫས
དང་། ཀུང་འགྱོས་ལས་སྟོགས་པ། ཆང་བར༔
བཅད་དེ། །བཙན་པོ་ཁྲི་གཙུག་ལྡེ་བཙན༔
གྱི་སྐུ་ཡོན་རྒྱན་གྱི་འཆད་པར་བྱེད་དོ། །

གཙུག་ལག་ཁང་འདིའི་མཚན་ཡང་། །
བཙན་པོ་ནི་བཀའ་ཞལ་གྱིས་བདགས་སྟེ། །
ཞིན་ཅང་དོ་ནི་ཕྱགས་དམ་གྱི་གཙུག་ལག
ཁང་ཆེན་པོ་ནི་མཆུག་ལ་གདགས་འིང་། །
ཆེམས་ཀྱང་། །བླ་ནས་མཚོད་པར། །བགགས་
གནང་། །ལྷ་རིས་ཀྱི་འབངས་དང་། དགོར་
ལ། །བྲལ་སྒྱི་དབབ་པ་དང་། ཁུ་དང་། ཆད་ཀ:
སྒྱི་བཞིས་པ་ལས་སྤྱོགས་པ་ཡང་། །ལྷ་རིས:
ཆེན་པོ་ནི་ཕང་དུ། །བགའས་གནང་ངོ་། །
གཙུག་ལག་ཁང་འདིའི་ཀྱིན་རིས་བསྒྱོ་ཞིང
སྒྱུད་པ་ཡང་། །ཞང་ཅུ་སྤྱོས། རྩེ་སྤྱར་བྲས་འིང་།
བསྒྱོས་པ་བཞིན་བཙུན་བར། །བགའས་གནོ། །
།རྣམ་ཞིག་ན། །ཞང་ཅུ་སྤྱི་ལ། བུ་ཚ་ཀྱུད་ཡོང:
སྤྱིད་པ་ཞིག་དུ་གྱུར་ན། །ཁྲལ་སྤུལ་ལས་སྤྱོགས་
པ་དབང་དོ་ཚོག །བླར་ཡང་སྒྱི་བཞིས།
ཀྱང་ཀྱི་སྤྱིན་བར། །གཙུག་ལག་ཁང་འདི་ཀྱིན།
དུ་བསྐན་པར། །བགའས་གནང་ངོ་། །
གཙུག་ལག་ཁང་གི་ཀྱིན་བཙད་པའི་དཀར:
ཆག་དང་། བསྒྱོས་ཡིག་ལྷ་དཔེ་ནི། །བཙོམ་ལྷན
འདའས་རོང་ཕྱགས་ཀྱི་འདུན་སར་བཞག །།
ཞིག་དཔེ་ནི། །ཞིན་ཅང་དོ་གཙུག་ལག་ཁང་གི:
གནས་བཙན་དང་། མཛན་ལ་སྩ་ལད། །དཔེ:
དེ་དང་འདྲ་བ་གཅིག་ནི། །གཙུག་ལག་ཁང:
འདིར་གཞག་པར། །བགའས་གནང་ངོ་། །

INSCRIPTION AT TSHUR-BU (B)

༄༅། །ཞེང་ཚོམས་པོང་

གསས་སྟེ་ནི་བུ་

ཚ། །གཙོགས ༔

གནང་བའི་བླ་

དཔེ་ནི། །ཕྱིང་བ

འི་སྨྱུན་མཁར་

ན། །གཙོགས ༔

ཉེན་པོ་གནན་གྱི་

བླ་ལ་བཞག ། །དེ་

དང་འདྲུ་བ་རྣམས ༔

གཙོག་ནི། གཙོག་

གཞན་གྱི་བླ་ལ།

བགའི་སར་བཞུ ༔

།གཙོགས་ཀྱི །

ཆོག་དཔེ་འཕྲུ ༔

མེན་གྱི་སྒྲོམ་བུ ༔

ནི། གཉུག་ལག ༔

ཁང་འདིའི་མཛོད་

དུ་གཞག་པར །

བགའས་གནང་

ངོ ། །

TRANSLATION OF THE INSCRIPTIONS FROM TSHUR-BU GOMPA

A.

A record of the founding of the Tsuk Lak Khang of Tö Chang Bu, written by [1] Shang Tshhe Pong Tak Zang Nya Tö according to the King's order that it should be inscribed on a do-ring.

According to the religious injunction that one should act without abandoning the Excellent Religion in each generation since the acceptance of the Excellent Religion in the time of the Kings, the Divine Son, the Father, and Ancestors, and according to the command bestowed upon him, Shang Tshhe Pong Nya Tö received the Excellent Religion in his mind.

In order to repay the great favour specially given to Shang Nya To, the favour of the Divine Prince, [2] Tri Tsuk De Tsen the Miraculous, [3] dedicating it as a royal offering, and after great prayer, he founded the Tsuk Lak Khang of [4] Tö Lung Chang Bu and established Images of the Three Precious Ones. And having arranged for [5] four Gelongs to live there, and having provided everything for its complete maintenance—bondsmen, forest and grazing, sacred objects and treasure, cattle and the like—he acted so that the offering for the King, Tri Tsuk De Tsen, should never be brought to nought.

And naming this Tsuk Lak Khang by the personal order of the King, he acted according to the command that, [6] although it was named after the

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A

Tshur-bu, the principal monastery of the Karmapa sect, is situated about 50 miles north-west of Lhasa in a side valley off the main To Lung valley. The pillar stood at one time in front of the Assembly Hall of the monastery but was moved within the last 50 years to the courtyard opposite the main entrance. It is about 8 feet high, excluding the pedestal and canopy, 1½ feet broad and 8 inches in thickness. The principal inscription is written on the south face and the lesser inscription on the east side.

[1] Shang Tshhe Pong Tak Zang Nya To. (Shang Tshhes Pong Stag Bzang Nya Sto.) Shang is probably a clan name; Tshhe Pong a family or sub-clan name; Tak Zang is perhaps the personal name; and Nya To may be an official title. In the second inscription there is reference to Shang Se To (Gsas) which may imply a subsequent change in the title of the founder.

In later histories the name Tshhe Pong is spelt Tshhe spong.

[2] Tri Tsuk De Tsen. (Khri gtsug lde brtsan.) The formal name of Tri De Song Tsen's son and successor who is now generally known by his familiar name, Ralpa-chen, the Long Haired. He reigned from 816 to 836 A.D. as the last of the Religious Kings for, on his assassination, Buddhism was suppressed by his brother Lang Darma. The use of the title Lha Se (Lha sras) here in conjunction with Tsen-po (btsan po) seems to mean Son of Heaven rather than Prince. I have not seen elsewhere the form Thrul kyi (hphrul gyi) instead of the full title Thrul Kyi Lha Tsen Po.

[3] 'Dedicating it as a royal offering.' Dechhen Chhökhor Rimpochhe says that sngo-wa implies doing something for another person and compares it with the verb je-ra (rje-wa) which is used for the offering of butter lamps for the dead.

[4] Tö-lung Chang-bu (stod lung lchang bu). As stated above, the name Chang-bu cannot now be traced in the Tö-lung valley.

[5] Four Gelongs. The establishment of four only indicates a lack of enthusiasm when one looks at the present population of Tibetan monasteries. It is recorded that Tri Tsuk De Tsen gave all sorts of privileges to monks in order to popularize the profession. Nowadays only those who have reached the highest stage of religious training are called Gelong but it is not certain whether the various stages, now existing, were in force in the earliest days.

[6] There is some difference of opinion about this passage. Dechhen Chhökh or Rimpochhe thinks that it means 'establishing it as an appendage of the great Tsuk Lak Khang of Ön Chang Do'; but Tshatrul Rimpochhe considers that it means 'naming it after Ön Chang Do in point of time'. Although it is possible that Chang-bu was made a dependency of Ön Chang Do, I have accepted the simpler reading.

great Tsuk Lak Khang of the Act of Devotion, at On Chang Do, it should in future be treated as even more holy.

And he acted according to the order, [1]by the will of the Divine Race, that on the subjects and property of the Divine Race no taxes should be imposed, nor rents, nor penalties.   And making the dedication of the means of support of this Tsuk Lak Khang he completed this matter also.   So doing, Shang Nya To acted according to the order for effectual performance according to the dedication.

And he acted according to the order that if, at any time, the future descendants of Shang Nya To should become extinct, the servants, lands, and the like in their possession should not be resumed or given to any one else but should be added to the maintenance of this Tsuk Lak Khang. And he acted according to the order that the list of offerings for this Tsuk Lak Khang and the principal copy of the dedication should be placed in the Assembly Hall of the [2]Ancient Law of Him Who Has Passed Away Victoriously, and that a secondary copy should be given to the [3]Abbot of On Chang Do and to the [4]Mngan, and that a copy and reproduction should be deposited in this Tsuk Lak Khang.

B.

The family of Shang Tshhe Pong [5]Se To placed the original copy of the deed in the Palace at [6]Ching Wa-i Kun Khar, treating it equally with

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On Chang Do was Tri Tsuk De Tsen's greatest foundation. The site is some 20 miles down river from Lhasa and little now remains of the great building of nine stories which is described in the histories. A single-storied lhakhang, surrounded like Sang-gye Gompa by large chho-tens, a large uninscribed do-ring outside the lha-khang, and a smaller do-ring decorated with Lucky Signs, are all that survive. The smaller do-ring which is in the courtyard of the lhakhang is said to be quite recent. Thugs dam means also 'meditation'; but in this context it appears to imply that the building of the Tsuk Lak Khang was an act of worship or devotion by the King.

There appears to have been a royal residence at On Chang Do—now called Hu-shang—before Tri Tsuk De Tsen made his Tsuk Lak Khang, as there is mention in one of the inscriptions from Sha Lhakhang of King Tri De Song Tsen living at the Palace of On Chang Do.

[1] Lha ris. See note 18 on the Sang-gye Gompa inscription. The meaning here might well be that the *monastic* property was not to be taxed. If that is so 'thang du' would mean 'for the sake of'. The weight of opinion is, however, in favour of translating lha ris as 'The Divine Race' or Royal Family.

[2] The Ancient Law of Him Who Has Passed Away Victoriously (bchom lden hdhs) means the Buddhist Religion.

[3] Gnas Brtan (Ne Ten). This is said to have been the title of the principal monk or Abbot and to be the equivalent of the modern mKhan-po.

[4] The Mngan appears to have been another monastic official, perhaps one concerned with magic, because Tibetan dictionaries treat 'mngan' as the equivalent of 'mthu' meaning 'inherent power' generally used with reference to magic. One of the signatories of the treaty between Tri Tsuk De Tsen and the Chinese Emperor Mu Tsung whose names are inscribed on the north side of the Lhasa Tsuk Lak Khang do-ring is described as 'Mngan Pon'.

B

This inscription seems to be a later addition.

[5] I have noted above the change in the name or title of the founder.

[6] The Palace of Ching Wa-i Kun Khar.   This is perhaps Sku mkhar hphying nga stag rtse which is stated in the Gyalpo Kathang (rgyal po bkah thang) to have been built by Tong Ri Tong Tsen (Stong ri stong btsan) one of the legendary early kings of Tibet.   It is attributed in the Gyerab Sel wa-i Me long (rgyal rabs gsal wa-i me long) to another legendary king-Chya Thri (bya Khri) Tsen po.   The Gyerab Sel wa-i Melong also mentions Sku mkhar hphying nga stag rtse in connection with much later history and states that it was in Yarlung.   Possibly by the ninth century it had become the home of Shang Tshhe Pong's family.

other great deeds.   That and another complete copy, treated equally with other great deeds, they deposited in the places as ordered.   And they acted according to the command that a secondary copy of the deed, known as [1] The Urn of Variegated Stone, should be placed in the Treasury of this Tsuk Lak Khang.

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[1] 'Men kyi trom bu ni' (men gyi sgrom bu ni).   One might have expected 'men kyi trom bu na', 'in an urn of variegated stone'; but the reading 'ni' is clear.   The document may have been given the name of the receptacle in which it was placed. There is frequent mention in Tibetan histories of royal orders and letters being con-tained in such urns or boxes.

N. do-ring at Uru Shai Lha-khang.
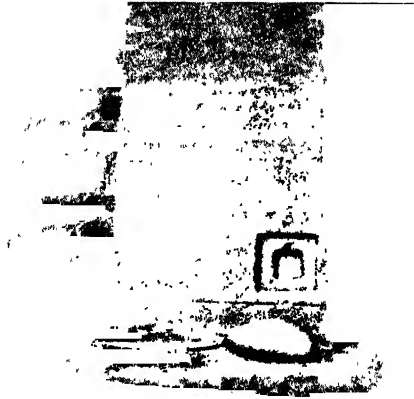
Detail from do-ring at Uru Shai Lha khang.

Sang-gye Gompa looking North, do-ring just visible to right of further Chhoten.
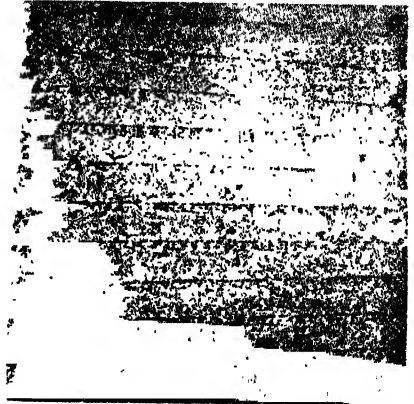
Detail from do-ring at Sang-gye Gompa.
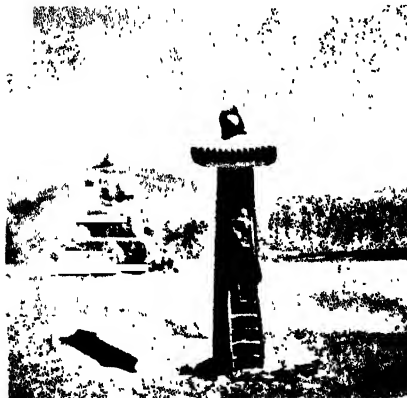
Do-ring at Sang-gye Gompa (Kar-chung).

Tsa Potrang.

IDENTIFICATION OF SOME OLD SITES IN RĀJAGṚIHA

By R. C. MAJUMDAR, M.A., Ph.D., F.R.A.S.B.

INTRODUCTION

Recently, I had occasion to spend a month in Rājgir, the ancient Rājagṛiha, which figures so prominently in the early Buddhist literature as a favourite residence of Gautama Buddha. I took advantage of the enforced holiday to ramble over its ruins and examine at close quarters the various sites identified with the important localities mentioned in the Buddhist texts and the writings of the Chinese pilgrims, Fa-hien and Hiuen Tsang. I naturally took as my guide the official reports of the Archaeological Department, specially that of Sir John Marshall.[1] At first I accepted without question all the identifications proposed by him, but doubts arose in my mind about their accuracy as I became more and more familiar with the grounds and subjected the detailed accounts of Fa-hien and Hiuen Tsang to a searching analysis on the very spots described by them. Gradually the conviction grew upon me that most of the identifications, now generally accepted, are possible, and at best probable, but by no means certain. As day after day, I moved around with the bearings and directions of Hiuen Tsang in my mind, new identifications suggested themselves to me. They cannot be regarded as certain, and the utmost that can be claimed is that they are not less likely or less probable than the theories which now hold the field. My object in writing the following notes is first of all to emphasize the tentative character of the current identifications, and secondly to draw the attention of the archaeologists to other possible sites. It may be confidently hoped that further excavations and explorations will be carried out in near future amid the ruins of this famous city. These notes may be of some use in directing these operations. Nothing can be a greater obstacle to the discovery of truth than a tacit acceptance of certain views as unquestionably right though they are not based on convincing evidence. In the following notes I have dealt with some such views, and drawn attention to new possibilities without being dogmatic one way or the other. Although I have naturally urged my own views with some emphasis, it should be distinctly understood that I merely regard them

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[1] The old Reports of Cunningham (*ASR*, I, III) and Beglar (*ASR*, VIII) are now mostly out of date and superseded by the Report of J. Marshall (*ASI*, 1905-6, pp. 86ff.). A further report was published by Mr. V. H. Jackson (*ASI*, 1913-14, pp. 265ff.), who differs on some points from Marshall, but makes no reference to, far less discusses, his view. Apart from casual references, notes on conservation work, and somewhat detailed discussion of the excavations at Maniyār Maṭh in the subsequent volumes of *ASI*, the only other important publications of the Archaeological Department are: (1) *A Guide to Rajgir* by M. H. Kuraishi, revised by A. Ghosh (Second Edition, 1944), and (2) 'List of Ancient Monuments, etc. in Bihar and Orissa by M. H. Kuraishi (pp. 112–136). Some of the opinions expressed in the last two publications differ from those of Marshall, but it is difficult to decide whether they represent the independent views of the author or are merely modified views of the Department. In this article Marshall's Report will be simply referred to as *Report*, the map of Rājagṛiha contained therein (Pl. XXIX) as the map, and *A Guide to Rajgir* as *Guide*.

as possibilities. It is hardly necessary to add that the proposed identifications, being mainly based upon the accounts of the Chinese pilgrims, only reflect the views current in their days, and may not always represent the actual historical truth. In other words, we can only try to find out the different sites and monuments which were shown to the Chinese pilgrims, but we cannot vouch for the accuracy of these traditions in regard to things or events more than thousand years old.

1. The Palace City

Hiuen Tsang distinguishes two different parts of old Rājagriha which he calls by two different names rendered by Beal as 'Palace City' and 'Mountain City'. It is also quite clear from his statement that these two had separate enclosures, for he refers to the North Gate of the first as well as of the second. It is somewhat strange that this topographical feature has not been kept in view by modern writers on the subject, and no attempt hitherto made to locate the two different sites.[1] But there can be hardly any doubt that the North Gate of the Palace City was either identical with or situated close to what is now regarded as the South Gate [2] of the old city (marked *p* in the Map). For the bearings of Jīvaka's mango-grove and Gridhrakūta with reference to the North Gate of the Palace City prove to be remarkably accurate only if we start from this point. The deep ditch mentioned by Hiuen Tsang 'where Śrigupta wished to destroy Buddha' is almost certainly to be identified with the deep moat beyond the Nakve Bund over which passes the small bridge on the way from South Gate of the inner enclosure to Chhatagiri.[3] The Palace City thus roughly occupied the southern part of the hill-girt area, bounded by the Bānganga Pass on the south, Sonagiri on the west and Udayagiri on the south-east. In the north it was probably demarcated from the Mountain City by the southern walls of the latter, the remains of which can clearly be traced. To its east lay the long narrow valley running north-east between two hill ranges, viz. the Chhatagiri and Sailagiri on the north and the Udayagiri on the south. It was protected in this direction by a crosswall connecting these two which runs almost north to south. This wall can clearly be traced right across the whole valley and has been noted in all the maps. But whereas it has been regarded as a part of the defensive arrangements for the old city, it should rather be regarded as the eastern enclosure of the Palace City.

The Palace City, as its name indicates, was evidently the citadel, containing the royal palace and the more aristocratic quarters. The taming of the elephant Nālāgiri which, at the instance of Devadatta, was sent to kill Buddha, is placed by Hiuen Tsang just outside the North Gate of the Palace City. This shows that the royal stables occupied its northern extremity. The Palace City was evidently entered through the valley in the east from Giriyak side [4] or from the wide and open countryside in the south through the narrow pass between the Sonagiri and Udayagiri. Through this pass rushes the Bānganga torrent to join the Panchana whose winding course, less than a mile away, is clearly visible from the top of

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[1] Mr. D. N. Sen hinted at such a possibility (*JBORS*, IV, 116) but did not go deeply into this question. Mr. Jackson's ideas on the subject (p. 271) are demonstrably wrong.

[2] This should be more properly called the East Gate as Mr. Jackson has done.

[3] This moat is described by Jackson (p. 268).

[4] Mr. D. N. Sen thinks that the Buddha, on his first visit to Rājagriha, entered through the Giriyak valley (*JBORS*, IV, 118).

the stone walls, running over the two hills, which are in a remarkably good state of preservation at this point. The Palace City, narrow at its south end, gradually widened towards the north, and its extreme length was about a mile. Unfortunately, this area has not yet been sufficiently explored as the main attention of the archaeologists, since the days of Cunningham, has been confined to the so-called inner enclosure of the old city and the region to its north outside the hills. But there are clear traces within this area of the old road which still bears the marks of the cart-wheels on the stone pavement and contains several inscriptions in shell characters. These, as well as an old well, prove the antiquity of the locality which obviously deserves a more careful attention in the hands of modern explorers than it has yet received. Not far from the southern end there are two mounds by the roadside which look like remains of old *stūpas* and the site abounds in remains of old sites. It is to be earnestly hoped that the Archaeological Department should take up the exploration of this site which was obviously a more important area in old days.

Cunningham did not distinguish this 'Palace City' from the 'Mountain City' and took both of them to mean the walled city of old Rājagṛiha shown in the map by dotted line. As a result of this he had to place Jīvaka's mango-grove at the foot of Vipulagiri and the Gṛidhrakūṭa, at a great distance from it on the Śailagiri. The Buddhist literature, however, clearly proves the proximity of the two, and there can be hardly any doubt about the identification of Gṛidhrakūṭa with the Chhathagiri, first proposed by Broadley and later supported with convincing arguments by Marshall.[1] Marshall's identification of Jīvaka's mango-grove must be approximately correct. In view of all this it is somewhat strange that Marshall should not have clearly distinguished the 'Palace City' of Hiuen Tsang and discussed it at some length. As it is he has only made a passing reference to it in course of a casual remark that 'Nakve embankment possibly represents the limit of the " Palace City " towards the east'.

As we know definitely from Hiuen Tsang in the case of New Rājagṛiha, there was probably an inner city or citadel as well as an outer city in old Rājagṛiha. The location of the palace in this area would satisfactorily explain the journey of Bimbisāra to Gṛidhrakūṭa as described by Hiuen Tsang and explained in detail by Marshall (p. 91).

2. The Mountain City

The 'Mountain City' of Hiuen Tsang evidently lay in the hill-girt valley to the north-west of the Palace City. It may be taken to correspond to the area enclosed by walls whose remains can be clearly traced and are shown on the map as inner walls as distinguished from the outer defensive walls running over the peaks of the surrounding hills. It has the shape of a boot with its toe, at the south-east, touching the Palace City mentioned above. Unlike the 'Palace City' it contained no old monuments or sacred spots associated with the Buddha; at least Hiuen Tsang does not mention any. All those which he describes in detail—and their number is large—were situated outside this enclosure. These may be broadly divided into

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[1] Marshall, op. cit., p. 90. It is interesting to note that Kittoe, writing in 1847 about 25 years before Broadley, places in this area the 'Gidhona peak, so named from the vultures, which perch and build their nests there' (*JASB*, 1847, p. 959). It seems from this that the name Gṛidhrakūṭa and the account of its origin as handed down by Hiuen Tsang were living traditions even so late as the middle of the nineteenth century A.D.

two parts, viz.: (1) those lying to the south-east in the area between the
south gate of the inner walls and the Gṛidhrakūṭa, and (2) others beyond
the north gate of the Mountain City. The identification of Gṛidhrakūṭa
and Jīvaka's house in the former group seems to be well established. As
for the rest, it is necessary to make a close examination on the spot in the
light of what has been said above regarding the North Gate of the Palace City
which was the starting point of Hiuen Tsang. As there is no place in the
neighbourhood where one can make arrangements for a prolonged stay,
I could not undertake the investigation and hence confine my observations
to the latter group.

3. North Gate

Hiuen Tsang notes the direction and distance of the monuments and
sites in this area with reference to the North Gate of the Mountain City.
It is therefore necessary to fix its position before proceeding to identify
them. Cunningham placed this gate nearly a quarter of a mile south of
the point where the two small streams meet just beyond the north-west
corner of the walled city.[1] But Marshall rejected this identification and
located it at a point (marked *b* on the Map) about 160 ft. to the south-east
of the confluence of the two streams. He also held that 'outside this inner
gate, again, and 250 ft. further north—right in the defile, that is to say,
between Vaibhāra-giri and Vipula-giri—was another gate in the fortifications
of the outer city . . . . It is this outer gate, most certainly, to which the
Chinese pilgrims refer, in speaking of the North Gate of the City . . . .' (p. 94).
It is difficult to accept the view so emphatically asserted by Marshall. For
it does not tally with the very first statement made by Hiuen Tsang, viz.
'to the west of the North Gate of the mountain city is the mountain called
Pi-pu-lo (Vipula-giri)'.[2] Marshall presumably takes this to be Vaibhāra-giri,
but apart from the close resemblance of Pi-pu-lo with Vipula, this identifica-
tion is further confirmed by the next statement of Hiuen Tsang that 'on
the northern side of the south-western crags of this mountain there were
formerly 500 warm springs; now there are only some ten or so'. Now this
can only refer to the south-western end of the Vipula-giri, and cannot in
any way be made to apply to Vaibhāra-giri. We must therefore look
for the northern gate of Hiuen Tsang further east, somewhere in the middle
of the northern wall of the old city. The most probable site is near the
confluence of the streamlet running east-west between the northern wall
and the foot of the Vipula-giri and another coming from the south-east
and winding through the northern part of the walled city, both of which are
shown in the map. There is a big gap in the northern wall at this point
and boulders of concrete are found on both sides of the stream.[3] A gate
at this point would really represent the North Gate of the city, whereas
the inner as well as the outer North Gate of Marshall really corresponds to
the north-west gate, being situated at the extreme north-west corner of the
inner walls.[4] Besides, a person coming out of the North Gate suggested

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[1] This is called by him Hastināpur Gate and marked *J* in his map of Rājagriha
(*ASR*, III, Pl. xli).
[2] Beal, II, 155.
[3] I showed this site to Mr. S. Bose, a member of the Archaeological Department,
who agreed with me that there was a gate here.
[4] In the Buddhist literature (*JBORS*, IV, 115) Rājgir is said to have possessed
32 large and 64 smaller gates. Whatever we might think of the actual figures there is
no doubt that the wall on each side must have contained several gates. The gate in
the centre of the north wall, rather than that at its western end, is therefore more
likely to be called its North Gate.

by me, could with some propriety refer to the Vipula-giri on its west, as the extreme end of this mountain on his left, to which the road from the North Gate must inevitably lead, was really to his west. The clear traces of the concrete floor leave no doubt about the existence of a gate and a causeway at this point, and it is a matter of surprise that this characteristic topographical feature has remained unnoticed so long. This North Gate is one of the three landmarks noted by the Chinese pilgrim, about the position of which, asserted Marshall, 'there can practically be no doubt' (p. 93). The other two are the hot springs, whose position is of course fixed by nature, and the Pippala cave to which we now turn.

4. THE PIPPALA CAVE

The Pippala cave was first identified by Cunningham, and his views have been accepted, without question, by all the succeeding writers on the subject; yet, strangely enough, no one has cared to see that it was based on a wrong presumption and, as such, scarcely deserves a serious consideration.

Cunningham had before him the following translation of a statement of Hiuen Tsang: 'To the west of the hot-springs stands the stone house of Pi-po-lo in which Buddha formerly lived. The deep cave which opens behind its wall was the palace of the Asuras.'[1] Accordingly, he identified the stone house with the 'massive foundation of a stone house, 85 ft. square, called *Jarasandh-ki-baithak*' (marked *a* on the Map) and the cave with a deep hollow immediately behind it, which, as he himself admits, 'was undoubtedly the quarry from whence the stones for the *Baithak* of Jarasandha were derived'. Apart from anything else, this stone platform can hardly be regarded as a house or even a foundation for one, and as Marshall has himself pointed out, it must have been originally intended as a watch-tower.[2] But the most vital objection arises from the wrong translation of Hiuen Tsang's statement on which the view was based. Watters has translated the passage as follows: 'To the west of the Hot-springs was the Pi-po-lo (Pippala) cave in which the Buddha often lodged. Through the rock at the back of this was a passage into the Asur's palace . . . . .' (II, 154).

Thus what Hiuen Tsang saw was a cave with a passage at its back and not a stone house with a cave behind it. That Watters' translation is right follows from the statement of Fa-hien that it was a cave, and this is confirmed by various references to the Pippala cave in the Buddhist literature. The stone platform does not agree with the description of Hiuen Tsang, nor does the quarry hole behind conform to it. There is thus absolutely nothing to commend the identification proposed by Cunningham even though it has been unanimously accepted by scholars.[3]

Having thus made up my mind that the generally accepted identification of the Pippala cave is not correct, I began to look for it in the neighbourhood. Fa-hien definitely says that the Pippala cave was on his way to the Saptaparnī cave. So I naturally walked from the hot springs towards the west, keeping close to the foot of Vaibhāra hill. After I had proceeded about 100 yards from the last of the hot springs known as the Gaṅgā-Yamunā, I saw an

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[1] *ASR*, III, 141.

[2] Marshall refers to two examples on the Vaibhāra (p. 89) and there is a third on Vipula-giri which has been identified by him as the *Stūpa* of Ajātaśatru (p. 96).

[3] Mr. D. N. Sen was constrained to admit that the cave seen by Fa-hien was a different one, but held that 'Hiuen-Tsang's stone house was undoubtedly the Baithak' (*Rajgir and its Neighbourhood*, p. 6).

opening on the hillside. Coming nearer, I found that it was a cave of natural formation, but bore traces of artificial improvement. It was on the north face of the Vaibhāra hill at a height of about 20 or 30 ft. from the level of the ground below. The front portion of the roof has crumbled but the supporting rocks at the two sides of the entrance give a fair idea of its original size. It was about 7 or 8 ft. high, and the opening at the front was about 7 yards wide and 5 yards deep.[1] There are two openings inside the cave, one at the right-hand side, as one enters, and the other at the back. The last one looks like a narrow passage or tunnel into the interior, as its end is not visible from the outside. It thus exactly corresponds to the description of the Pippala cave as translated by Watters. There is no doubt in my mind that this has a far better claim to be regarded as the Pippala cave than the *Jarasandh-ki-baithak*. It may be noted that about 40 ft. to the east of the cave are two mounds with traces of masonry,[2] and not far from the cave, at the foot of the hill, is the dry bed of a very old tank. There is thus ample evidence that this locality was once the resort of pious hermits, as mentioned by Fa-hien. 'Along (the sides of) the hill', says he, 'there are also a very great many cells among the rocks, where the various Arhans sat and meditated.'[3] As a matter of fact beyond this cave there are several other caves, higher up on the hill, some of which I personally visited.

5. DEVADATTA CAVE

Hiuen Tsang states that 'to the left of the North Gate of the Mountain City, on the north of the south cliff there, going east 2 or 3 *li*, you come to the large cave in which Devadatta went into Samādhi'.[4] Here again it is clear that the North Gate of the pilgrim could not be the same as the North Gate of Marshall, for then 'going left' would mean going towards the west and not to the east, as the pilgrim specifically states.[5] What the pilgrim meant can be clearly explained if the North Gate occupied the position suggested by me. Immediately after passing out of the gate, he turned to his left till he reached the end of Vipula-giri, and then proceeded east for 2 or 3 *li* along the northern side of the hill till he came to the Devadatta cave. Here again, the same Chinese expression has been translated as 'cave' by Watters and stone-house by Beal. But as Fa-hien also calls it a rock-dwelling Watters' translation seems to be the right one. Marshall argues (p. 99) that as the same Chinese word is used for Pippala cave, which can be safely identified with *Jarasandh-ki-baithak*, it should be taken to mean a structural edifice. But his argument loses force in view of the new identification of Pippala cave proposed above. We shall thus be justified in regarding 'cave' as the proper meaning of the word which has been translated as 'stone-house' by Beal and others.

The Devadatta cave can be reasonably identified with the cave above Makhdum Kund (or *darga*) now overshadowed by a big tree. Hiuen Tsang refers to a flat stone, not far to the east of it, with coloured spots like blood, and tells a story to explain it.[6] Fa-hien tells the same story and places

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[1] The measurements are only approximate as I had no measuring tape with me.
[2] Mr. D. N. Sen states on the authority of Buddhist literature that there was a small *vihāra* in front of the Pippala cave (*Rajgir*, p. 5). The masonry might represent its remains.
[3] Legges' Tr., p. 85. [4] Watters, II, 155.
[5] Mr. D. N. Sen therefore thought that Hiuen Tsang was wrong; he went to the right and not left (*Rajgir*, pp. 26-7).
[6] Beal, II, 158.

the 'black rock' at a distance of fifty paces.[1] Curiously enough, even today, the visitors are shown a piece of stone, situated at about the same distance to the east of the cave, and reached by a flight of steps. It contains crimson marks which are explained as blood stains. This confirms the identification of the cave above Makhdum Kund with the Devadatta cave.

The *Guide to Rajgir*, published by the Archaeological Department, refers to this stone as the one 'mentioned by Hiuen Tsang as being not far to the east of Devadatta's stone-house' (p. 24). But still this latter is identified with the stone platform[2] near Surj Kund at the foot of the Vipula-giri on the ground that 'this site exactly corresponds to the indications given by Hiuen Tsang'. Now, even apart from the fact that the object in question was a cave and not a structural edifice, such as the stone platform near Surj Kund would indicate, the distance of 2 or 3 *li* from the North Gate mentioned by Hiuen Tsang, would lead us much further beyond it to the cave above Makhdum Kund with which I have identified it. But the most serious objection against the identifications proposed in the *Guide book* is the long distance between the proposed Devadatta cave and the black stone with crimson spots. Even the *Guide* identified the latter with the stone at Makhdum Kund. But Fa-hien clearly says that there was only a distance of fifty paces between the two. As pointed out above, this is really the distance between the cave above Makhdum Kund and the flat stone with crimson spot. So, as the *Guide* identifies this stone with the one at Makhdum Kund, the logical corollary would be to identify the Devadatta Samādhi cave with the cave above Makhdum Kund as proposed by me.[3] Thus in this case also we shall be justified in taking the Chinese word to mean a cave and not a stone house.

6. Venu-vana

Hiuen Tsang next proceeds to describe the Karaṇḍa-Venu-vana or Bamboo Park, famous in Buddhist literature as the favourite residence of Buddha in Rājagṛiha. 'Going about 1 *li* from the North Gate of the Mountain City we come to Karaṇḍa-venu-vana where now the stone foundation and the brick walls of a *Vihāra* exist.' [4] It seems that Hiuen Tsang now turns from the foot of the Vipula-giri to the region lying between it and Vaibhāra-giri. For Fa-hien says that this park was on the west side of the highway about 300 paces from the north wall. The statements of the two pilgrims indicate that the Bamboo Park was quite close to Marshall's North Gate. Marshall located it in the 'open ground on the left of the road, where gardens still exist, well watered by the stream and the perennial springs from above' (pp. 94-5). He was of opinion that it was bounded on the north by the mound containing the Muhammadan tombs almost immediately to the north of the hot springs on the Vaibhār hill across the small streamlet formed by them. He was led to this view by

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[1] Legge, p. 86.

[2] This is the third watch-tower, referred to above in f.n. 2, p. 69, which Marshall identifies with the Ajātaśatru *Stūpa* (p. 96).

[3] Mr. D. N. Sen also probably held the same view (*Rajgir*, pp. 26-7), though it is not quite clear whether he meant this or another cave. It is interesting to note that even today the Muslims point out to this cave as the place where Makhdum Sha (the Muslim saint after whom the Darga and Kund are named) sat in meditation and fast for 40 days and spent a number of years. For an account of the saint who is revered all over India, and the veneration with which the place is regarded both by Hindus and Musalmans, see *JASB*, 1872, pp. 243-44.

[4] Beal, II, 159-60.

its position in respect to a tank which lies to the north of it. For Hiuen Tsang refers to a tank called Karaṇḍa-*hrada* about 200 paces to the north of Veṇu-vana-vihāra. Marshall took the tank to the south of the Inspection Bungalow to be the Karaṇḍa-*hrada*, and hence identified the mound, which is approximately 200 paces to its south, with the Veṇu-vana-vihāra. Accordingly, this mound was excavated but yielded no satisfactory result. The tank in question, however, does not appear to be an old one, as already pointed out by Mr. D. N. Sen, and hence Marshall's identification is doubtful. Mr. Sen also rightly points out that Marshall has included Tapodārāma in the area assigned by him to Veṇu-vana.[1]

It would appear from the Buddhist literature and the Chinese accounts that there were no less than three parks in the neighbourhood of the northern gate of old Rājagṛiha. The first, Tapodārāma, as the name indicates (Tapodā = Taptodā or hot water), must have been in the immediate neighbourhood of the hot springs. The second, Sītavana (cold forest), has been located in the area covered by New Rājagṛiha, on the basis of a legend recorded by Hiuen Tsang. According to it, once when Bimbisāra banished himself to Sītavana, which contained the cemetery, the king of Vaiśālī made preparations to invade Rājagṛiha. Thereupon the Lords of Marches, 'built a town', and as the king was the first to inhabit it, it was called 'the royal city' (Rājagṛiha).[2] Of course, no historical importance attaches to this story as we know that the old capital city was called Rājagṛiha. But it has been inferred from it that the New Rājagṛiha covered the area of the old Sītavana. But this certainly does not follow from the statement of Hiuen Tsang. The king, who had been living in Sītavana, was, according to the story, the first to inhabit the newly built city. But this does not mean that the new city was built in Sītavana. On the other hand, references in *Mahāparinibbāna Sutta* (II. 57) to 'Sappasoṇḍika Pabbhāra' in Sītavana clearly shows that it must have included a hillside, for *Pabbhāra* (*Prāgbhāra*) means a slope or top of a mountain. Now there is no hill in New Rājagṛiha. Mr. D. N. Sen, who accepts the current view that the 'Sītavana is now almost wholly occupied by the ruins of New Rājagṛiha', contradicts himself when he says in the very next sentence: 'As there is no hill or mountain in this area, the *Pabbhāra* must mean the slope of mount Vipula.'[3] The reason which probably led Marshall and others to identify the Sītavana with New Rājagṛiha is the existence of the Hindu Burning-*ghāṭ* not far from the walls of New Rājagṛiha. But it is forgotten that there is also a Burning-*ghāṭ* between the slopes of Vipula and Vaibhāra hills, a little to the north of Marshall's North Gate, which is even now used for this purpose. Mr. D. N. Sen observes: 'There was at least one good reason for avoiding the northern approach of the city, as, in the immediate vicinity of it, lay the Sītavana where the people of Rājagṛiha used to deposit their dead.'[4] Now this can only apply to the Burning-*ghāṭ* near the North Gate referred to above, for the other, near walls of New Rājagṛiha, would be too far from the North Gate.

Thus Sītavana and Tapodārāma were both just outside, at least not very far from, the North Gate of Marshall. The third, the Veṇu-vana may, therefore, be taken to occupy roughly the centre of the plain ground between Old and New Rājagṛiha, but its exact limits cannot be defined. If we accept this view we have to reject the identifications of Veṇu-vana-vihāra and Karaṇḍa-tank proposed by Marshall and suggest new ones. There is a remarkable high mound with foundations of stone blocks, with a few

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[1] *Rajgir*, pp. 4, 32.   [2] Beal, II, 165-66.
[3] *JBORS*, IV, 131.   [4] *Ibid.*, 118.

later pillars fixed upon it, at a short distance to the south-east of the Inspection Bungalow, on the modern road, about half-way between the south-east corner of the ramparts of New Rājagṛiha and Marshall's North Gate. This seems to have a better claim to be regarded as the Veṇu-vana-vihāra.[1] At a short distance to the north-east of it is the dry bed of an old tank with clear traces of stone embankments round it. Unlike the tank referred to by Marshall, which is on a high ground and is only filled by rain-water, this tank was fed by the water of the hot springs on the Vipula-giri. The streamlet fed by these springs still runs close by the tank, its course being diverted from it for purposes of irrigating the neighbouring fields. Both these facts render the identification more probable. Hiuen Tsang places the Aśoka *Stūpa*, 60 ft. high, at a distance of 2 or 3 *li* to the north-west of the Karaṇḍa-*hrada*. On the basis of our identification of the Karaṇḍa-*hrada* this *stūpa* may be identified with the very high mound on which the Burmese temple has been constructed, or another, less high, a little to its south. Hiuen Tsang places the town of Rājagṛiha (i.e New Rājagṛiha) not far to the north-east of this *stūpa*. He evidently refers to the city proper outside the citadel, for he remarks that whereas 'the outer walls of this city have been destroyed and there are no remnants left, the inner city walls, although in a ruined state, still have some elevation from the ground and are about 20 *li* in circuit'. The remains of these walls have been partially excavated, and lie almost immediately to the north and west of the Burmese Temple, whereas the walls of the city proper can still be traced to the north-east of the Burmese Temple.[2]

To the east of Veṇu-vana was the *stūpa* built by Ajātaśatru. This may be identified with the structure whose stone foundations, made of undressed blocks, in a neat rectangle of about 70′ square, have been exposed within the compound of the Japanese temple lying immediately to the east of the stone foundations identified with Veṇu-vana-vihāra. These two buildings stood facing each other on two sides of the ancient main road running north-south from the New to the Old Rājagṛiha. By its side—and indeed all along near it on both sides of the road—are a large number of mounds which probably conceal the remains of other *stūpas* mentioned by Hiuen Tsang. Having lived in the Japanese temple for about a month, I have closely examined the area surrounding it, and have come across numerous mounds, some of which are clear remains of small *stūpas*. Unfortunately, this area has not yet received the attention it deserves, and it is high time that the Archaeological Department should take up the excavation of the site.

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[1] This has been identified in the *Guide* (p. 9) with the *stūpa* of Ajātaśatru to the east of Veṇu-vana. But see f.n. 2 on page 71 re. Marshall's identification of this *stūpa*.

[2] Even the 'inner city walls' of Hiuen Tsang extended beyond the citadel enclosed by the stone ramparts. For according to Hiuen Tsang they were about 20 *li* or more than 3 miles in circuit, whereas the stone ramparts of New Rājagṛiha have a circuit of about 1¼ mile (see plan. *ASI*, 1905-6, Pl. XXXV, which also shows the walls of the city proper). It is thus difficult to locate the spot in New Rājagṛiha from which Hiuen Tsang took the direction and distance of the Aśoka *Stūpa*. It has been suggested that this is identical with the *stūpa* mentioned by Fa-hien as having been built by Ajātaśatru. But this is doubtful. Fa-hien places it '300 paces outside the West Gate' of New Rājagṛiha, whereas Hiuen Tsang places Aśoka *Stūpa* not far to its south-west. As in Old Rājagṛiha there was a 'Palace City' as well as a 'Mountain City', so here, too, there seem to have been two cities, viz. the citadel (i.e. the area enclosed by stone ramparts whose remains can still be seen) and the city proper, whose walls disappeared even in Hiuen Tsang's time. So long as it is not clear which of these is referred to by the Chinese pilgrims we cannot rely much on the identifications based on the distance and direction from New Rājagṛiha.

Another possible identification of Veṇu-vana must also be kept in view. It is the extensive semicircular area along the foot of the Vaibhāra facing the inner walls of the city immediately to the south-west of Marshall's North Gate. It is enclosed between the crescent-like bend of the Vaibhāra hills and the streamlet running along, but outside, the western wall of the inner city. Another streamlet coming from the top of the Vaibhāra hill runs directly through this area. Although it is almost dried up now, its bed, filled with pebbles, still shows that it was much larger in old days. The straight end of the Park, running north to south, would thus lie just beyond the Western Wall of the inner city, and run parallel to it for a considerable distance, across the small streamlet that flows between the two along the foot of the Vaibhāra hill. This region is even today filled with dense bamboo forest, to which undoubtedly the Veṇu-vana owes its name. Within this area, and about midway between the Sonbhāndār cave and Marshall's North Gate, there are extensive remains of a stone foundation [1] which may be that of Veṇu-vana-vihāra. This position remarkably agrees with the following statement of Fa-hien: 'North of Veṇu-vana-vihāra, 2 or 3 *li*, was the *śmaśāna* (cremation ground). As they kept along the mountain on the south and went west for 300 paces they found a dwelling among the rocks named Pippala cave. Going on still to the west for 5 to 6 *li*, on the north of the hill, in the shade, they found the cavern called Srataparṇa.' Marshall held that the reference to the *śmaśāna* was a casual one [2] and was not on the route actually followed by Fa-hien in going from Veṇu-vana-vihāra to the Saptaparṇī cave, for such a continuous journey did not agree with his identifications. But we can clearly follow the route in its normal sense if we locate Veṇu-vana-vihāra in the position indicated above, and take the *śmaśāna* (Burning-*ghāt*) to be the one near the North Gate. [3] Thus going towards the north, about 2 *li* (about a third of a mile), Fa-hien would reach a spot at the end of the Vaibhāra hill, which is even now used as a cremation ground. He then turned the corner of the Vaibhāra hill towards the left, and 'kept along the mountain on the south and went west for 300 paces', till he passed beyond the hot springs and reached the cave, identified above with the Pippala cave. 'Going on still to the west for 5 or 6 *li* he found on the north of the hill the cavern called Srataparṇa.'

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[1] Possibly this is referred to in the *Guide* (p. 24) as 'the foundations of a stone building 118' square including the walls which are 5' thick'. But it appeared to me that it would be nearly 200' long.

[2] Marshall writes as follows:—

'The cemetery, alluded to by Fa-Hien, must then be located not far from the south-west corner of New Rājagriha, in the waste ground to the west of the modern Dāk Bungalow. This is where the Burning-*ghāt* of modern Rājgir still exists, and where, therefore, in view of eastern conservatism, we should, in any case, be inclined to look for the old *śmaśāna*. In connection with this cemetery, it may be noticed, by the way, that Fa Hien speaks of it parenthetically. He does not say that he went from the Bamboo Garden to the Pippala stone house by way of the *śmaśāna*. He entered the Bamboo Garden on the south, visited the ruins of the old *vihāra*, and then went westward among the rocks up to the Pippala stone house. That he should have visited the cemetery, half a mile away, between these two places, is obviously unlikely' (p. 96).

But, as noted above, there is no need to identify the cemetery alluded to by Fa-hien with the modern Burning-*ghāt* which is half a mile away. We have another not far from the North Gate of Marshall which lies exactly where we would expect it from Fa-hien's account.

[3] According to Marshall's own arguments, quoted in the preceding note, this Burning-*ghāt* which I myself have seen being used even today may be presumed to have existed even in Fa-hien's time. Besides, the existence of the cremation ground at this place in old times is also supported by Buddhist literature as noted above (p. 72).

6B

As the cave, which is now almost universally regarded as Saptaparṇī, lies about a mile to the west of the Pippala cave, the description of Fa-hien remarkably agrees with the proposed identifications and confirm them.

Hiuen Tsang places the Saptaparṇī cave to the south-west of Veṇu-vana, about 5 or 6 *li*, on the north side of the southern mountain. This would tally with the proposed identification if we suppose that Hiuen Tsang climbed the Vaibhāra from the south side directly from Veṇu-vana, following more or less the road which is even now in use and follows a south-western direction from the proposed site of Veṇu-vana. If this identification be accepted we have to identify the Karaṇḍa-*hrada* with the tank at the foot of the Vaibhāra hill, a little to the south-east of the modern bridge over the streamlet Saraswati near the hot springs. The sides of this tank are faced with stone and this indicates its antiquity and importance. The old tank near the Pippala cave, mentioned above, might also be taken as the Karaṇḍa-*hrada*, if we take the direction and distance in a straight line over the mountain.

Reference may be made in this connection to a statement of Broadley which seems to have escaped the notice of all subsequent explorers, including Marshall. Referring to the Karaṇḍa-*hrada* he observes: 'The remains of the tank can still be seen facing the southern wall of the new town, and a figure I found there bore the words "A religious gift to the Karaṇḍahrada tank".'[1] By 'new town' Broadley refers to the city of New Rājagṛiha, but unfortunately he does not give enough particulars of the tank to enable us to identify it. I had not his article with me and so could not verify his statement on the spot, but to the best of my recollection there are no clear traces of a tank immediately outside the southern ramparts of New Rājagṛiha, unless we take the low patches of cultivated ground between the Inspection Bungalow and these ramparts to be the remains of such a tank.[2] But in any case, if the tank were quite close to the ramparts, the Veṇu-vana-vihāra must be looked for about 200 or 250 yards to the south of it. This would agree more with the site near Inspection Bungalow suggested by me than with the mound, with Muslim tombs on it, proposed by Marshall.

But there are two difficulties in accepting this identification based on Broadley's statement. The inscription to which he refers has not yet come to light, and in view of many other instances of this kind, one cannot be quite sure that the name Karaṇḍa-*hrada* was read quite correctly either by him or by the scholar to whom he referred the record. It may be pointed out, for example, that in the same article Broadley quotes the reading and translation of another record (of Nālandā) by Dr. Rajendralal Mitra in which the words *Nālandāyām* and *suvarṇa-vrīhi-saktā* were misread as *na-tadbhāryām* and *suvallabi-deśastha*, with the result that Vāgiśvarī, i.e. the Goddess Sarasvatī, on whose image the record was engraved, was made the wife of Gopāla (Pāla Emperor) and a resident of the country of Suvallavī, while the all-important reference to Nālandā was entirely missed. In view of this it is difficult to conclude from Broadley's reading of the record that there was really a reference to Karaṇḍa-*hrada* in it.

Secondly, even assuming that the record was correctly read, one must be sure that the figure originally belonged to that tank and was not thrown into it at a later date, before any conclusion can be drawn. If the figure

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[1] *JASB*, 1872, p. 234.

[2] There is a tank immediately to the north of the southern ramparts of New Rājagṛiha. This is shown in the plan of New Rājagṛiha (*ASI*, 1905-6, Pl. XXXV). If Broadley had this tank in view it can hardly be identified with the Karaṇḍa-*hrada*—for the tank is inside New Rājagṛiha, whereas the Karaṇḍa lake was outside it.

were a very heavy one, the presumption would of course be in favour of the first view, but of this we have no record. Broadley's reference to the inscribed figure is certainly very important for the purpose of identifying the site of Karanda-*hrada*, and an earnest search should be made for it. But until it is found, and the inscription on it carefully read by experts, it is not safe to draw any conclusion.

To sum up, if we accept Fa-hien's statement in its normal sense—and there is no reason why we should not—we must locate Venu-vana at the foot of the Vaibhāra hill facing the western inner wall of the old city of Rājagriha in the region between Marshall's North Gate and the Sonbhandar cave. Otherwise, we may look for it in the wide plain, about half a mile long, that lies between New Rājagriha and the hills surrounding the old town of that name. But in this case it is more reasonable to place the Venu-vana-vihāra nearer the former than the latter. Marshall's view which places it close to the hot springs seems to be the least likely one, though it cannot certainly be dismissed as altogether improbable.

7. Saptaparṇa(ṇī) Cave

Opinions differ widely on the location of the site where the followers of Buddha met shortly after his death in order to collect his teachings. Almost the unanimous tradition of the Buddhists mentions the Saptaparṇī (or Saptaparṇa) cave in Rājagriha as the place of this meeting. Some Buddhist texts simply locate it in the Vaibhāra hill, but more definite information about its position is furnished only by the Chinese Buddhists. The statements of Fa-hien and Hiuen Tsang regarding the relative position and distance of Venu-vana-vihāra to this cave have been quoted above. On the basis of these statements Cunningham identified it with the Sonbhandar cave. This view was soon challenged by others, including his assistant Beglar, and though supported by Broadley, is now unanimously rejected. It must be pointed out, however, that of all the caves in Rājagriha, so far known to us, the Sonbhandar cave alone possesses all the features necessary for being the venue of a big assembly of 500 monks. But the most vital objection against its identification with the Saptaparṇī cave is the express statement of both the Chinese pilgrims that the latter was situated on the north side of the hill. The ingenious attempts of Cunningham to interpret this passage so as to suit his proposed identification must be regarded a failure. If the Chinese passage has been correctly translated, we must give up the identification, or in any case hold that the Sonbhandar cave could not possibly have been shown to the Chinese pilgrims as the place of the religious assembly.

The statement of Fa-hien enabled Beglar,[1] and later Stein,[2] to locate the cave on the north side of the Vaibhāra hill, a little below the Jaina temple dedicated to Ādinātha.[3] This view has been challenged by Marshall[4] who has suggested a new identification. His whole theory hangs on one question—was the place of meeting a cave or a structural building? As in the case of Pippala cave and Devadatta cave, so also here, Marshall relies on Beal's translation of Hiuen Tsang's statement according to which it was a stone house. But Watters' translation of the word as 'cave' is supported by the numerous references to Saptaparṇī *cave* in the Buddhist texts. Marshall argues, in support of his interpretation, that 'the same words are used of the Pippala Stone House, which

[1] *ASR*, VIII, 92–99.   [2] *IA*, 1901, pp. 57–60.
[3] This is marked 'Cave' on the map.   ·   [4] *Report*, 97–100.

fortunately can be identified with certainty and which we know to be a structural building' (p. 99). But as noted above, this was also a cave, and Marshall's argument, therefore, falls to the ground. Thus in all the three cases—Pippala cave, Devadatta cave and Saptaparṇī cave—Watters' translation of Hiuen Tsang's statement must be preferred to that of Beal who renders the word (or words) as Stone house.

The real objection against the generally accepted identification [1] of Saptaparṇī cave is the topography of the locality. This has been forcefully pointed out by Marshall in the following passage:—

'The caves are, as may be gathered from a perusal of Dr. Stein's own description of them, nothing but low and narrow caverns, naturally formed in the rock, while the terrace in front of them is nothing but a narrow ledge, averaging some 7 yards in width, with a retaining wall at its outer edge, and below it, the steep and precipitous sides of the cliff, up which no approach exists or is ever likely to have existed. That the great Sattapaṇṇi Hall, capable of holding 500 people, could have been built on this narrow little terrace, or that this could have been pointed out to the Chinese pilgrims as the traditional site of such a Hall is incredible; nor, indeed, is it easy to believe that, if any structure at all had been built against the face of the rock at this point, all traces of it would have been so effectually obliterated' (p. 99).

I have personally visited the cave twice with all these arguments in my mind, and must admit that they are worth serious consideration and cannot be lightly dismissed. Nevertheless, they cannot be regarded as conclusive against the proposed identification for the following grounds, among others. In the first place, the objections raised by Marshall apply with equal or perhaps greater force against any other cave in or near Rājagṛiha, with the single exception of Sonbhandar cave. As the identification of Saptaparṇī with this cave is out of question for reasons already stated, the proposed identification must be regarded as the best at the present state of our knowledge.

Secondly, it appears from actual measurements of the space which might have been covered by the terrace in front that it is not impossible to accommodate 500 men there. It is true that the construction of such a terrace against the steep and precipitous side of the cliff must have been a task of enormous difficulty, and it is not easy to understand why anybody should have undergone all these troubles and expenses when it should not have been at all difficult to provide for a meeting place elsewhere, either on the top of the same hill which has large stretches of level ground at different places, or in the plain below at the foot of this or any other hill. But as against this commonsense view we must remember that there are *actual traces* of a terrace built artificially in front of the cave, with a retaining wall to support it. There could have been only one object in doing this, viz. to provide for the accommodation of a larger number than was otherwise possible. Once we assume this, we must hold that the occasion for doing this might be the convocation of the Buddhist monks as well as anything else, preferably the former, as kings and people in ancient India have always shown greater zeal and enthusiasm, and opened their purse strings more widely, for religious rather than secular purposes.

Marshall was certainly exaggerating things when he ridiculed the idea of building a hall to accommodate 500 men on this narrow little terrace.

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[1] It is interesting to note that the Guide Book published by the Archaeological Department upholds this identification as against that of Marshall.

There is no warrant for the assumption that a magnificent edifice of stone or brick was built here to hold the meeting. What was most probably done was to build on the terrace a temporary pavilion [1] fixed on wooden posts where 500 persons could sit and deliberate. As stated above, the available space on the terrace cannot be regarded as altogether insufficient for the purpose. It is also not unlikely that the actual number of monks was much less than 500, and the terrace built in front of the cave was really smaller and the building operations much less arduous than we imagine. It may be argued, as Marshall has done, that whatever might be the actual size of the original terrace, the Chinese pilgrims must have seen a site which was capable of accommodating 500 men. The actual position is even worse than Marshall thought, for Hiuen Tsang records that the number of monks was 1,000. But this argument is fallacious. For at the time of the pilgrim's visit the Hall, and possibly also a part of the terrace, had crumbled, and only the foundations remained, leaving full play to the imagination to increase its capacity almost to any extent. And from what we know of the Chinese pilgrims, we may be quite sure that any rational doubts about the possibility of building a hall of any desired size in that place would not disturb their pious sentiments evoked by the memory of the Great Assembly, or shake their belief in traditions handed down from old times.

Marshall has done scant justice in his Report to Beglar and the Saptaparṇī cave originally discovered by him. Thus he remarks: 'No one since his (Beglar's) day has been able to trace the recesses in the rock described by him, and we ourselves searched the side of the hill time after time with as little success as those who had gone before us.' In a footnote to this passage he even goes so far as to observe that 'Mr. Beglar's identification seems altogether too imaginative to be taken seriously'. All this really sounds very strange, for there can be no doubt that the cave, described, in great detail by Beglar with diagrams, is the one which was subsequently visited by Stein and identified with Saptaparṇī cave. Why Marshall and others before him failed to recognize the cave it is difficult to say, for I and my companions had no difficulty in recognizing the caves even from the plain below. Marshall dismisses as imaginary 'the recesses in the rock described by Beglar'. But the latter in his Report (p. 96) calls it a cave and correctly describes it as consisting of a series of six chambers separated by natural walls of rock. Of course, one might describe it equally well as six different caves in close juxtaposition. But the main point is that there are really six caves as Beglar says, and not merely two as stated by Stein and repeated by Marshall. It is clear from Stein's description that the place was covered by a thick jungle when he visited it, and that is probably the reason why the four smaller caves escaped his notice. But Marshall's mistake is less excusable. How, in face of the detailed description of Beglar, illustrated by diagrams, he could speak of only two caves and ignore the rest passes my comprehension; and still more mysterious is his doubt about the very existence of these caves. The most charitable view that we can take is to suppose that Marshall never visited the actual site and, having depended entirely on Stein's Report, failed to see that Stein was actually describing two of the six caves noted by Beglar. This is, of course, a great lapse on his part, for Stein's account should have

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[1] This is also clearly indicated by the word *Mahāmaṇḍapa* (great pavilion) used in the Buddhist texts to denote the structure built at the entrance of the Sattapaṇṇi cave (*Sattapaṇṇiguhā-davāre*) for the purpose of holding the First Assembly of Buddhist monks (*JBRS*, IV, 126-7).

left no doubt that he was describing the caves already referred to by Beglar. Stein observes [1] that 'a perusal of Mr. Beglar's description of this remarkable spot conveys the impression that his visit had been of the most hufried character'. This remark, while giving less than due credit to Beglar for the discovery, is certainly unjust to him. For, to judge by the result, Stein's visit seems to have been more hurried than Beglar's. For while the latter correctly put the number of caves at six, Stein saw only two. I have personally visited the spot more than once and am convinced that Beglar's description is quite correct in spite of the taunting remarks of Marshall and Stein. In view of the statement made by a man of Marshall's status, it is desirable that the photos of the Saptaparṇi cave or caves should be published by the Archaeological Department. [2]

Some of the objections of Marshall against the proposed identification of Saptaparṇi cave are based on the ground that it is only accessible from the top of the hill and cannot be reached from the plains below. This may be the case today, but might not have been true even of the time when the Chinese pilgrims visited it, not to speak of earlier periods. For, one day, five or six of us made a successful attempt to climb the Vaibhār hill direct from the plain below. It was a difficult job no doubt, and we had to suffer a great deal, particularly from thorny plants, but we found, as we went up, that there are clear traces of old paths here and there, and wherever we could pick them up, we had little difficulty in ascending the hill. Besides, we saw clear traces of masonry at many points on the way. No doubt was left in our minds that with an ordinary clearing of the jungle we could easily climb up the hill. We did not, of course, reach the Saptaparṇi hill direct from below, for we began the ascent from a point a little too far to the east of the cave, and hence got to the top of the hill before we reached it. But our experience encourages the belief that it is not impossible to climb up to the Saptaparṇi cave from the plain below, after clearing the thick jungle that now covers the face of the rock, and that it would be wrong to assume that there never existed such a path. In view of the great importance of this question I would earnestly request the Archaeological Department to explore this region by clearing up the jungle.

I need not discuss in detail the identification of the Saptaparṇi Hall proposed by Marshall. If it is established at any time, beyond any reasonable doubt, that the convocation was held in a structural building, and had nothing to do with any cave, Marshall's identification should certainly be regarded as a reasonable one. But this is not the case at present, and we need not therefore attach much importance to it.

To sum up. There is hardly any reasonable doubt that Saptaparṇi was the name of a cave and not a stone hall. Cunningham's view that it was the Sonbhandar cave must be definitely rejected so long as the statement of the Chinese pilgrims that it was on the northern side of the hill is not otherwise interpreted or positively proved to be wrong. The identification, originally proposed by Beglar, and later made independently by Stein, though not altogether satisfactory or free from difficulties, must be

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[1] *IA*, 1901, p. 59.

[2] It is gratifying to note that some amends have been made by the Archaeological Department for the great wrong that Marshall and others did to Beglar by the frank recognition in the *Guide* that there are really six caves and that they were first discovered by Beglar (pp. 10-11 and f.n. 1). Unfortunately the *Guide* has not as wide a circulation as the Report of Marshall and so even now there is a general impression that 'the fissures' noted by Beglar do not really exist or at least have not been seen by anybody else. Even a week ago I found this statement made by several candidates at the M.A. Examination of an Indian University.

regarded as the most reasonable at the present state of our knowledge. Marshall's criticism against it can only be partially upheld, but is mostly untenable and based on wrong assumptions and imperfect knowledge. His own theory is hardly tenable.

REVIEWS OF BOOKS

'MEWĀD KĪ KAHĀVATEN.' By Rao Sahab Pt. Lakshmilal Joshi, M.A., LL.B. (Udaipur), Part I, pages 16+199+4. Price Rs.2. Publishers: Hindi Vidyāpīth, Udaipur (Mewad).

Each part of a country has its own proverbial sayings, and they are often used by its people in their talks. Proverbs are the best source of becoming conversant with the thoughts, habits, ideals and modes of living, etc. of the people of that part where they are used.

Though the proverbs or maxims are composed in simple language and concise sentences, like 'Sutras' written by our old sages, yet they carry a vast meaning behind them. In Sanskrit literature 'Sutras' are described as under:—

खल्पाद्यरमसन्दिग्धं सारवद् विश्वतो मुखम् ।

अस्तोभमनवद्यं च सूचं सूचविदो विदुः ॥

As their mode of expression is figurative, they leave deeper and longer effect on the mind of the person than an ordinary sentence.

Pandit Joshi has done a great service to Hindi literature by collecting about one thousand proverbs of Mewad and giving their meanings and explanations in Hindi. He has also added, at the end, a vocabulary of local and difficult words occurring in these proverbs with their meanings.

In this volume the proverbs have been divided under seven different heads:—

(1) Ethics and guidance, (2) human nature, (3) expressing something else than what is said (वन्योकि), (4) relating to caste, (5) historical, (6) relating to seasons, and (7) miscellaneous. The compiler, on his part, has taken great care to put the proverbs under proper heads, yet as they are capable of more than one application, it is not possible to make hard and fast rules for their division. Further as many of them are also common in other parts of the country with slight lingual changes here and there, it is therefore difficult to trace the place of their origin as well.

At few places the explanation given by the author may not be acceptable to others (as on Nos. 27, 34, 219, 233, 238, 244 in the Ethics section). But the book is very useful and it is hoped that its author will receive due encouragement from the scholars of Hindi in general and those of the Rajasthani in particular, so that its second part may also be soon published.

Further, if there is a chance of the second edition of this part literal meanings of some of the proverbs left out in this edition (as on Nos. 6, 25, 55, 58, 204, 227 in the 1st section), may also be added.

BISHESHWARNATH REU.

'RĀJASTHĀN MEN HINDĪ KĒ HASTA LIKHIT GRANTHON KĪ KHŌJA', Part II.
By Sjt. Agarchand Nahta, pages 15+171. Price Rs.4. Publishers:
Vidyāpīth, Udaipur (Mewad).

Its first part was published in 1942 A.D., which contained the systematic
catalogue of 175 Hindī manuscripts, while this part deals with 183 Hindī
manuscripts, related to the subjects:—

(1) Dictionary, (2) Poems, (3) Medicine, (4) Examination of Jewels,
(5) Music, (6) Drama, (7) History, (8) Story, (9) Knowledge
of omens, (10) Palmistry, etc.

and written by 102 different poets, from about 17th to 19th century A.D.
They have been systematically catalogued from different manuscript
collections.

Sjt. Nahta is to be congratulated for this sort of useful work, which he
is doing since last many years.

Thanks are also due to the Government of Mewad for the grant of
Rs.1,000 for this report and the Vidyāpīth, Udaipur, deserves as well the
thanks of Hindī scholars for publishing such valuable works.

BISHESHWARNATH REU.

INDIAN AND WESTERN MUSIC

By ALAIN DANIELOU

Preliminaries.—Your General Secretary has very kindly asked me to speak to you about Indian and Western music. This subject is not a very easy one. Musical systems differ more deeply than people usually realize and to explain their differences it will be necessary for us to make a general survey of musical history as well as to enter into the rather complex theory of music. I shall try to do this as briefly and clearly as I can, and hope to be forgiven if I may not be able to avoid completely the technical terminology of music.

But first, I think that the very title given to this talk is wrong. Music is not Eastern or Western. It may happen that at a given time a particular musical system is given preference to in a particular country, but this is usually a temporary phenomenon. It would be more accurate for us to speak of music as modal and harmonic. This would put our enquiry on a sounder basis, and we may well discover that there are numerous musical elements found in Western countries which, in fact, belong to the modal or so called Indian system. Further a certain use of polyphony is not at all unknown to Indian musical theory and was extensively used in India at a time when it was still unheard of in Europe.

Different languages.—Before we can compare two systems of music, or two languages we first have to find out what common ground they may have. In the case of languages, we find that certain types of speech differ only in their vocabulary, their sound, but make use of a similar grammatical system. Such is, for example, the case of the Indo-European group of languages. But if we want to compare languages belonging to different families, such as Chinese and Italian, we find far less common points. It is only after we have determined the different forms through which an idea may be expressed, that we can attempt to translate, or, if the differences are too great, to transpose the ideas from one language into another.

Music a form of language.—Music does not differ from language in its principle. In fact the ancient Sanskrit theorists always considered music as a form of language. Music is but a means of expressing emotions or ideas through sounds and relations of sounds, which is also the characteristic of language.

Different types of language.—Just as there are different kinds of language, there are also different kinds of music. There are several types of grammar which cannot be used at the same time in one language. Similarly the different types of music may be incompatible. Languages are not usually at the same time agglutinative and inflexional, so also music may not be both harmonic and modal.

Towards a common language.—A question which has always faced mankind since the time of the tower of Babel is whether it would not be better to have one common language for all, one common music for all.

Qualities of different languages.—But whatever the advantages of a common means of understanding, there are qualities inherent to each type of language, and a great part of the treasure of human thought and culture

would disappear if some of the great languages were to vanish, because the modes of expression, the ideas inherent to those languages, can never be exactly translated into another tongue. There are for example many subtle ways of expression in Bengali that can never be rendered in Hindi or English.

Music is not an international language.—Contrarily to a common belief *music is not* a word-less language which can be understood by all beings. No bird seems to enjoy the song of another kind of bird. The perception we have of musical sounds is, of necessity, based on acoustic phenomena which must be common for all beings endowed with a similar system of hearing. Yet these common acoustic properties are used in each system in a particular and exclusive manner, and it requires a special training to recognize them. This training, necessary to understand a particular musical system, is not less long and tedious than is the study of a foreign language.

The hope that the gentle sounds of music may soften all hearts and create understanding between men and nations is unfortunately not founded. Even if the members of the United Nations were to sing to one another instead of making speeches they would not understand one another better for that. On the contrary they would be likely to irritate one another even more deeply.

Four types of musical systems.—In the world today we know of four completely different types of musical systems which make use of distinct properties of sound. These systems can be called the cyclic system, the modal system, the harmonic system and the melodic system. Chinese music is of the cyclic type, classical Indian music is modal, modern Western music is harmonic, and most of the popular music of all countries comes within the melodic system.

Cyclic system.—The cyclic system is in a way the fundamental one, if not the original one. It makes use of no interval in which may figure a prime number higher than 3 or a power of 3. Its basic interval is what we call a fifth, that is the interval from Sa to Pa, or C to G, which corresponds to the ratio 3/2. Cyclic music utilizes the peculiar properties of successions of fifths as the basic of its musical language. Its main outward characteristic is the pentatonic (or 5 notes) scale. This pentatonic scale known in India as rāga Bhūpālī is the only mode or rāga used in cyclic music, where the basic means of expression depend on changes of tonic and variations in pitch.

The Modal system.—Next comes the modal system, of which the most elaborate example is classical Indian music. Its most characteristic feature is the permanence of a fixed sound called the tonic. The musical or expressive value of all the other sounds are here envisaged exclusively as depending on their relation with the tonic. All kinds of intervals can thus be formed which are further assembled in what we may call an oblique structure so as to create an *indefinite variety* of modes or rāgas.

The Harmonic system.—Third comes the harmonic system which, in many of its features, is a comparatively recent development. In this system, the different sounds are played together in groups which are called chords and which are so arranged as to form given intervals in relation with a lower sound called the *fundamental* of the chord. The characteristic of this system is that a given pitch of sound can convey a different expression according to the position it occupies in relation to the fundamental notes of different chords.

Melodic Music.—These three systems represent the main learned ways of music at present in use. There is, however, a further type of system which is very common and may be termed the melodic system. It is out-

wardly akin to modal music, but in this case the memory functions differently in what we may term a horizontal rather than a vertical way. Further the tonic plays in it a less important rôle; each note taking its expression from its relation to the previous and the following notes.

Melodic and modal form.—Maybe I should make this clearer. In a melodic form of music the shape of the song is fixed, that is, you can learn the melody of a song and sing it perfectly, without knowing which note is a Sa or a Ga, the tonic or the third. The memory functions horizontally from one note to another. In modal music on the other hand the group of notes on which the melody will move is fixed and memorized vertically as one unit. Now, when singing a mode or a rāga, the musician concentrates on the scale. The melody cannot be fixed. The musician cannot know exactly through which melodic contours he moves around this fixed back-bone that is the scale. If he concentrates on the melody, he will loose the rāga. He just acts like the artist, who, while making a drawing, con-centrates on the profile which will come out of the page. He cannot follow every circumvolution of the pencil. He does not know what movements his pencil does. Such is the case for the melody of the modal musician.

Melodic music has a far less important place than modal music so far as musical theory is concerned because it can never produce a very highly evolved music. The mistake underlying most of Western interpretations of Indian, Arab or Greek music has been that they confused modal music and melodic music and could therefore understand nothing of the theory nor the practice of music in those countries where music happened to be of the modal type.

INDIAN HISTORY

The older system is modal.—While the harmonic system appears to be a comparatively recent development, both cyclic and modal music had a very advanced theory and practice in quite ancient times. Probably the older type of advanced music was modal although the existence of a cyclic music seems not to have been unknown to early modal theorists of which the works have survived.

Greece and India.—A few centuries before Christ the music of India and of the known parts of Europe was of the modal type. In fact most of Greek theory and instruments came originally from India through the Middle East. There is a certain amount of musical evidence to show that a civilization, which at one time seems to have extended from India to Egypt and the island of Crete before the Aryan invasions, had already a very advanced art of music and elaborate musical instruments. At a later period the Śaiva cults, which gave a very great importance to out-door dancing and singing, were again imported into Greece and Egypt. Megasthenes who came to India in 302 B.C. reports that the Indians were great experts in music and dancing and that they counted 6,000 years from the time when Dionysos (that is Śiva) taught them music, till the time of Alexander. These dates exactly tally with those given in the old Śaiva Purāṇas. Meanwhile, the Aryan diatonic scale and the system of music expounded in the Gāndharva Veda had also found their way into Greece. The conflict between the old Dravidian and the Vedic-Aryan music is apparent in Greek musical theory as it is in the Sanskrit musical works of the early period. And the basic scales of these two main schools or Matas of Indian music, the Dravidian and the Aryan, became known to Greek theorists as the chromatic and the diatonic. The enharmonic division, or scale of the Śrutis, which was the common theoretical basis of both systems, is practically identical in Greek and in Indian theory.

History of Indian Music.—The musical history of India is linked with the whole history of civilization. Through the study of musical development in India, as well as through the development of other arts and sciences, we may be able to reach conclusions which will be an asset to define with more precision those parts of political and literary history which have remained so far ill determined. We have here to be aware that musical tradition is extraordinarily permanent. People can change their country, their language, their dress, their food, and still come back to the same musical forms which are more suited to the peculiarities of their ears and temperament. Musical forms are seen to survive, often unnoticed, through a different theory, in the midst of a different system, to reappear again unchanged after centuries.

A recent and most brilliant example is that of Tagore songs, which represent a melodic form under the garb of a modal one. They are purely in the ancient tradition of Bengali music and are not rāgas although they appear to use the scale of some usually mixed rāgas. They are not either influenced by Western music, as some people believe, although they make use of some adapted Western tunes. Modal theory cannot account for their expression. This is what the common man feels when he says that they have a 'peculiar', undefinable charm.

The four Mata-s.—The medieval and later books on music speak of four Mata-s, or systems of music, each referring to a basically different school. This can be interpreted in two ways. Either these Mata-s represent different ways of classification while the art itself would be practically the same, or they may refer to actually different musical systems.

In practice even today, and in spite of mutual influences, we find in India four very distinct types of music which we may call from their most representative elements: the Dravidian modal school with its basic chromatic, the Aryan modal school with its basic diatonic, the Melodic school predominant in Bengal and among many ancient peoples of Central India and the Himalayas and also a school of cyclic pentatonic music, of Mongolian origin, found in Nepal, Assam and a few other regions. These represent fundamentally different systems. The fact that they could remain distinct, in spite of the efforts made by theorists for centuries to link them into a common theory, well shows the remarkable tenacity of popular culture in its will to resist the assertions of insufficiently learned theorists, a phenomenon which can be observed in every country and at every period.

The confusion of the four Mata-s.—From medieval times the tendency of Indian theorists has been to confuse the different Mata-s. With the consolidation of the predominance of Sanskritic culture, the writings of all the ancient Ācāryas were pooled together, and patient attempts were made with the help of linguistic artifice to show that there was no contradiction between them. This definitely obscured musical theory. The larger and more typical work of this period is the celebrated Saṅgīta Ratnākara of Śārṅgadeva, a book written in the thirteenth century as a sort of general treatise on musical science. It is a work of marvellous learning and ingenuity from which Indian music has not yet recovered.

The original Indian systems.—If we want to have a clear view of the theory of the original systems we have to fall back upon earlier works. Unfortunately many of these are now lost. Yet, with patient labour, it is possible to reconstruct part of their theory from the extensive quotations available in later books.

Early books on music.—The Indian books on music can be divided into three periods.

The first or ancient period which we may call pre-Buddhistic includes the theory of music as it can be traced in the Vedas and the Upavedas, as well as the music referred to in the earlier Purāṇas, parts of the Epics, and generally all authors who appear to be anterior to Pāṇini who was approximately a contemporary of Gautama Buddha.

It may be noted here that the cautious modern scholarly method which consists in dating works as late as possible may be very misleading. There is no doubt that practically no ancient work survives which has not been re-shaped in some way or other in the later centuries. But to consider these works, in their bulk, to be as late as their last reshaping, simply because some late additions are found in them, gives a wrong historical perspective. We are equally falsifying history when we consider the later parts of these works as being early or their early parts as being late. I do not quite understand why it seems to be deemed as a sort of virtue for a historian to take great risks in dating ancient works much too late while it is considered a fearful sin to take slight risks in dating parts of a work too early. So far as music is concerned we can take present historical conventions rather light-heartedly since we have means of deciding the age of a given document which are different and safer than linguistic considerations. Such are, for example, the basic scales, the instruments mentioned, the authors quoted, the appearing or disappearing of particular technical terms and their use.

The Buddhist age.—After the early period comes what we may term the Buddhist age extending approximately from 500 B.C. to the fifth century A.D. which represents the literature on music contemporary to Kauṭilya, Kālidāsa, Amara Siṃha, Patañjali.

Then comes the medieval age with the commentators of Bharată, that is Udbhaṭa in the eighth century, Lollaṭa and Śaṅkuka in the ninth, then in the tenth century the monumental work of Abhinava Gupta, and that of Nānya-deva in the eleventh, and of Śārṅga-deva in the thirteenth century, not forgetting the contemporary commentary on the Saṅgīta Ratnākara by Siṃha Bhūpāla, the very protector of Śārṅga-deva.

The later Sanskrit literature on music from the fourteenth to the eighteenth century is quite rich, but is generally of lesser theoretical interest. The works of this later age endlessly quote the definitions of earlier works and try to explain away the theoretical difficulties which were born of earlier confusion.

Veṅkaṭa-Makhin.—In this connection a special mention should be made of Veṅkaṭa-Makhin who, in the seventeenth century, reformed South Indian music. We are often told that South Indian music is more conservative and represents Indian music in its purest and more ancient form. This is probably very far from true. The present system of South Indian music is a mixture of melodic and modal forms, and its theory was profoundly altered by several theorists but particularly by Veṅkaṭa-Makhin, who systematized the reforms started by his father Govinda Dikṣhita, a protege of Mahārāja Raghunātha Nāyaka of Tanjore.

In an endeavour to restore the ancient theory and explain away the contradictions of earlier authors, Veṅkaṭa-Makhin made a beautiful and clever blend of the conflicting systems and deeply altered the theory of South Indian music.

Purer music in the north.—The case is quite different in the north where, in spite of foreign invasions and alleged influences, the music, partly thanks possibly to the loss of its theory in days of insufficient learning, remained, through mere technical tradition, remarkably faithful to the old definitions.

No cyclic or melodic literature.—Among the earlier works on music we find, as could be expected, no literature regarding the Mongolian pentatonic which had always its centre outside India. It should be remembered that this Mongolian cyclic pentatonic has nothing to do with the pentatonic forms of the basic rāgas in the Śaiva system. Further the melodic system has left to my knowledge no important theoretical literature. A scrutiny of Tāntric documents might, however, reveal some valuable elements.

Dravidian and Aryan texts.—As regards the Dravidian and Aryan modal systems we possess many documents of the greatest value and antiquity. Generally speaking, we can observe that the earlier theory of Dravidian music, as found in Sanskrit texts, is represented by the Śaivā school whose main expounder is, after Śiva himself, Nandikeśvara. Besides these, other important names are those of Śārdūla, Pārvatī, Jamadagni, Bhṛṅgī, Vighneśa, Kīrtidhara, Rāvaṇa, etc., and probably the musical theory found in the earlier Purāṇas, the Vāyu Purāṇa, the Mārkaṇḍeya Purāṇa, as well as such works as the Gītālaṁkāra which is attributed to Bharata but is the work of a Bharata distinct from the presumed author of the Nāṭya Śāstra. The Nāṭya Śāstra itself is a compilation probably dating from the beginning of the Christian era and expounding mainly the theory derived from the Gāndharva Veda. The Gītālaṁkāra, on the other hand, is a purely Śaiva work and all its classifications are of a different and very original kind.

It is very difficult to date the earlier Śaiva texts on music. It is also difficult to ascertain their original language. But the musical theory they expound and especially the use of certain technical terms or instruments can help us to be quite affirmative about their antiquity independently of all linguistic considerations.

Tamil and Greek sources.—The Tamil epic, the Śilappadikāram, which belongs to the second century, has important passages referring to the theory of music and musical instruments, and is thus a precious help in dating contemporary works.

Vedic music.—I have no authority nor sufficient knowledge to enter into the question of the origin of the so-called Aryan civilization. So far as music is concerned, we find from the earliest Vedic period a constant use of music and instruments. The Ṛg Veda mentions some wind and string instruments as well as drums. The Sāma Veda was chanted, and there were theoretical treatises and Śikṣās explaining all the technical peculiarities of this chant. Later, under the name of Gāndharva Veda, appeared a vast literature on music, its philosophy and its technique. The number of early theorists of Aryan music of which we know the names is considerable, but very few works have survived although a certain amount of quotations from these in later works are sufficient to determine with certainty the nature of the system.

Among the names of the early writers of music some are quite celebrated —Agastya, Kāśyapa, Aṅgirasa, Vasiṣṭha, Yājñavalkya, Yaṣṭika, Añjaneya and many others.

Nārada.—A strange figure creates a sort of link between the two schools Dravidian and Aryan, or Śaivā and Vedic, and that is Nārada. There are fragments of his work belonging to either school. It is true that all the available works attributed to Nārada are of different periods. But there must have been an original Nārada and he is claimed by both sides.

Bharata.—Similarly Bharata appears as an indefinite entity. But this is a different case. The word 'Bharata' simply meant a performing artist and the treatises referring to dance and music naturally came to be known by that word. We know of at least four Bharatas who are called Ādi

Bharata or Bharata Muni, author of the original Nāṭya Śāstra. But there is also Nandi Bharata, Arjuna Bharata, Mataṅga Bharata and others. The existing Nāṭya Śāstra is probably a compilation of extracts from several of these original sources made during the Buddhist age.

Sanskrit literature on music.—The vast Sanskrit literature on the theory the philosophy and the technique of music, which lies so sadly neglected and unpublished in the libraries of India, represents a system which has no rival in the world so far, and from which modern Western theory would have much to learn. It is not easy, however, to know how far this rich Sanskrit literature is indebted to earlier literatures. There is little doubt that in the process of the Aryanization of India much of earlier literature was translated or adapted in Sanskrit while the originals were lost. This is certainly true of parts of Purāṇic literature. And this explains why we often find very ancient books written in late Sanskrit, a fact which led unaware scholars to discard them without due consideration.

Nandikeśvara's surviving works.—A careful research would, however, allow us to identify and recover many ancient works. For example, I was fortunate enough to be able to identify a valuable fragment of Nandikeśvara's work which lay anonymously in Bikaner library. This short fragment explains the theory of music on the basis of the Maheśvara sūtrā in terms very similar to the explanation of the theory of language by Nandikeśvara on the same basis in a work known as Nandikeśvara Kāśikā which is sometimes incorporated in the Mahābhāṣya.

WESTERN HISTORY

But let us turn now towards the West.

Origin of Western music.—The early musical history of Europe appear so far, rather cloudy. This may be due to the lack of understandable documents, but also to the fact that most of Western research on history was done in a time when historians were genuinely unaware of the importance and antiquity of Indian civilization. This led them usually to interpret as a spontaneous and natural growth cultural developments which in fact were built with remains of older elements which had their roots in the East.

Western modal music.—Seen in the light of what we know now of the early cultures in Europe and India we are bound to come to very parallel developments first a musical culture spreading to Egypt, Crete, Italy and probably further north. Then a succession of invasions by more barbarous people which gradually adopted the ways, manners and instruments of the conquered countries. This assimilation was, however, less complete in Europe than it was in India and therefore it is again from the East that periodically came new influences and developments which shaped the culture of ancient Europe. Whatever we know of the musical system and instruments of the Greeks leaves little doubt in this respect and so is the case for the instruments still found in those countries where druidical culture lasted longer. The survival of the biniou of Britanny and the bagpipe of Scotland is particularly interesting since the presence of the drone pipe proves, without any doubt, that the music of these people was at one time and still is basically of modal form, although these instruments are now often played on melodic lines where the drone serves no essential purpose. It could surely not have been evolved out of a melodic form of music. Harmonically it is monstrous.

The stability of the mode absolutely requires a drone, a permanent sounding of the tonic. This is not essential nor desirable in any other system.

Survival of ancient systems in Europe.—In England, today, there are very few people, even among music students, who are aware that Scotch bagpipe music belongs to a system entirely different from Western harmony. It is a system akin to Arab and Indian music quite unsuited for the Western orchestra and instruments. Similar is the case of Hungarian and some branches of Norwegian popular music. Further, there are definite traces ✦ of pentatonic music of the Chinese family all along the Atlantic coast from Spain to the north of Scotland. But what is really amusing is that Scotch or Hungarian music lovers may well get infuriated if told that their music is still different from that now in fashion in Europe, and in fact belongs to an Eastern system.

I remember a celebrated Hungarian violinist, to whom I had spoken of the great interest I took in modal forms surviving in Hungarian folk music, who, with undisguised anger, answered me sharply that 'there is nothing in Hungarian music which does not belong to the Western diatonic system'.

Greek theory.—In Europe the earliest writings on the theory of music which came to us are those of the Greeks. These refer basically to a modal system of the Indian family. But certain elements of cyclic music had found their way into musical theory, probably through Turco-Mongol channels giving rise to the Pythagorean scale which so strangely perverted and confused the writings of the Greek authors.

Medieval music.—After the Greeks we know very little about the state of music in the West except a little Church music, the modes of which were imported from Byzantium in the sixth century by the pope Gregory. The picture of Europe at the end of the Middle Ages shows us a mixture of modal and melodic systems. Arab music exerted a profound influence on the southern countries, influence which is still predominant in Spain and south-eastern Europe. On the other hand, the earlier modal systems remained well preserved in northern countries and the travelling Minstrels used instruments which show that modal music was at a rather high level of technical development.

Beginnings of Polyphony.—It is in this context that polyphonic music began to develop. How it first started is not quite certain, but it probably owes its origin to some Mongolian influence through eastern Christendom, for the superposition of voices is a natural development in cyclic music, not so in modal music.

At first polyphony was limited to adding to the main melody a second voice, making slight variations. This had a rather interesting effect and, although it weakens the modal expression, it became quite popular as a novelty in congregation singing.

Gradually this new fashion developed, and a more complex counterpoint was evolved. First with two voices and drone, then with 3 and 4 voices.

Now, the modal expression, the Rāga, can no longer exist if there are several voices at different pitches. The mutual relation between these different notes, which form themselves in chords, create new expressions which annihilate the concentrated expression of the modal note. To the modal musician, polyphony is extremely distressing, something like several people speaking together so that you cannot follow any one. In fact the new polyphonic system must have been at first a fashion, a game of amateurs against which all the classical musicians fought desperately. But musicians were poor and of low standing. They could do nothing against the whims of society people. Meanwhile the new fashion took great favour among the aristocracy. It was easy, new, amusing and finally it completely defeated the old music. Thus Europe found itself in the fifteenth century

with a new musical toy still primitive and undeveloped, while the old musical culture was quickly dying out.

Parallel with modern India.—We can easily understand what happened by comparison with Indian music today. Through the crave of fashion we see the development of an orchestral form of music which corresponds to no musical necessity whatever, which is ruinous for the music of the land and utterly distressing to all sensitive ears. But this is a unique opportunity for unmusical and ignorant youngsters to declare themselves the geniuses of a new art, and take the bread out of the mouth of India's great *ustāds*. It is merely a fashion. It has, we may hope, no future. But it may well ruin entirely the music of India leaving this country with but a vulgar copy of Western cheapest music, such as we can find in Egypt, Malaya, the Philippines, etc., today.

In Europe the tragedy was great. But it was final, and out of the ruin of medieval music a new art had to develop.

Development of Harmonic music.—Due to their ingenuity and patience the musicians finally managed to produce out of the harmonic system very remarkable works of art. It should, however, be remembered that, from the point of view of the theory of music, the possibilities of harmonic music are considerably smaller than those of other systems—that is, the range of emotions and ideas that harmonic music can express is far less great than what modal music can account for. The Westerners, however, supplemented the limited possibilities of the music itself through endless research in the field of instrumental colouring, and also through contrasts and oddities of sound relations. It led to the creation of the modern orchestra which is a marvellous achievement of exquisite workmanship and infinite labour where the total quality of wonderfully built instruments is perfectly balanced in a most melodious whole. Yet we find this great sound producing machine strangely inadequate to express certain kinds of emotions.

Western music is essentially sensuous. It aims at creating a pleasurable atmosphere where vague visions and sentiments gently blend into one another. There it profoundly differs from modal music which on the contrary tends at creating a one-pointed concentration where the tonal value of voices and instruments becomes insignificant since the mind is entirely taken away into an abstract world of ideas and visions.

The particular tendencies of both systems are well shown by the fact that the themes of Western music are mostly themes of passion, while Indian music, though it depicts all types of emotions, always ultimately leads to some form of contemplation.

I have no intention of belittling the great works of Western music. The man of genius can express himself through any medium, and each medium has its own possibilities. The advantage of writing music further enables us to preserve the inspired moments of great musicians. But we should keep in mind that an Indian *ustād* on his single instrument can carry us into a diversity of visions, into a depth of emotion which is very much subtler than that which the thunder or murmur of the orchestra with its elaborate instruments can produce.

Statistical possibilities.—This is not a question of talent, I do not mean to say that the Indian musician is necessarily more subtle than the Western. It is a pure question of statistical possibilities. Contrarily to common belief, the variety of sound relations possible in modal music is very much greater than those possible in harmonic music. Perceptible sound-relations in a system where the tonic changes are far less numerous than in a system where the tonic is fixed. And differences of intervals which are not appreci-

able in a harmonic system become wonderfully intense in an oblique movement by relation to a fixed tonic.

Relative number of chords and rāgas.—The poverty of possible combinations in the harmonic form of music has finally led Western music to a sort of dead-end, and to a decline from which it may not easily come out unless it deeply alters its basis. This is because the whole of Western music is built around 12 or 15 different chords which have been now used and re-used in every conceivable way.

On the other hand, although each rāga corresponds to a definitely distinct mood, the number of theoretically possible rāgas is immense. Should a man try to play each of the possible rāgas once only for five minutes, even if he remained playing without rest or food for a hundred years, he could not see the end of his attempt.

Decay in Indian music.—There is no doubt that there has come a certain amount of paralysis in Indian music. It cannot be said that it has degenerated because the great *ustāds* of today are still at a remarkable level of technique and expression. But the progress has been stopped through the loss of theoretical knowledge since the musicians have ceased to know Sanskrit in which all the theoretical works were written.

Remedy.—The revival and development of Indian music will depend on a return to classical forms and a study of musical classical literature whether directly in Sanskrit or through adequate modern translations.

It is in this field that irresponsible improvisations should be discouraged if we want to avoid in India the musical tragedy which overtook modern Egypt, Malaya and the South Sea islands. It is to be hoped that learned societies may find a way to take an interest in encouraging a sane study of the country's priceless heritage and may afford protection to true learning to protect the nation's cultural assets against the attacks made by irresponsible reformers and unqualified amateurs always ready to start risky experiments without due regard for classical values.

TECHNIQUE

Musical translation.—We have seen that music, like language, is a means of expressing ideas and emotions through the medium of co-ordinated sounds. Just as different families of languages offer different possibilities of expression and rarely have exact equivalents so also the different systems of music offer different possibilities and cover different fields of expression.

When comparing the two musical systems now prevailing in India and Europe we will discover that practically no one of their features can be transferred from one into the other. It would seem easy enough to take a simple Indian song, a Tagore song for example, note it down and harmonize it as if it were a Western melody. This is a simple process. But we find that this melody, although it may sound quite lovely, will not convey to the Western hearer any feeling which resembles that conveyed by the Bengali song. In the context of a new system *the melody has completely changed its meaning.*

Equivalent sounds may convey distinct ideas.—I once saw a cartoon representing an American soldier looking sentimentally at a French girl and saying 'May we' and she answers 'Mais oui'. The only difference is that, in French, 'Mais oui' means 'of course yes'. The very same sounds by changing language have acquired a completely different meaning. If we want to convey the same idea in different musical systems we shall be faced with a very similar phenomenon. We cannot make use of common

features. We have to translate, that is, first analyze the meaning clearly, then try to express it through another medium. To harmonize Indian songs according to Western harmonic rules will usually not make good Western songs and will convey to the Western hearers no idea whatever of what the songs meant to Indian ears. This does not mean that it is not possible to write certain Indian melodies in Western notation. It is further possible to write accompaniments for modal music which can be played on Western instruments. But for this one has to follow the rules of modal polyphony which is something very different from harmony. Even then the song so arranged will convey only part of its expression to the Western hearer. He will require some training before he can create a habit of hearing this new form of music, which has been only slightly adapted so as not to shock his outward conception of what music should look like. We should not forget that, according to the perfect definition of Sanskrit grammarians, ideas are conveyed through sounds by a process of 'recognition' (प्रत्यभिज्ञान), not by a direct perception, and we cannot understand a language or a word which we do not already know.

Difference in way of hearing.—As we have seen the main difference between modal and harmonic music lies in the way of hearing. We believe that we hear music with our ears and that we instinctively find the sounds pleasant or unpleasant. But it is not so. We do not hear music *with* our ears although we hear it *through* our ears. We hear music with our memory. When we hear a sentence we have to remember all its successive sounds so that the last sound may reveal to us the idea. This is a commonplace saying of Sanskrit grammar.

Training of memory.—In music a similar rule applies, and we may not be surprised to find that by training our memory to record a particular succession of sounds rather than another we may come to hear, that is to get from the music, a meaning, an expression, completely different. We shall thus see that modal and harmonic music are in fact based on two different ways of hearing and this is why to understand both one has to be musically bilingual.

Musical bi-lingualism.—We can easily see that if an Indian hearer listens to Western music with his mental habit he will follow the shape of the melody as if it were a horizontal development independent from chords, and he is sure to find it meaningless, disorderly and discordant.

On the other hand, when the Western hearer listens to Indian music, he is unable to grasp its continuity, and he finds it bodiless and insignificant.

The mixing up of systems.—It is not particularly difficult to train oneself to hear both systems, but one must study both forms of music quite independently. Rāga and harmony are quite incompatible and cannot co-exist. Those who pretend to mix both systems are, from the point of view of music, irresponsible illiterates. Although one may have one's own preferences, it would be wrong to believe that both these musical systems do not offer great possibilities of expression. One may choose either. But there is no compromise, no appeasement possible between them. Harmony has entirely ruined the modal music of ancient Europe and will destroy any modal music on which it is superimposed. The official and other encouragements which are given nowadays to modern Indian orchestras amount to nothing but an attempt at a cultural suicide. There is no valuable contribution to world music which India could make by trying to blend her music with Western music. The possibilities of harmonic music are comparatively limited and have been exploited to their utmost possibility so much so that Western musicians are now desperately looking for new musical forms to revitalize their music.

Possibilities of Modal Music.—We have seen that modal music, on the other hand, offers almost indefinite possibilities of which only a small fragment is utilized in present-day Indian music. It is to be hoped that the effort of Indian performers and technicians may be turned towards research in this field, in which they already have realized such magnificent achievements rather than waste their energies in the no-man's-land of hybrid music.

Music and National Spirit.—A question comes naturally to our mind. The development of Indian music is linked to a particular conception of life, to a particular culture and civilization. The Indian listener comes to hear music with a mind different from that of the Western hearer. The idea of an underlying Divinity pervades all the activities of Indian life and all the arts are conceived as processes of identification with some higher state of being. Religion, philosophy, music are all here based on common principles and cannot be separated from one another.

The Western hearer is very different. His attitude is that of a moralist. He does right actions and is then entitled to a place in paradise. He stands on his right. Knowledge to him has little to do with religion. He delights in man's mastery over nature, and music is to him his mastery over sounds. And he wonders at his own genius. Western music expresses that attitude and the harmonic system, developed in the West, is quite suited to that purpose.

The question is: will the Indians of the future have the same outlook as the Westerners of today. I cannot think so. Therefore the Western system will ever remain unsuited to express the Indian genius. All the efforts made to impose on India a musical system, inadequate to bring out the finer emotions and deeper inclinations of the people, cannot lead to any great achievements in the field of music.

Each country must develop its own genius or it ceases to exist as a country. It is only when a nation's culture is flourishing and powerful that it can borrow from other lands and assimilate what it gets. To borrow in time of poverty brings oneself into the clutches of the money-lender from which one shall not come out intact. Indian music at the present moment is in a difficult period and it is only by bringing together all efforts to restore its classical greatness that it may be safely protected for future developments.

EXAMPLES

Example—Bhairavī.—Now to illustrate the working of the means of expression in both Modal and Harmonic music we may take an example. Although it is not the proper time for it, let us choose the well-known Rāga Bhairavī.

This rāga is characterized by the peculiar combination of a major and a minor second (a śuddha Rṣabha and a komala Rṣabha). The minor second (the komala Rṣabha) being on its higher śruti which expresses love—and not sadness.

Then comes the minor third (the komala Gāndhāra) also on its high śruti which is loving and tender.

The fourth and the fifth are natural. The sixth and seventh (Dhaivata and Niṣāda) are minor, but high, similar in expression to the second and third (the Rṣabha and Gāndhāra).

The predominant notes (the Vādi and Saṃvādi) are the tonic and the fourth, Ṣadja and Madhyama.

The combination of these elements should create an atmosphere of lovely and tender emotion; the predominant mood is peace, calm, balance,

as shown by the Vādi and Saṃvādi which are the tonic and the perfect 4th, Madhyama. The four flattened notes are on their high śruti, which is tender and charming, but not sad. There is an accidental appearance of manly power brought in by the major 2nd, which is called Ṛṣabha, the bull, and is thus pictured as the vehicle of Bhairava. The glitter of colours appears with the 5th Pañcama, which always represents the sun. Yet, this sunshine remains dominated by the cool, calm 4th (Madhyama). It will not therefore bring out the burning sun of Sāraṅga or Śrī, but a lovely, cool morning light.

This mood is well depicted in the description which Nārada gives of Bhairavī.

स्फटिक-रचित-पीठे रम्य-कैलास-पृष्ठे

विकच-कमलपत्रैरर्चयन्ती महेशम् ।

करधृत-घनवाद्या पीतवर्णायताक्षी

सुकविभिरियमुक्ता भैरवी भैरवस्त्री ॥

Which we may translate 'She, whom poets in their vision see as great-eyed Bhairavī, golden consort of Bhairava, throned on carven crystal on the peak of Kailāsa, with cymbals in her hands, worships Him with the leaves and flowers of the lotus'.

Any one conversant with Indian music will agree that the poem wonderfully depicts the mood of Bhairavī. Let us first hear its scale, then its main theme.

1. The theme

We may now ask ourselves how we can represent the subtle and delicate mood of Bhairavī in harmonic music.

Suppose we make a classical harmonization utilizing the notes of the scale. The result would be completely unlike Bhairavī. It would give something like this.

2. Classical harmony

In fact this conveys to us nothing of the expression of the rāga. We have changed tonic several times and our mental habit will always tend to restore the A flat (Dha komala) as tonic because the basic mode of Western music is the major mode.

Whatever the manner in which we may manipulate this scale in the classical harmonic way, it will never convey to us the expression of Bhairavī.

Should we therefore say that this kind of expression is impossible in harmonic music. Not necessarily. But the means of rendering the expression will be different. We are therefore to translate the meaning rather than the notes.

The very picture of the rāga seems an almost ideal theme for a symphonic poem. The tender and lovely goddess, the flowers, the sunshine, the presence of Śiva, at times, in the background; the calm and devoted prayer on the crystal throne of the Pleasure Mountain. We think of Ravel's Fairyland, of Debussy's preludes, of List's pilgrimages, even of some of Wagner's more romantic passages.

3. The scale and theme

What are the means at the disposal of the musician who wishes to express this particular theme?   Let us see what the Indian scale offers us and whether anything can be managed harmonically out of it.   We, of course, shall have strongly to maintain the Indian tonic which is here the C, though according to Western convention we are in Ab.

First let us hear the theme again.   (See p. 96 for the scale and theme.)

The first chord which offers itself to us is already deceptive.   It is the minor chord based on the tonic, which is too melancholy.

4. The minor 3rd

But, on the other hand, the dissonant chord of 4th and 5th keeps the character of the rāgă and so does the chord of 4th and 6th.

5. Fourth and 5th;   4th and 6th.

But if we are to bring a feeling of sunshine this cannot be conveyed harmonically by a 5th accompanied with a minor third.   To bring an idea of sunshine we already need a note which is outside the scale of the rāgă, that is a major 3rd to form a major chord.

6. The major 3rd

Yet we cannot use this major chord together with a 5th in the melody because that would mean an overwhelming activity very contrary to the feeling we want to express.   Therefore when the 5th appears in the melody we must break its effect through the dissonance of the more tender 4th.

7. Major 3rd softened by 4th and 5th

The prayer element may be brought out by an apparent modulation to the 4th. But a touch of the major 3rd will have from time to time to balance the melancholy

8. Modulation to the 4th

These very few chords have already shown us most of the harmonic material at our disposal in this scale. We see that it is rather poor. Therefore it is through another means, that is the variety of sound-patterns, that we have to supplement it.

First a peaceful swing of the basic sounds may bring an idea of calm activity.

9. Calm activity

A pattern of alternate octaves brings out a more passionate element.

10. Passion
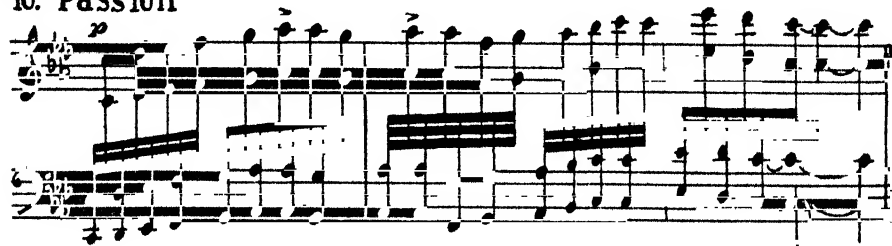
But now, to bring out the idea of Śiva's presence, a mere introduction of the 2nd in a chord is too vague. We need a powerful bass melody.

11. The virile presence

The idea of flowers and of the delicate ritual gestures cannot be brought out through heavy chords but one may attempt to represent them through a delicate lace-work of flying notes.

12. The flowers and gestures

If we now try to build up a short composition out of these elements we find that the modal chords we use hardly deserve the name, real modulation is entirely absent, yet we can with the help of sound-patterns realize a sort of picture which may be accessible to both Eastern and Western ears.

These sound patterns are our only common ground; they do not belong to any particular system. Through them we can make some of the ideas of the rāga perceptible to a harmonic listener. This will give us a sort of variation on the theme of Bhairavī with modal chords and descriptive sound patterns.

Certain theoretical possibilities for polyphonic development which exist in modal music can be shown by further examples. It should, however, be remembered that this type of phantasy, although it may serve some purpose for stage music or entertainment, in fact completely distracts the mind from concentration on the rāga, and can only lead to an inferior type of music. I think it was Wagner who said once that 'it is from the use of silence that you can tell great music'. This is much more true still for modal than for harmonic music. The intensity of each note of the rāga, once the mind has been tuned to it, can be so immense that no addition can serve any useful purpose. Any outside element is, of necessity, detrimental to the meaning. The more we add to it, the poorer it becomes. And there is no doubt that the music nearest to silence, the music where every sound is most meaningful, that music is the greatest.

Let us hope that the coming generation will learn to respect and study more deeply the unrivalled science that is classical Indian music and will protect with love the purity of an art which, in spite of the hardships it had to bear and the prejudices born of foreign influence remains the most profound, most moving and most elaborate system of music in existence today.*

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* Paper read at the Society on 2nd February, 1949.

2B

TWO TORTOISE-SHELL INSCRIPTIONS IN THE DACCA MUSEUM

By Dr. Dines Chandra Sircar, M.A., Ph.D.

(*Received May 14, 1949*)

Two pieces of inscribed tortoise-shells were found by Mr. Girindranath Basu, B.A., in reclaiming a tank at Basupārā in the village of Vajrayoginī in Vikrampur within the jurisdiction of the Munshiganj Police Station of the Dacca District, East Bengal. They were presented by Mr. Basu to the Dacca Museum and were published with facsimiles by the late Dr. N. K. Bhattasali, Curator of the Museum, in the *Annual Report of the Dacca Museum* for 1939-40, pp. 7-8.

The first of the two pieces of shells is blackish in colour and measures $5\frac{3}{4}'' \times 4\frac{1}{2}''$, while the second is a greyish piece measuring $6\frac{1}{2}'' \times 4\frac{1}{2}''$. Both the pieces are broken, the first into two and the second into four fragments. There are two lines of writing on the first shell and six (actually, five) lines on the second. The characters belong to that class of the northern alphabet which is commonly styled the proto-Bengali. The inscriptions may palaeographically be assigned to the tenth or eleventh century. The single or double *daṇḍa* indicating stop is always preceded by a *visarga*-like sign in the second record. The language of the records is Sanskrit, although it is influenced by the local Prakrit.

The text of the inscription on the first shell was deciphered by Dr. Bhattasali as follows:—

1. [Siddham] svasti śreyasāya | Sujino janānām ‖
2. [Siddham] na

Dr. Bhattasali's translation of the text is as follows: 'Peace. For the welfare of the good Buddhists.'

Dr. Bhattasali's reading of the text of the inscription on the second shell runs as follows:—

1. [Siddham] Śrī.
2. [Siddham] namo bhagavate Vāsudevāya | namo Buddhāya ‖
3. svasti niśreyasāya | sujino janānām | Śrī
4. ma namo bhagavate
5. Manarasarmma kārāvadhamma ‖ Śrī
6. namo bhagavate Vāsudevāya

Dr. Bhattasali did not translate this record but appended a note in which his views as regards its interpretation are made perfectly clear. He says, 'Leaving out an individual *siddhir = astu* (i.e. *Siddham*) figure and the *Śrī* following, the inscription has five lines, the last three of which appear to be incomplete. The fourth line appears to pray for the death or incarceration of one Manaraśarman (Manorathaśarman?) and helps us to understand the trend and nature of these curious inscriptions. They pray for the welfare of the good followers of Buddhism and invoke death or jail of Manaraśarman, showing thereby that they are *mantras* or charms for *Abhicāra* or *Māraṇa* (i.e. killing or injuring one's foes), and the unclean nature of the material, on which the inscriptions are incised, also bespeaks a sinister design. It would appear from these curious tablets that, sometime between 1000 and

1100 A.D., the Buddhists were in a bad way in Vikrampur where these tablets were found, and the hands of one Manaraśarman lay specially heavily on them.   This helps us to understand to some extent the religious history of the period following the fall of the Buddhist Candras of Vikrampur, who were supplanted by the Brahmanical Varmans, when Bhavadeva Bhaṭṭa, minister of Harivarmadeva, is boastfully described as the Agastya of the Jaina and the Buddhist seas in his Bhubaneswar inscription'.   The name of the village, Vajrayoginī, may have lent colour to Dr. Bhattasali's views, as it shows that there was originally a temple of the Buddhist goddess Vajrayoginī at the village.   Vajrayoginī, sometimes said to be the consort of Heruka, was adopted by the Brahmanical Tantriks as Chinnamastā; cf. Bhattacharya, *Indian Buddhist Iconography*, pp. 155-56.

These far-reaching conclusions in regard to the religious history of ancient Bengal arrived at by Dr. Bhattasali on the basis of the two inscriptions under discussion are, however, entirely unwarranted as his reading and interpretation of the records are both full of mistakes.

Dr. Bhattasali's reading of the first inscription (line 1) contains no less than three mistakes.   The word read as *śreyasāya* is actually *niśreyasāya*, *ni* being written above the line.   The engraver at first omitted *ni*, but corrected himself, when he noticed the mistake, by incising it above the line.   This is of course a common practice followed even today.   The fact is that while *niśreyasa* is a familiar Sanskrit word meaning the same thing as *mokṣa*, the word *śreyasa* is not recognized by Sanskrit lexicons.   It should be pointed out that the second inscription (line 3) uses the same word *niśreyasa* in the same context.   After *niśreyasāya*, Dr. Bhattasali finds a *daṇḍa* which is, however, undoubtedly a medial *ā* sign.   Nowhere in these two records is a *daṇḍa*, double or single, joined above with the top *mātrā* of the preceding *akṣara*; cf. the five cases of the use of the *daṇḍa* in the first inscription, line 1, and the second inscription, lines 2, 3 and 5.   There is absolutely no doubt that the reading is *niśreyasāyā°* and not *niśreyasāya* | as deciphered by Dr. Bhattasali.   The next *akṣara* is read as *su*; but any one who would care to compare the *akṣara su* in the expression *Vāsudevāya* in the second inscription, lines 2 and 6, would certainly be convinced that this *akṣara* is anything but *su*.   Medial *u* in *Vāsudevāya* as well as in *Buddhāya* in the second inscription, line 2, is a slanting stroke joined below a consonant; but in the *akṣara* after *niśreyasāyā°*, the upper part of which is represented by *s*, there is besides the *u* sign a clear subscript which is either *n* or *t*; but that it is a subscript *t* becomes absolutely certain when one compares this *akṣara* with the subscript *t* in the word *svasti* in both the inscriptions; cf. the first line of the first and the third (actually, second) line of the second inscription.   The reading of the passage is therefore *svasti niśreyasāy = āstu Jino janānāṁ* and certainly not *svasti-śreyasāya | sujino janānāṁ* as Dr. Bhattasali deciphered it.   In the second line, the engraver began to incise *namo bhagavate Vāsudevāya*, but gave up writing after engraving only the first *akṣara*.

Dr. Bhattasali's translation of the above passage is also equally unfortunate.   The interpretation of *svasti* as 'peace' and *śreyasāya* as 'for the welfare' can hardly be regarded as ideal; but the climax is reached when *sujino janānāṁ* is translated as 'of the good Buddhists'.   Of course Jina was a name of the Buddha; but how can *sujina* mean 'a good Buddhist'? And even if *sujina* can be taken in the sense of a good Buddhist, how can one account for the *visarga* changed into *o* after that word?   Even if therefore we ignore the mistakes in Dr. Bhattasali's reading and accept his reading of the passage as genuine, it has to be admitted that his translation is altogether absurd.   There is absolutely no reference to good Buddhists in

the first inscription.   It simply says, 'Let the Jina (Buddha) be for the prosperity and salvation of men.'

In the first line of the second inscription, what Dr. Bhattasali reads as the *siddham* symbol may actually be a figure for 1 indicating that the *akṣara śrī* that follows was omitted in line 1 and has to be inserted there. The use of *śrī* before *namo bhagavate* in two other cases below in this record may suggest that the engraver wanted to insert *śrī* before *namo bhagavate* also in line 2 which may actually be regarded as line 1 of the inscription. Otherwise Dr. Bhattasali deciphered this line quite correctly.   Line 3 (actually, line 2), however, reads: *svasti-niśreyasāy=āstu Jino janānāṁ* ‖ *śrī°*.   The main passage is exactly the same as we find in the first inscription. As already pointed out in connection with the first inscription, it is impossible to read it as *svasti-niśreyasāya | sujino janānāṁ* after Dr. Bhattasali.   Line 4 (actually, line 3) is also correctly deciphered by Dr. Bhattasali.   The first *akṣara ma* is redundant.   Whether the engraver was thinking of the second *akṣara* of *namo* or the first letter of the name at the beginning of the next line cannot be determined.   Line 5 (actually, line 4) is read by Dr. Bhattasali as *Manarasarmma kārāvadhamma* ‖ *śrī°*. But there appear to be some inaccuracies.   In the first place, there is a clear sign of *anusvāra* above between *na* and *ra* of *Manarasarmma*.   It is also possible that we have to read *nu* instead of *na*.   But even correcting *sarmma* into *śarmma*, we have a rather peculiar name Manaṁraśarman or Manuṁraśarman into *śarmma*, we have a rather peculiar name Manaṁraśarman or Manuṁraśarman.   Secondly, the third *akṣara* of what has been read as *kārāva* is certainly *ta* and not *va*, while the preceding *akṣara* looks more like *ri* than *rā*.   The reading thus appears to me to be *kārita* (for Sanskrit *kārita*).   The next word *dhamma* no doubt stands for Sanskrit *dharmmaḥ*. The last *akṣara* reads *śī*, the intended reading being no doubt *śrī*.   There is no mistake in Dr. Bhattasali's reading of the last line.

Now we come to Dr. Bhattasali's interpretation of the second inscription. Dr. Bhattasali thinks that these lines 'pray for the welfare of the good followers of Buddhism and invoke death or jail for Manaraśarman, showing thereby that they are *mantras* or charms for *Abhicāra* or *Māraṇa*'.   But it has already been shown that the passage *svati-niśreyasāy=āstu Jino janānāṁ*, which he wrongly deciphered, has absolutely nothing to do with a prayer typically 'for the welfare of the good followers of Buddhism'. Attention of scholars may be drawn to another fact in this connection. One of the causes of abandoning the first shell seems to be that the engraver was not inclined to incise *namo bhagavate Vāsudevāya* after *svasti-niśreyasāy= āstu Jino janānāṁ*.   This is suggested by the second inscription in which the arrangement is altered.   Another fact is that Vāsudeva has been called a *Bhagavat* which epithet has not been used with the Buddha's name. The text of the second inscription clearly shows that Vāsudeva is given more prominence than the Buddha or Jina; at least the former is not subordinated to the latter.   We know that attempts of the Buddhists to incorporate Brahmanical deities in their own pantheon can be traced in works like the *Sādhanamālā* and the *Niṣpannayogāvalī Tantra* (cf. *Ariana Antiqua*, 1947, pp. 36–39).   The latter work describes twenty-seven magic circles of the Buddhist deities and mentions a host of Brahmanical gods and goddesses as companions of those deities.   But orthodox Buddhists always placed Brahmanical deities in a position subordinate to that of the Buddhist gods and goddesses often as *vāhanas*.   Their attitude is truly represented in the conception, e.g., of Vidyujjvālā Karālī, a form of Ekajaṭā (an emanation of Akṣobhya), who is said to have originated from the Buddha's sweat, as having Indra, Brahman, Viṣṇu and Śiva together as her *vāhana* (Bhattacharya, *op. cit.*, p. 81).   The *vāhana* of Vajrahuṅkāra is Śiva (*ib.*,

p. 143), that of Vajrajvālānalārka is Viṣṇu and his wife (*ib.*, p. 145) and that of Trailokyavijaya is Śiva and Gaurī (*ib.*, p. 146). Mahācakra Vajrapāṇi treads on Brahman and Śiva (Getty, *Gods of Northern Buddhism*, p. 53). It is therefore highly improbable to expect that an orthodox Buddhist would have placed Vāsudeva in a superior or equal position with the Buddha. This fact shows that the inscriptions under discussion have nothing exceptionally and typically Buddhist in them. But they no doubt point to a rapprochement between the worship of Vāsudeva and that of the Buddha, which is also indicated by the fact that Buddha was regarded as an Avatāra before Kṣemendra (eleventh century) and Jayadeva (twelfth century). This further suggests that a number of Buddhists were gradually absorbed in the fold of the Vaiṣṇavas. And this is probably supported by the present records which point to the joint adoration of both Vāsudeva and the Buddha. The reference to the Buddha shows beyond doubt that the person responsible for the inscriptions was a Buddhist. Had he been a Vaiṣṇava, there is no meaning of the adoration to the Jina or Buddha. The fact that Buddha was regarded as Viṣṇu's Avatāra is not material as no other incarnation is adored at the same time. But the same man also adored Vāsudeva and could hardly have been an orthodox Buddhist. There is thus little possibility of these two being communal Buddhistic records as believed by Dr. Bhattasali.

It is impossible to understand how, even if one accepts Dr. Bhattasali's reading *Manarasarmma-kārā-vadha-mma*, the passage can signify that a person's incarceration or death was prayed for. *Kārā-vadha-mma* of course contains *kārā* and *vadha*; but the expression is no doubt as meaningless as *sujino-janāmām*.[1] The actual reading of the passage is, as shown above, *Manamrasarmma-kārita-Dhamma*, i.e. *Manamraśarma-kārita-Dharmaḥ*. It appears to mean that a person named Manamraśarmman caused a *Dharma* to be made in his behalf. Now the word *Dharma* may indicate anything, the making of which is related to the maker's religious merit. The word *kīrti*, 'fame', is known likewise to be used in the sense of any construction (e.g. a temple for a deity) leading to the fame of the person responsible for it. But the material on which the inscriptions are incised appears to preclude the possibility of the above interpretation. What pious construction was possible by means of tortoise-shells ? It thus seems possible to suggest that the tortoise-shells (or earthen images of tortoise covered by these shells) were worshipped as Dharma Ṭhākur whose worship in the shape of a tortoise is prevalent in the Burdwan and Presidency Divisions of West Bengal even at the present time. *Vide* 'Dharma worship' by K. P. Chattopadhyay in *J.R.A.S.B.L.*, Vol. VIII, 1942, pp. 99–135.[2] As regards the tortoise form of the deity, Dr. Sukumar Sen in a paper entitled 'Is the cult of Dharma a living relic of Buddhism in Bengal ?' published in the *B. C. Law Volume*, Part I, says, 'The emblem of Dharma—rather his *pāda-pīṭha* on which was placed or engraved the *pādukā* (boots or sandals)

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[1] Bhattasali's interpretation reminds us of a Kannaḍa story in which a person, who had been asked to purchase *menasu* (pepper) and *jīrige* (cumin seed), bought *mēṇa* (wax) and *sūji* (needle) and explained that *rige* was unknown in the market. The hopeless position of *mma* in Bhattasali's transcript resembles that of *rige* in the story.

[2] Most of the images examined by Chattopadhyay in the Districts of Birbhum, Midnapur and 24-Parganas were shaped like tortoises measuring about 6″ × 4″ (12″ × 12″ in one case). 'In one case it had a tortoise back only.' Cf. *loc. cit.*, pp. 104-05. Coomaraswamy refers (*The Arts and Crafts of India and Ceylon*, p. 185) to an Allahabad 'jade tortoise' in the British Museum, 17″ long, as an ancient work. This appears to point to the prevalence of the worship of the tortoise-shaped deity outside Bengal in ancient times.

of Dharma—is a tortoise. In most cases, it is a natural bit of stone shaped like a tortoise; in other cases, it is a chiselled stone image of the same.' In the introduction (p. xi) to the *Rūparāmer Dharma-maṅgala*, edited by Dr. Sen jointly with Mr. Panchanan Mandal, the following two verses, one in Sanskrit and the other in Bengali, have been quoted from the ritualistic literature of the Dharma cult:

> *ulūka-vāhana Dharma deva tejomay-ātmaka,*
> *Idānīṁ kūrma-pṛṣṭhe tu divya-rūpa namo=stu te.*
> *Hāt pātiyā Dharma sṛjilen sṛṣṭi,*
> *Pādukā sthāpiba lae kūrmer pṛṣṭi.*

Sen and Mandal further point out (*op. cit.*, p. i) that, although the worship of Dharma Ṭhākur is now prevalent only about the Burdwan Division, it was in former times also current in other parts of Bengal. They trace it in the present day ceremony of Del or worship of Pāṭ Ṭhākur in East and North Bengal and point to the existence of 'Dharma Ṭhākur's *Gādi*' not far from the chief town of the Bogra District. They further connect the Dharma cult with the Chaṭ Parav or Ṣaṣṭhī-parva prevalent in Bihar. The present records coming from the Dacca district undoubtedly support the above contention. Cf. also the ancient jade tortoise from Allahabad referred to above.

Another important fact suggested by these records of a Vaiṣṇavite Buddhist is that they associate the Dharma cult with Buddhism and Vaiṣṇavism. Pandit Haraprasad Sastri (*Proc. A.S.B.*, 1894, p. 135; *J.A.S.B.* 1894, pp. 55–61; 65–68) pointed out that Dharma Ṭhākur's *dhyāna* represents the deity as *śūnya-mūrti* and *nirañjana*, which connect the Dharma cult with the theory of the Void, so popular with the later Buddhists, and show the latter's influence on the former. Chattopadhyay speaks of 'the wheel of Dharma' in connection with the Dharma Ṭhākur cult; cf. *loc. cit.*, pp. 112, 115; figs. 2, 3. But Sastri's theory that the present-day Dharma cult of Bengal is a relic of Buddhism seems to be unwarranted in spite of the fact that the present records point to its popularity with the Buddhists. Pandit Sastri confused the tortoise shape of Dharma with the form of a Buddhist Caitya and ignored the fact that Buddhist literature does not represent Dharma (one of the celebrated Buddhist *Tri-ratna* or 'three jewels', viz. Buddha, Dharma and Saṅgha) in the shape of a tortoise. It may be pointed out that the Kailan inscription of Śrīdhāraṇa Rāta (seventh century) and the Sundarban inscription of Ḍommaṇapāla (twelfth century) use the expression *Ratna-traya* to indicate a Buddhist establishment. This is probably because the images of Buddha, Dharma and Saṅgha came to be worshipped in later Buddhist monasteries. But the three *Ratnas* of the Buddhists are known to have been represented in human form. When represented in art, the four-armed Dharma usually shows the *añjali* against the breast by one pair of hands and carries the rosary and double-lotus in the other (cf. Bhattacharya, *op. cit.*, Plate III). We know that the Mahāyānists placed Dharma instead of Buddha in the first place amongst the *Ratnas* (*ib.* p. xv). It is also known that the Dhyāni-Buddha is the first *kāya* or body of the Buddhist trinity called *Trikāya* and that he is the *Dharma-kāya* or the inner intelligence of the body of the Buddha. This *Dharma-kāya* is identified by some Buddhist sects with Dharma of the Buddhist *Tri-ratna* (A. Getty, *op. cit.*, p. 28). Buddhist scriptures represent Ādi-Dharma as a goddess who revealed herself from the centre of a triangle and produced Buddha, Dharma and Saṅgha from its three sides. The Dharma that was produced from its second side is the wife of the Buddha,

produced from the first side, and is the mother of the other Buddhas (*ib.*, p. 197). But these conceptions had apparently little to do with the tortoise form of Dharma Ṭhākur whose name, however, connects him with the Buddhist *Ratna*. In Brahmanical mythology, Dharma is sometimes a separate deity (justice or virtue personified as a bull, dog or dove and identified with Viṣṇu or Prajāpati) and sometimes another name of Yama and of Yudhiṣṭhira.[1] No representation of the independent deity called Dharma is known. The figure of Yama (or Yudhiṣṭhira) as conceived by Brahmanical literature and represented in art has likewise nothing to do with a tortoise. The conception of the tortoise and other non-human incarnations of Viṣṇu [2] was no doubt based partly on the ancient worship of the tortoise and other animals amongst totemistic inhabitants of India and partly on local adoration of mysterious animals such as that of Dakṣiṇarāya, the tiger divinity of the Sundarbans, at the present time in Bengal. I have heard tales about the helpfulness of mysterious fish (usually of the class known as *Śol* and *Gajār* in Central Bengal) living in the waters of particular *Bils* (lakes). The story is always the same. People used to get whatever they wanted from the strange inhabitant of the waters; but its favour was discontinued as a result of the dishonesty exhibited by one of the recipients of favours. It seems that an old tortoise worship in ancient Bengal was later influenced by both Buddhism and Vaiṣṇavism. Its association with Vaiṣṇavism can easily be traced through the conception of the tortoise incarnation of Viṣṇu. But its origin in Buddhism is rather difficult to trace excepting its association with one of the Buddhist *Tri-ratna* by name. Both Sen and Chattopadhyay think that the Buddhist conception of the Void 'may indicate the influence of the Dharma cult on Tantric Buddhism' and this view seems to be supported by the importance of the Void in the religious and philosophical beliefs of the Austric-speaking people of Polynesia. But even admitting the influence of Buddhism on the Dharma cult, there is no reason to believe that the worship of Dharma in the shape of a tortoise originated with the Buddhists.[3] The name Dharma applied to the deity, is regarded by Prof. Suniti Kumar Chatterji as derived from some Austric word meaning 'tortoise' and sounding like *daram* (cf. Sen and Mandal, *op. cit.*, p. xv).

Dharma Ṭhākur is usually identified with Viṣṇu, but in many cases also with Śiva (cf. Sen and Mandal, *op. cit.*, p. xiv). It is interesting to note that the form of Pāṭ Ṭhākur, worshipped in the Faridpur region of Central Bengal as identical with Śiva, has actually both Śaiva and Vaiṣṇava characteristics. It is made of Nimba or Bilva wood roughly in the shape of an alligator and has the emblems of the bull and the trident, associated with Śiva, as well as the conch, discus, club and lotus symbols of Viṣṇu.

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[1] Yudhiṣṭhira is worshipped in the Madras Presidency as Dharmarāja. This Dharmarāja cult of South India seems to be related to the Dharma Ṭhākur worship of Bengal; but it does not explain the tortoise form of Dharma. For the Dharmarāja cult of South India, see Chattopadhyay, *loc. cit.*, pp. 129-30.

[2] The tortoise incarnation was originally ascribed to Prajāpati (cf. *Śatapatha Brāhmaṇa*, VII. 5, 1, 5-6), but was later attributed to Viṣṇu.

[3] Some writers have associated the Dharma-kām ceremony, prevalent among the Chākmās who are a Buddhist tribal people of the Chittagong region of East Bengal, with the cult of Dharma Ṭhākur. Cf. Mādhav Chandra Chākmā Master, *Chākmā Jātir Itihāsa*, p. 54; Satis Chandra Ghosh, *Chākmā Jāti*, p. 200. But *Dharma-kām* of the Chākmā Buddhists is actually nothing but a ceremonial worship of the Buddha, the name of Dharma being conspicuous by its absence from the *mantras* employed in the ceremony. The expression *dharma-kām* is a corruption of Sanskrit *dharma-karman* meaning a religious rite. The Chākmā ceremony is so called because it is the religious rite *par excellence* amongst the Chākmā Buddhists.

A text of a work on the procedure of Pāṭ Ṭhākur's worship, copied by me, also supports this.   Cf. the section called *Pāṭa-sṛṣṭi* which runs:

Āchambite jaṭa nūrilen Paśupati,
Bīja pariyā Bel-vṛkṣa Nimer utpatti.
Gorā kāṭiyā āgā kāṭiyā madhye dilen cheo,
Mājhkhāne bānāilen Pāṭ-bāṇ bhāo.
Viśvakarmā dilen Pāṭ nirmāṇ kariyā,
Śaṅkha cakra gadā padma cāri mudrā diyā.
Gārilen triśūla goṭā kāṭā tin sāri,
Śukla-vastra diyā morā Pāṭ-vāṇ ghiri.
Kahen o to satya-guru Maheśeri var,
Pāṭ-vāṇ śuddha karilen prabhu Bholā-Maheśvar.

Sen and Mandal (*op. cit.*, p. xiii ff.) suggest that the cult of the Vedic and Iranian Sun-god, Vedic Varuṇa, the war-god of such peoples as the Doms and Chaṇḍāls, and several other deities, mostly non-Aryan, contributed to the growth and development of the Dharma Ṭhākur cult.   As to the solar origin of Dharma Thākur, Dr. Sen observes, 'Dharma is the Sun-god. The tortoise (*Kūrma, Kaśyapa*) as the symbol or emblem of the (rising?) sun is probably a non-Aryan concept.   But the identity of the tortoise with the sun appears early in Indo-Aryan religion, at least as early as the *Śatapatha Brāhmaṇa* (VII, 5, 15).   As an Aryan god, the sun moves in a chariot.   So does Dharma.   As a matter of fact, the ceremony of Rathayātrā was originally concerned with Dharma.   Like the Sun-god, Dharma cures incurable diseases like leucoderma.   The Sun-god has a bird as his *vāhana* and the god of death (Yama) as his son.   Dharma's direct creation *Ulūka* (owl) combines the two personalities.   The monkey cult was originally associated with sun worship.   In the cult of Dharma, Hanumān is his factotum.'   Chattopadhyay lays greater stress on Dharma's relation with Vedic Varuṇa and the latter's association with the sun.   He also points to Dharma Pennu, the creator god of the Khonds, and to Dharma regarded as a great god by the Santals.   In Brahmanical mythology, Dharma is the name of a son (Yama) and an attendant of the Sun-god.

The antiquity of the cult of Dharma Ṭhākur in Bengal is definitely established by the present inscriptions.   The tortoise-shaped deity was no doubt called Dharma as early as the tenth or eleventh century.   But when precisely this Sanskritic name came to be applied to the tortoise deity for the first time cannot be determined.

There is thus absolutely no reason to believe that the present inscriptions are *mantras* or charms for *Abhicāra* or *Māraṇa*, as suggested by Dr. Bhattasali.   Had they been so, it may further be pointed out, they would have certainly contained certain mystic *bijākṣaras*, such as *hrīm*, etc., which abound in such *mantras* noticed in Tantric works both Brahmanical and Buddhistic.

I give below my reading and translation of the inscriptions discussed above.

<div align="center">

No. 1

Text

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1. [Siddham ||][1] svasti-ni[2]śreyasāy=āstu Jino janānaṁ[3] ||
2. [Siddham ||][4] na[5]

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[1] Expressed by symbol.   [2] The *akṣara* ni is engraved above the line.
[3] Read *janānām*.   [4] Expressed by symbol.
[5] Apparently the engraver was beginning *namo bhagavate Vāsudevāya*.   One of the causes of his giving up engraving on this shell has been suggested above.   Another cause may be that he became conscious of the omission of the word *Śrī* before *namo*.

Translation

[Let there be success.]   May the Jina be for the prosperity and salvation of the people.

[Let there be success.]   (Incomplete.)

No. 2

1. · [Siddham][1] śrī [2] namo bhagavate Vāsudevāya | namo Buddhāya ||
2. svasti-niśreyasāy=āstu Jino janānāṁ[3] || śrī
3. ma[4] namo bhagavate[5]
4. Manaṁrasarmma[6] -kārīta[7] -Dhamma[8] || śi [9]
5. namo bhagavate Vāsudevāya[10]

Translation

[Let there be success.] *Śrī*. Adoration to the most worshipful Vāsudeva. Adoration to the Buddha. May the Jina (Buddha) be for the prosperity and salvation of the people. *Śrī*. Adoration to the most worshipful one. [This is an image of] Dharma caused to be made by Manaṁraśarman. *Śrī*. Adoration to the most worshipful Vāsudeva.

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[1] Expressed by symbol.
[2] The *akṣara śrī* is incised above the line with the indication *1* probably pointing to the necessity of its insertion in line 1. It seems that *śrī* here stands as a substitute for the *Praṇava*.
[3] Read *janānām*.
[4] This *akṣara* is superfluous.
[5] It is difficult to determine why the engraver did not complete the line by the addition of the word *Vāsudevāya*. It is not impossible to conjecture that his intention was to engrave in this line the matter of the next line. It should, however, be admitted that the epithet *Bhagavat* is often used in inscriptions to signify Viṣṇu without specifying any of the god's names. But the absence of *daṇḍas* may point to the incomplete nature of the line, although the expected *daṇḍas* are absent also at the end of the following line where, however, the record ends. Under the circumstances one may suggest *bhagavate* || or *bhagavate Vāsudevāya* ||
[6] Read *śarmma*[c]. The reading of the name may be *Manuṁra*[c].
[7] Read *kārita*.
[8] Read *Dharmmaḥ*. The *visarga*-like sign after the word seems to be a part of the stop as it is found after °*devāya* and *Buddhāya* in line 1 and *janānāṁ* in line 2. Note that it is absent after °*devāya* in line 5 which does not end with the sign for stop.
[9] Read *śrī*°.
[10] Read °*devāya* ||.

PLATE XI.

No. 1.

No. 2.

Tortoise-shell Inscriptions in the Dacca Museum.

DATE OF THE PARAŚURĀMEŚVARA TEMPLE AT BHUBANEŚVARA

By Krishna Chandra Panigrahi, M.A.

(Communicated by Dr. D. C. Sircar)

R. D. Banerji was first to draw the attention of scholars to the names of the planets inscribed above each of them on the door of the sanctum of the Paraśurāmeśvara temple. M. M. Ganguli did not notice them, but on the consideration of some resemblance which this temple bears with the temples of Durgā and Huchchimalligudi at Aihole in the district of Bijapur, Bombay Province, he has assigned the Paraśurāmeśvara to the fifth or sixth century A.D.[1] The date fixed by him is based upon an inscription of Pulakesin II in the Śaka year 556 corresponding to 634 A.D. on the temple of Meguti at Aihole, which has been taken later than both the Durga and Huchchimalligudi because of its advanced architectural features. It has been further supposed by Ganguli that the Orissan art of temple building was transplanted in the Deccan as early as the fifth century A.D. at the latest, which produced the predecessors of the Meguti at Aihole. The whole train of his arguments is, however, based on the hypothesis that Orissa was conquered by Samudragupta and the Orissan architecture was influenced by the northern style during the Gupta period. This hypothesis together with the fact that the definite and stereotyped system of techniques followed in the Orissan architecture presupposes a long evolution, led him to conclude that 'the Orissan style of temple building was much developed in the beginning of the Christian era or even before that'.[2] The conclusion has been taken to be totally wrong by R. D. Banerji who points out that according to the palaeography of the inscriptions on its door, the Paraśu-rāmeśvara, 'the oldest temple in Orissa' cannot be earlier than the eighth century A.D. and that there is no temple in Northern, Central or Southern Orissa which can be earlier than the Paraśurāmeśvara in date. According to him there is thus a gap of at least eight hundred years between the latest Jain caves of the earlier group at Udayagiri or Khandagiri, which do not provide any semblance of temple architecture, and the earliest known temple in Orissa, namely the Parasurāmeśvara.[3]

Now, it is worth while quoting a few lines from R. D. Banerji's *History of Orissa* which contain his remarks about the palaeography of these inscriptions, which has provided the basis of the date given to the Paraśurāmeśvara, a date which has since then been accepted and followed by the scholars even in the latest works.[4] Criticising M. M. Ganguli, he says 'Unfortunately for Mr. Ganguli there is a class of evidence which no amount of artistic argument can shake. The Navagraha slab over the *antarāla* in the Paraśurāmeśvara temple is inscribed with the names of the planets and in these inscriptions a class of palatal Śa has been used which has not been

[1] M. M. Ganguli, *Orissa and Her Remains*, pp. 270 ff.
[2] *Ibid.*, p. 272.
[3] R. D. Banerji, *History of Orissa*, Vol. II, p. 340.
[4] Percy Brown, *Indian Architecture*, pp. 118-9.

found anywhere in Northern and Southern India before the eighth century A.D. This form of palatal Śa is used for the first time in the Pāla inscriptions of the ninth century A.D. In this form, the hook or arc, which forms the proper left limb of the letter, is not joined to the proper right limb, which is a straight line. It is, therefore, impossible to assign the building of the Paraśurāmeśvara to any date before the eighth century and that in the later decades of that century.' [1] Evidently Banerji had not taken the impressions of these inscriptions nor examined them closely before he passed his remarks on their palaeography which has formed the sole basis of the chronology of all the earlier temples at Bhubaneśvar. The facsimiles of the inscriptions reproduced, will show that the hooks or arcs which form the proper left limbs of the two palatal Śas in them are certainly joined to their proper right limbs which are straight lines. His mistake in this respect seems to have arisen from the fact that in the dark corner of the Jagamohana, he took the dental Sa of the word Saniścchara to be a palatal Śa and attributed to it the peculiarities of a Pāla palatal Śa. It is, however, a mistake of the scribe. There is more than one mistake in these few names, viz. Ādyatya for Āditya, Brihaspati for Bṛhaspati and Saniśchchara for Śaniśchara. That Banerji did not examine the inscriptions properly is also evident from the fact that he calls the slab containing the planets to be the Navagraha slab, although the number of the inscribed names is only eight, and among the planets there is no image of Ketu which is also conspicuous by its absence in all the early temples of Bhubaneśvara, containing similar planet slabs.

We shall now try to prove the real age of these inscriptions. The reproductions will show that the letters in their totality can neither belong to the sixth century nor to the eighth or ninth century. They straight way point to the main development of the Eastern Alphabet in the first quarter of the seventh century A.D., of which the copperplate inscription of Mādhavarāja II of Kaṅgoda (Ganjam district), the vassal of the King Śaśāṅka of Gauḍa, provides us with the typical specimens.[2] On a reference to the latest palaeographical chart prepared by Mr. C. Sivarāmamūrti, Superintendent of the Archaeological Section of the Indian Museum, Calcutta, it will be seen that the form of palatal Śa on which R. D. Banerji lays so much stress, cannot in any way tally with the same letter of the Pāla Period, although it can go back to the sixth or even the fifth century. But the form of Ka with a loop forming its proper left limb that we find in these inscriptions, cannot possibly go back to the sixth century when it was formed of two lines, of which the upper one in the horizontal position had become curve. The letters ṇa, sa and ra can in no way belong to the Pāla Period, although they can go back to the sixth century. To avoid all possibility of an early dating, it will, therefore, be best to assign them to the time of the copperplate inscription of Mādhavarāja II, which is dated in 300 years of the Gupta Era corresponding to 620 A.D., and this should be taken to be the date of the Paraśurāmeśvara temple.

There is another temple at Bhubaneśvara which bears similar inscriptions on a planet slab, that support the date given by us to the Paraśurāmeśvara. It is one of the three ruined temples standing in a row in close vicinity of the Rāmeśvara temple, half-way between the railway station and the Lingarāja temple. This ruined temple standing on the northern extremity of the row, has been given the name of Śatrughneśvara in Percy Brown's *Indian Architecture*,[3] a name which we adopt here for the sake of

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[1] *History of Orissa*, Vol. II, pp. 338-39.
[2] *Ep. Ind.*, Vol. VI, pp. 143–46.   [3] p. 119.

convenience.   The temple of Śatrughneśvara is now only a mass of rubbles with no sculptures and not even the lintel of its door frame left, but still it preserves some evidence which enables us to give it an approximate date. All writers on the Bhubaneśvara monuments have failed to notice the inscriptions similar to those on the Paraśurāmeśvara, on the eave of its southern niche containing the images of eight planets.   The planet slab is now half buried in debris and a jungle has grown round it.   Of the eight inscribed names, only those of Soma, Buddha, Bṛhaspati and Śukra have been fully preserved and the remaining ones have broken off.   It would have been possible to fully compare these inscriptions with those of the Paraśurāmeśvara, had they all survived.   Nevertheless, the palaeographical indications are that they are a little earlier than those of the Paraśurāmeśvara.   *Va* shows a triangular shape and *ma*, *śa* and *ha* have more archaic forms.   But that they are not far removed from the Paraśurāmeśvara inscriptions is proved by the occurrence of the same form of *ka* which has a loop as its proper left limb.   The temple of Śatrughneśvara should, therefore, be assigned to the beginning of the seventh or the closing of the sixth century.

Various dates have been given by the scholars to the group of three temples of which Śatrughneśvara is one.   Percy Brown puts them at the end of the temples assigned by him to *c.* 750 to 900, thus suggesting that they belonged to the ninth century.[1]   M. M. Ganguli takes them to be the temples constructed by Harivarmadeva of Bengal belonging to the first quarter of the eleventh century.[2]   On consideration of their architectural peculiarities, R. D. Banerji assigns them to the ninth century.   The view of the last-named scholar deserves more than a passing notice, because he takes the absence of the porch or *mukhaśālā* in these three temples and some other temples of Bhubaneśvara, Baudh and Khiching in Mayurbhanj, to be a definite feature and groups them under a separate class on the ground of such a feature.   He has assigned this class of temples grouped on this supposed peculiarity to the ninth century, because there is an art sequence between the Liṅgarāja temple and the great temple at Khiching as shown by R. P. Chanda and the former possessing a *mukhaśāla* or porch is generally placed at the end of the tenth century.   The whole train of arguments adduced by Banerji is neither clear nor based on actual observations.[3]   In the first place, the three temples at Khiching share the peculiarity of not possessing a porch with all the temples of the south-west Bengal as he himself points out, and as such it should be taken as a local architectural feature not extending to a class of temples in Orissa as a whole.   In the second place, in the three temples at Baudh, as Banerji puts it, the place of the Jagamohana is taken by a very small *Antarāla* or porch supported by two pillars in front and two pilasters. Such a type of porch should, therefore, be taken to be the local architectural feature of the Baudh temples, which is not found to have extended to the temples either at Khiching or Bhubaneśvara.   In the third place, there is not a class of temples at Bhubaneśvara, assignable to a particular period, which are marked by the peculiarity of not possessing a porch.   Of the temples almost contemporary, some are found to have possessed porches and others have none.   In the fourth place, so far as these three ruined temples are concerned, it is definite that the Śatrughneśvara which bears the inscriptions under discussion, did possess a porch or Jagamohana, the rectangular plinth of which is still visible.

It may be added here that, although Banerji discusses the date of the three temples at Baudh and assigns them to the ninth century,[4]   his

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[1] p. 119.   [2] *Orissa and Her Remains*, pp. 391-92.
[3] *History of Orissa*, Vol. II, pp. 353-356.   [4] *Ibid.*

posthumous work, *History of Orissa*, Vol. II, contains a photograph of one of these temples between pp. 192-93, which has a label 'One of the Chaturvyūha Śiva Temples (Tantrik) fourth century at Baudh'. Evidently, fourth century is a misprint for ninth century, but it still creates an impression that there existed in the Orissa of the fourth century, a temple with a full-fledged *śikhara* which has come down to us almost quite intact, an impression which is not compatible with the evolution of temple architecture in India nor with the durability of a temple structure. The word Tantrik inserted within the brackets indicates that Banerji intended to make the date ninth century, but not fourth century, for, a scholar of his erudition could not have made the mistake of tracing a Tantrik temple back to the fourth century A.D.

There is still another source which supports the dates given to the temples of Satrughneśvara and Paraśurāmeśvara. It is a tradition recorded in four Sanskrit works, viz. Ekāmra Purāṇa, Svarṇṇādri Mahodaya, Ekāmra Chandrikā and Kapila-Saṁhitā, which profess to deal with the origin of the temples, rituals, festivals and the allied matters connected with the Śaiva shrine at Bhubaneśvara. The first of these works, Ekāmra Purāṇa, is the oldest and most comprehensive. It has been quoted both by M. M. Ganguli [1] and R. D. Banerji, but they seem to have been very imperfectly acquainted with its contents, or else they would not have missed certain definite references so important for the history of Bhubaneśvara. Kapila Saṁhitā has also been quoted by M. M. Ganguli from a MS. copy of the Asiatic Society of Bengal.[2] Some twenty years ago, Pandit Ratnakara Gargabatu of Bhubaneśvara, who still lives as an octogenarian, first published them in Oriya from the palm-leaf manuscripts. The date of these works cannot be earlier than the thirteenth century, because, all of them mention the temple of Ananta-Vāsudeva [3] which was built in Saka 1200 (1278 A.D.).[4] The tradition recorded in all these works credits Śaśāṅka with the building of the first temple in the shrine now represented by the great temple of Liṅgarāja. Śaśāṅka, as is well known, lived and ruled in the first part of the seventh century to which we have assigned the temples of Satrughneśvara and Paraśurāmeśvara on palaeographical grounds. As in all Purāṇas, the tradition has been put in the form of a prophecy, but that it contains the germs of historical truth, admits of little doubt on close examination. Śaśāṅka has been referred to in these works sometimes as Chandra or Chandramā and sometimes by name as Śaśāṅka and in one case he has been represented as the lord of a portion of the earth extending up to Kaliṅga. The last-named reference leaves little room for doubt that Chandra, Chandramā or Śaśāṅka of the tradition can be any other person than Śaśāṅka, the King of Gauḍa, who was the overlord of Kaṅgoda, a part of Kaliṅga, as is evidenced by the copper-plate grant of Mādhāvarāja II of the Śailodbhava Dynasty.[5] In view of their importance, I quote below the translations of the texts containing the tradition, the Sanskrit originals of which with their contexts have been given in the Appendix.

The Chapter 13 of the Ekāmra Purāṇa gives a conversation between Śiva and Brahmā in the Satya Age, in which the latter expresses his desire to

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[1] *Orissa and Her Remains*, p. 333.   [2] *Ibid.*, p. 397.

[3] It has been subsequently been proved that Chandrā Devī, daughter of Anaṅgabhīma Deva, was the real builder of this temple and that her inscription, now preserved in the hall of the Royal Asiatic Society of Great Britain and Ireland, London, was its original commemorative inscription (Above, Vol. XIII, New Series, p. 63 ff.).

[4] R. D. Banerji, *History of Orissa*, Vol. I, p. 267.

[5] *Ep. Ind.*, Vol. VI, pp. 143–46.

build a temple for the former, but Śiva chooses to remain in an open ground and says:—

'With the coming of the Kali Age, Chandra will go to the earth and having become the lord of men (the King), he will worship the liṅgam.'

'He, who is of good determination, will cause a beautiful, white and purifying stone temple to be erected and a great worship performed.'

'He who is famous, well-known, and engaged in daily worship of Śiva, will establish this liṅgam of Tribhuvaneśvara in accordance with my command.'

'O Brahman, you know me to be this stone liṅgam that can neither be seen nor touched.'

'Śaśāṅka with his heart attached to Śiva, will be infinitely intelligent and will worship with diligence all the liṅgams that exist in the earth.'

'O Vivudheśvara (Brahmā), (Śaśāṅka's) work (kīrtti) will endure (lit. remain unhurt) in this world. O Pitāmaha, it is difficult (for you) to do (i.e. to construct a temple for me); (so) your efforts are useless.'

In the Chapter 48 of the same work, Śiva in course of his conversation with the Bālakhilyās speaks as follows:—

'When one quarter of the Kali Age has passed away, Chandramā will go to the earth.'

'My devotee Śaśāṅka, the lord of the earth, with his mind fixed in none (except in me), will rule a portion of the earth extending up to Kaliṅga.'

'According to my command, he will construct a massive and beautiful temple, bearing the voice of the gods. O the best of ascetics, you have (now) heard (this all) well.'

Again in the Chapter 50 of the same Ekāmra Purāṇa, we find a reference to Śaśāṅka. Rāma, son of Daśaratha of Ayodhyā, desirous of building a temple for Śiva, wanted to fix up a site in Ekāmra. Vaśishṭha to acquaint him with the situation speaks as follows :—

'O king, the past tradition is that Śaśāṅka will cause it to be done.'

'So, O the best of the kings, construct a temple elsewhere.'

'When the high-souled Vaśishṭha was speaking this, an invisible voice descended from the sky (which spoke thus).'

'O Rāma, the long-armed Rāma, the increaser of the pleasure of the gods and the expert in the knowledge of the worship of Śiva, please hear my best words. Chandramā dropped down from (my) crown will not soon go to the earth.'

In the Chapter 14 of the Svarṇṇādri Mahodaya, when Brahmā expresses his desire to build a temple for Śiva, the latter directs the former to build it at a site now represented by the Brahmeśvara temple but reserves his own site (the site of Tribhuvaneśvara) and speaks as follows:—

'It will not be done by your hand; in the Kali Age Chandra will do it.'

In the chapter 9 of the Ekāmra Chandrikā, the same tradition is recorded as follows:—

'Do not build the temple here; in the Kali Age Chandra will do it.'

In the Chapter 16 the Kapila Samhitā also, the lord Tribhuvaneśvara is found to have made the same refusal to Himavat, the king of the mountains:—

'Why have you asked for a thing which was not available to the gods such as Brahmā, Vishṇu, Indra, Yama and Varuṇa? The temple (of mine) is impossible to be constructed; in the Kali Age Chandra will do it.'

It will be seen from the quotations given above that the tradition about Śaśāṅka having built the first temple in the shrine of Tribhuvaneśvara is

persistent in all the four Sanskrit works dealing with the subjects connected
with Bhubaneśvara. These are the only friendly references that we ever
find to have been made to Śaśāṅka in any records so far discovered. His
character has been painted black in all other records that have emanated
from his political rivals, or their friends and supporters or from the sources
of the Buddhists who regarded him as an enemy of their religion. If these
traditions have any value, they show that stone temples existed at
Bhubaneśvara during the age of Śaśāṅka. The evidences furnished by the
palaeography of the inscriptions and the traditions thus support each other
and as such the dates assigned to the temples of Śatrughneśvara and
Paraśurāmeśvara, on the strength of both, should be taken as conclusive.
It is not, however, concluded that either of these two temples was built by
Śaśāṅka. All traditions credit him with the building of a temple in the
shrine of Tribhuvaneśvara or Liṅgarāja. The present temple of Liṅgarāja
and also the other temples in its compound are much later structures and it is
impossible to assign any of them to the time of Śaśāṅka. On another
occasion we shall try to trace out the plausible archaeological remains of
Śaśāṅka's temple and shall discuss the part played by him in the great
Śaiva shrine of Bhubaneśvara.

The text of the inscriptions on the Paraśurāmeśvara temple:—

    1. Ādyatya. 2. Soma. 3. Aṃgāraka. 4. Budha. 5. Brihaspati.
    6. Śukra. 7. Śanīśchchara. 8. Rāhu.

Note.—The mistakes in the inscriptions have already been pointed out.
The word Śanīśchchara probably represents the phonetic peculiarity of the
age of the inscriptions. The present Oriya pronunciation is śani but not
śaṇi.

The text of the inscriptions on the Śatrughneśvara temple:

    1. Soma. 2. Buddha. 3. Bṛhaspati. 4. Śukra.

APPENDIX *

Quotation No. 1

From Chapter 13 of the Ekāmra Purāṇa, pp. 101-2

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श्रीशांकर उवाच

मद्वाक्यं परमं चेदं निग्रामय पितामच ।

व्यक्तमिच मामेवं नान्यः पश्यति त्वदृते ॥

यथेष्टं कोटिलिंगानि कुरुष्वाभिमतं तव ।

अच्चमेव एयक् भूत्वा तिष्ठाम्यन्न जगत्पते ॥

व्याञ्छायामिमां ग्राह्ता¹मस्तात्रौति: प्रवर्द्धते ।

प्रसादात्मवतं चान्न स्थितिरेषा गुणात्तिका ॥

त्वतचेतायुगे जाते स्वयं स्रौर्यति पादपः ।

द्वापरे तु युगे ग्राप्ते स्थितिरभात्तिका स्मृता ॥

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* Texts have been reproduced as they occur in the originals without any
corrections in respect of obvious grammatical mistakes.

¹ Read ग्राह्ताऽस्तात्रौति:

सूर्याचंद्रमसौ देवौ पश्यन्तौ सततं तदा ।
रेजाते तेजसा तस्माद्दर्घस्पर्घगुणान्वितौ ॥
वायुः शिवत्वमाप्नोति लिंगं स्पृष्ट्वा तदानघ ।
मदाश्रयातो वाग्दिव्या मेध्यान्मेध्यतराच्च ते ॥
प्राप्ते कलियुगे ब्रह्मांश्चन्द्रो यास्यति मेदिनीम् ।
भुत्वा मनुजनाथोऽसावर्चयिष्यति लिंगकम् ॥
भक्तितः प्रवरां पूजां कारयिष्यति सुव्रत ।
प्रासादं रुचिरं शुभ्रं शुद्धं शैलमयं तथा ॥
शिवयच्चपरो नित्यं कौर्तिमान् सुबडश्रतः ।
प्रतिष्ठयिष्यतीदं स लिंगं त्रिभुवनेश्वरम् ॥
मदाश्रयानुरूपेण दर्घस्पर्घविवर्जितम् ।
लिंगः[1] शैलमयं ब्रह्मांततो जागति मामयम् ॥
शश्यांकोऽनन्तमेधावी भविष्यति शिवात्मकः ।
पृथिव्यां यानि लिंगानि अर्चयिष्यत्यतन्द्रितः ॥
कौर्तिर्व्याहृता लोके स्थास्यते विबुधेश्वर ।
अलमध्यवसायस्ते दुष्करोऽयं पितामह ॥

Quotation No. 2

From Chapter 48 of the Ekāmra Purāṇa, pp. 364-5

प्रसन्नो ह्यभवं यस्मात्तस्माच्च क्षपयायवा ।
कथितं पुण्ययोगाद्वा भवतां पुण्यजन्मनः ॥
एतद्वेदेषु दुष्प्राप्यं देवतासु न लभ्यते ।
एतद्ध्यानं दिशश्रेष्ठा भवसागरतारणम् ॥
अतःपरं परं श्रेयः किमन्यत् परिपृच्छथ ।
एवं देवपतेर्वाक्यं श्रुत्वा ते मुनिपुंगवाः ॥
इदमूचुः पुनर्भक्त्यां भवितव्यं न वेति वा ।
भूय एव मुनिश्रेष्ठा ऊचुस्ते परमेश्वरम् ॥
कस्मिन् कस्मिन् युगे देव किंरूपेण व्यवस्थितः ।
तानुवाच ततो देवः पृश्रणुध्वंतु ऋषिसत्तमाः ॥
ज्ञातचेतायुगे तावन्मां पश्यंति देवताः ।
द्वापरे लिंगमाप्नोऽहं प्रासादगुणावर्जितः ॥
कलौ मम स्फुटं लिंगं प्रासादगुणावर्जितम् ।
कलावतीतपादे च मर्द्धीं यास्यति चन्द्रमाः ॥
ग्रासयेत् पृथिवीभागं मद्भक्तो नान्यमानसः ।
यावत् कलिंगपर्यंतं शशांकः पृथिवीपतिः ॥

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[1] Read लिंगं

ममोपदेशकर्तासौ प्रासादं रुचिरं एथुम् ।
श्रुत्वा देवेरितं सम्यक् श्रुतान्ते मुनिपुंगवाः ॥
दर्शनं स्वर्घनं पूजां चक्रुरात्मनिवेदनम् ।
ज्ञातज्ञात्वा हि ते सर्वे बालखिल्या दिवं गताः ॥
खपुरीं तु धनाध्यक्षो ययौ पुष्पकवाहनः ।

ब्रह्मोवाच

एवं देवस्य माहात्म्यं श्रुतं मे गिरिकन्धके ।
सर्वपापप्रशमनुलं सर्वपुण्यविवर्धनम् ॥

Quotation No. 3

From Chapter 50 of the Ekāmra Purāṇa, pp. 384-5

वशिष्ठं स्थविराचार्यं वामदेवं च काश्यपम् ।
पार्थिवान् धर्मप्रवणान् सुहृत्प्रकृतियाजकान् ॥
सर्वान् प्राह महीपालः पूर्णेन्दुसदृग्राननः ।
इच्छेऽहमालयं कर्तुं लिंगस्यास्यानुरूपतः ॥
क्षिप्रं संवाहय छात्रं पाषाणाश्म[1]मयानि च ।
वाठमित्येव ते सर्वे चक्रुः कर्माण्यप्रेषितः ॥
प्रयच्छतः सुसंतुष्टो भरतो रामशासनात् ।
वशिष्ठस्तमुवाचेदं राघवं मुनिभिः सह ॥
ब्रह्मा विष्णुश्च ब्रह्माद्या देवदैत्योरगासुराः ।
यक्षविद्याधराः साध्या मुनयश्च दिवौकसः ॥
अवस्थिता महीपालाः पुरा राम अनेकशः ।
सत्त्वयुगपर्यन्तं साम्प्रतं भवतोदितम् ॥
यदि प्रसन्नो भगवान् कुरुष्वाभिमतं तदा ।
पुरा श्रुतिरियं राजन् अर्घार्घः कारयिष्यति ॥
तक्षात्त्वमपि राजेन्द्र अन्यच्चायतनं कुरु ।
इत्येवं वदतस्तस्य वशिष्ठस्य महात्मनः ॥
ततश्चान्तर्हिता वाणी गगनादवतारिता ।
राम राम महाबाहो देवानां प्रीतिवर्धन ॥
ब्रह्माराधनतत्त्वश्च श्रृणु मे परमं वचः ।
पंचमा मुकुटादुभस्रो महीं यास्यति नाचिरात् ॥

तदासौ कुरुते ज्वाकां प्रासादं शिवसम्मतम् ।
विधत्स्वान्यं महावाह्रो प्रासादं रविरद्युतिम् ॥
तत्राहं स्वयमेवोच्चैरुपतस्याखे चिरं सदा ।
पूजितः प्रीतिमतुलं ददाम्यभिमतं फलम् ॥
मुश्रावातर्हितो वाणीं रामो भाटसुहृत्सुखः ।
स भूयः प्राञ्जलिं बद्धा तं देवं प्रत्युवाच च ॥
कस्मिन् देशे करिष्यामि आच्चापय महेश्वर ।
तमुवाचाम्बरस्थो मधुरां लोकसाच्चिणौम् ॥
बिंदुसरादूरेण वायव्येन समाश्रिते ।
घेम्वंतरगवप्रते सप्तव्युत्तरभूम्रते ॥
कुरुख्वायतनं पुण्यं शिवस्थानमनुत्तमम् ।
एवं ते ग्राम्वतो कौर्त्तिर्लोके ख्यास्यति सर्वदा ॥

Quotation No. 4

From Chapter 14 of the Svarṇṇādri Mahodaya, pp. 66-7

चतुर्भिर्वेदकैरेव तुष्टाव परमेश्वरम् ।
स्तवांते भुवनेग्रस्तु प्रसन्नोऽभूद्दिशोत्तमाः ॥
वरं वरय भद्रं ते यत्ते मनसि वर्त्तते ।
प्रसन्नोऽसि यदि स्वामिन्नाच्चापय जगत्पते ॥
मंदिरं कर्त्तुमिच्छामि यग्रस्थं कौर्त्तिवर्द्धनम् ।
त्वदाच्चया करिष्यामि सर्वावयवसुंदरम् ॥
त्वद्भक्ते गाभविष्यद्वै कलौ चंद्रः करिष्यति ।
लिंगस्याख्य त्वदूरेण ईमत्प्रचलिताम्बरे ॥
घेम्वंतरसच्चैके विंघ्रोत्तरग्रतांतरे ।
पूर्वस्याख्य दिग्रो भागे चैघ्रानौं दिघ्रमाश्रिताम् ॥
ददर्घे विपुलां भूमिं मेरोः घ्रंगमिवापराम् ।
कुरुख्वायतनं तच्च दिघ्रमामोदितं मम ॥

Quotation No. 5

From Chapter 9 of the Ekāmra Chandrikā, p. 71

पुरा भौमं प्रसन्नः सन्नभ्रवौत्यार्वतौपतिः ।
गाभ .... कलौ चंद्रः करिष्यति ।
यमेश्वरादूरेण नैऋतेन समाश्रिते ।
घेम्वंतरसच्चैके कुरु देवालयं शुभम् ॥

Quotation No. 6

From Chapter 16 of the Kapila Saṁhitā, p. 78

किमिच्छसि गिरिश्रेष्ठ ब्रूहि कामं यथेप्सितम् ।
संतुष्टो वरदोऽहं च लोचनेनानेन चागच ॥
इति श्रुत्वा वचस्तस्य धूर्जटेर्हिमवांस्तदा ।
बद्धाञ्जलिं करपुटे वाचमूचे प्रियंवदम् ॥
अस्मिन् क्षेत्रे जगन्नाथ त्वदीयं लिंगमुत्तमम् ।
दिवृच्छरक्षि तच्चाहं प्रासादं कारवाणि च ॥
यतो मद्वेश्म संस्थप्य छागतत्वं सङ्गोमया ।
अतो दिवृच्छक्तं साध्वीमागतोऽहं तवालयम् ॥
तस्यां च महती प्रीति विदुपुत्रः स्थितोऽपि मे ।
तद्वत्त्वला त्वयि हतमनुरागं हि वर्द्धते ॥
अधुना बहुभी रत्नैः प्रासादं कारवाणि ते ।
आज्ञापय महेशान यदुक्ति करुणा मयि ॥
गिरीन्द्रमथ देवेशो वाक्यमेतदुवाच च ।
दुर्लभं देवताभिश्च किं त्वया प्रार्थितं गिरे ॥
ब्रह्माणा विष्णुनेन्द्रेण यमेन वरुणेन च ।
प्रासादश्च ह्यसाध्योऽयं कलौ चंद्रः करिष्यति ॥
इदानीं मत्समं लिंगं केदारेश्वरसंज्ञकम् ।
सिद्धेश्वरसमीपे च प्रासादं कुरु सुव्रत ॥

Plate XII.
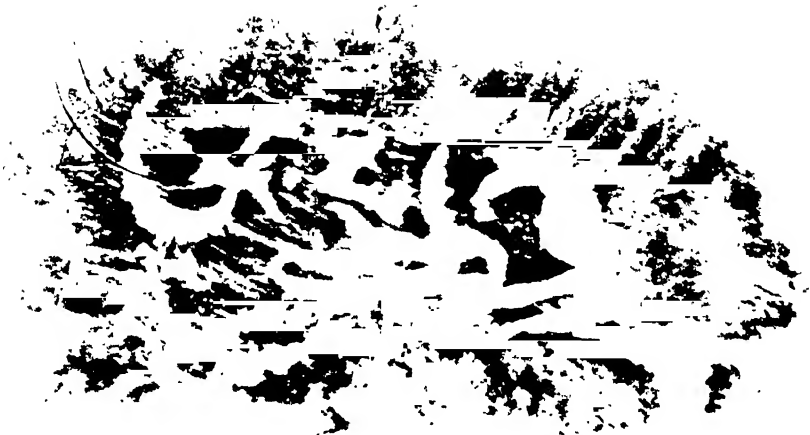
No. 1.

No. 2.
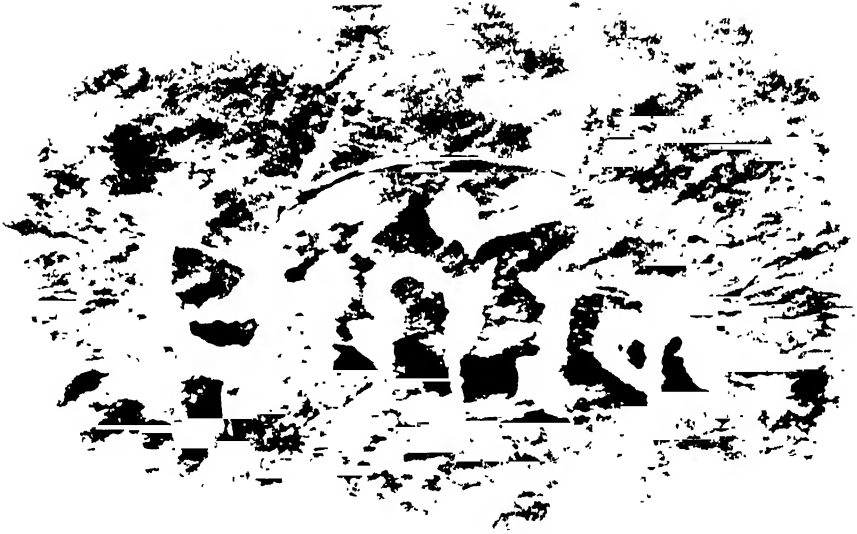
No. 3.

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No. 8

No. 9.

No. 10.

No. 11.

No. 12.

THE *DEŚĀVALIVIVṚTI* AND THE *DIGVIJAYAPRAKĀŚA*

By DINESH CHANDRA BHATTACHARYYA, M.A.

Dr. H. P. Śāstrī worked hard and long on the manuscript (No. 3582 of the India Government collection), containing a large fragment of the Sanskrit Gazetteer *Deśāvalivivṛti* and smaller fragments of *Pāṇḍavadigvijaya* and *Bhaviṣyapurāṇa*. It took him (and his assistants) 'nearly a month' to describe (*J.A.S.B.*, Feb. 1914, p. xxii) and the long descriptive note was published in 1923 (*Des. Cat. of Sans. MSS.*, Vol. IV, pp. 36–62). Though he was fully aware that 'there are bigger fragments' of these works in the MS. collection of the Sanskrit College, Calcutta (*ibid.*, Introd., p. iii), he evidently regarded the works to be of such great importance that he worked with alacrity even on the smaller and more modern copy of the Society. Recently the *Deśāvalivivṛti* has been more thoroughly and critically analyzed by Dr. R. C. Majumdar (*Sāhitya-Pariṣat Patrikā*, Vol. 55, pp. 1–20) on the basis of the Society's copy and he learnt on enquiry from a former Principal of the Sanskrit College, Calcutta, that no copy of the work can be traced in the MS. collection of the College !! As a matter of fact there were at least four large fragments of this book in that collection, as described in the Des. Cat. of Sanskrit MSS. in the Library of the Calcutta Sanskrit College (Vol. VI, pp. 43–48 and 56—Kāvya MSS. Nos. 69–71 and 78), the total number of folios being well over 1,000. After a long and tedious search we succeeded in tracing and examining two fragments of the work in the Sanskrit College Library.[1] As we are specially interested in the history of Tippera, the following extracts are published from MS. No. 87; this portion is not found in the Society's copy.

अथ त्रिपुरादेशविवरणम् ।

उत्तरांशे च श्रीहट्टं दत्ते कर्णफुली तथा ।
डुमुरांतं च प्राच्यां वै नदौ हुड्डा च पश्चिमे ॥
"अमरतोला" राजधानौ ख्याता सर्वजनैरपि ।
"डमामाणिक्य"-भूपेन स्थापिता सा प्रयत्नतः ॥
तत्प्रेन्द्रमाणिक्येन राज्यं तत्रा(प्य)कारि च ।
प्रजानां पालनं चैव कृतं धर्मेण बुद्धिमा ॥
धर्ममाणिक्यपुत्रश्च बहुभोगं चकार च ।
पुत्रवत् पालनं चैव लोकानां धर्मबुद्धिमा ॥
तद्‍न्वयो "राजधरः" बहुयुद्धं चकार च ।
मगैः साकं विजित्वा च तेन राज्यं कृतं स्थिरम् ॥

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[1] Of the four fragments of the *Deśāvalivivṛti*, very imperfectly described in the Des. Cat., hardly one-third is now traceable in the Library. The rest must have been stolen by unscrupulous men under a false sense about the value of the work.

प्रतिष्ठां प्राप्तवान् बाल्ये गतोप्येषो महान् भुवि ।

चित्रपुरार्यां स राजा च भुक्ता हत्वा दिवं गतः ॥

*   *   *   *

ततो द्वियोजनाभ्यां च पश्चिमे "सप्तमारकः" ।

ग्रामो हि वर्तते ख्यातः तत्रस्थैः सर्वजातिभिः ॥

तत्र मन्दिरमध्ये तु महाकालीति विद्यते ।

*   *   *   *

प्रतीच्यां राजविषयादष्टकोशव्यतिक्रमे ।

श्रीराजधरगञ्जं च ख्यातं राजधरेण वै ॥

*   *   *   *

राजधान्याः पश्चिमे तु योजनद्वयव्यत्यये ।

पुरी "वामन"-संज्ञा च वेष्टिता ब्राह्मणैः सदा ॥

उत्तरे चायतोलायाः योजनद्वयव्यत्यये ।

नगरं कालिकाख्यं तत्र काली विराजते ॥

*   *   *   *

इति विक्रमसागरोक्ततदेशावलीविश्लिष्टौ चित्रपुरादेश्चविवरणं सम्पूर्णं ।

The account of Tippera is found in three folios (70–2, also marked 11–3), the last part of the colophon continuing in the first line of the next folio (73a = 14a). We refer to this account as a typical instance of the most unreliable character of the book. 'Agratolā', the capital of the kingdom of Tripurā, is the Sanskritized form of the modern Āgartalā. The older part ('Purātana Hāveli') of the small township was first founded by Rājā Kṛṣṇamāṇikya (1760–83 A.D.) exactly in the year 1170 T.E. (i.e. 1760 A.D.). So in the original Rājamālā (unpublished Press Copy, p. 334):—

এগারশ সত্তর সন হয়েত যখন,

আগরতলা রাজধানী করিল রাজন ।

(Compare Śrī-Rājamālā, ed. by Kālīprasanna Sena, Vol. I, p. 238.) The place became 'famous' much later. Umāmāṇikya, the supposed founder of the new town, is absolutely unknown in the royal family of Tripurā. Indramāṇikya was not a son of this mythical king, nor did he ever reside in Āgartalā. A son of Dharmamāṇikya named Udayamāṇikya (the author of the book could not evidently recover his name) usurped the throne only for a few months in 1739 A.D. (Rājamālā, pp. 318-9). Rājadhara was not a descendant of Dharmamāṇikya, but was the grandson of his brother Mukundamāṇikya. Rājadhara had no fight with the Maghs, but only with a distant cousin (ibid., pp. 349-50). Rājadhara's death has been noted by the author; it occurred exactly 'on the night of 1st Maug 1210, corresponding to 13th January, 1804 A.D.' (Collector of Tippera's letter, dated 7-4-1804). Here is a clear evidence pointing to the date of composition of the ugly forgery, which successfully duped scholars like Dr. H. P. Śāstrī—it was never written before 1810 A.D. The temple of Kālī, famous in that region, was not situated at 'Saptamāraka' (i.e. modern Sātmorā), but at Śrīkālī

nearby. The town of 'Bāman' (i.e. evidently the Subdivisional place Brahmanbaria) and 'the town of Kālikākaccha' are not 'two yojanas' distant from Āgartalā, whatever measure the term yojana might mean. All the same, residents of these two places will, we doubt not, feel flattered by the mention of these towns in a Sanskrit book preserved in MSS. This is really the secret behind the authority achieved so long by these modern forgeries. Almost all local historians of Bengal have attempted to enrich their books, without the least suspicion, with quotations from these unpublished Sanskrit books preserved in MSS. in institutions like the Calcutta Sanskrit College and the R.A.S.B. In the colophon here as elsewhere the clever author has not forgotten to state that his book is 'extracted from the *Vikramasāgara*'. We should mention here that a fragment of a part (named Bhūgolanirṇaya) of the original *Vikramasāgara* was preserved in the Calcutta Sanskrit College—the name of the author was one Rāmakṛṣṇa Yajvan who wrote it at the request of 'Vikramārka' (i.e. the father of Vaijala, the patron of Jaganmohana). We do not know if the book is still preserved in that college library (*vide* Des. Cat., Purāṇa part, p. 69, MS. No. 108, foll. 13). The unreliable character of the book can be easily proved if any other part is subjected to a critical analysis. For instance, in the chapter on Bāklā-Candradvīpa, which was undoubtedly written after 1801 A.D. as the mention of Barisal (with a fantastic derivation of its Sanskrit form Varaśālā) proves, it is stated that Rāmacandra was chief in 1400 Śaka and reigned 60 years, his son was chief for 50 years and Udaya went to the forest after 50 years' rule. These round figures of date are all fantastic nonsense; not a single period of rule of these chiefs has yet been accurately ascertained. There is hardly a single statement in this large book which can be accepted as correct without verification from reliable sources.

Digvijayaprakāśa.

A similar and equally unreliable book is the *Digvijayaprakāśa*, otherwise known as the *Pāṇḍavavijaya* or the *Pāṇḍavadigvijaya*. It is cited as an example along with the *Śaṅkaradigvijaya* in the *Śabdakalpadruma* under the word 'digvijaya'. Long extracts from it are cited in the *Viśvakoṣa* (e.g. under the word Kalikātā in Vol. III) and the editor regarded it as a work of the early seventeenth century A.D. (under Kavirāma, Vol. III, p. 349). This book was also preserved in huge MSS. in the Calcutta Sanskrit College, the total number of folios being well over 3,000 (MS. Nos. 72–77, 80 and 114 in the Kāvya part of the Des. Cat.). Some of these copies, which are very inadequately described, are now missing from the Library. The following two extracts, which we discovered after a tedious search, will indicate its professed authorship and date.

रामभूपोनिदेशेन पौलस्त्यमहेश्वरं प्रति ।

किरातदेश्याग्रासमगार्थीसुक्तवान् विनयान्वितः ॥   ११०२

शिवभट्टुः ग्रासगं च ज्ञात्वा देशं किरातकम् ।

निवेदिता देग्ररौतिः पौलस्त्यभूमिमपं प्रति ॥   ११०१

कुवदिदिविजयग्रन्थे विहितौ च नियोजितः ।

" कविरामो " हि तेनेदमुक्तवान् भू.......... ॥   ११०४

*   *   *   *

इति कुवदिदिविजयग्रन्थे समगाङ्कजविवरणम् ।

(Foll. 77-78 of a MS. numbered as 80-84: it now contains two separate books, Vidyāpati's *Bhūparikramaṇa* and the *Pāṇḍavavijaya*. The numbering seems to show that two or three large fragments of the latter book, separately described in the catalogue, were lost, leaving this small multi-numbered bundle as the relic of an outrage.)

उत्तरभविष्यदालोक्य व्यालोक्य नीतिग्राह्वकां ।

इतौहासं समालोक्य स्रुत्वा वद्रोपदेग्रतः ॥

मद्याराजाधिराजस्य पौलस्त्यस्य निदेग्रतः ।

पाङ्क्ष्वागां दिग्विजयदेग्रानां विस्तिः क्ला ॥

चतुःखंडावग्रिष्ठातिदेग्रानां रचमानि च ।

व्यार्जुने मिश्रखंडे च यत्तौभावौति भूपते ॥

"रंभाव्यिनेचचन्द्रै"-ख गणिते वत्सरे गते ।

कार्याटिभूराजनगरे यग्यः सांगं समागतः ॥

(Fol. 728*b* of MS. No. 79 at the end of Nakuladigvijaya.) The date of completion of the work has been cleverly worded; if referred to the Śaka era the date becomes 1249 Ś. (i.e. 1327 A.D.), ascribing a hoary antiquity to the book, which was really completed according to our surmise in 1249 Fasli (i.e. about 1840 A.D.), a little over a century ago. That it is such a modern work will be clearly proved by the following extracts taken again from its chapter on Tripurā :—

इदानीं चिपुरादेग्रविस्तृतिं घट्ग पार्थिव ।

चिपुरा द्विविधा प्रोक्ता कमिल्लादिप्रभेदतः ॥

कमिल्लापूर्वभागे च द्वियोजनविपर्यये ।

चिपुरासुन्दरी मद्याविद्या मद्यापीठे च वर्त्तते ॥ ४१

*　　　*　　　*　　　*

तितासासरितक्तौरे नूराख्यनगरं मद्यत् ।

यदन्तरे मद्यान्तख ग्रामाः चुद्राख सन्ति हि ॥ ४६

तेषु ग्रामाः पञ्च मुख्यास्तेषां नामानि वै घट्ग ।

विट्घरो विद्याकूटख ग्रिवपूराख्य एव च ॥ ४७

कष्वायामो राजधरगञ्जख नानाजातिनिवासभूः ।

विटागं लंपटागं च रूढं यन्न च भूयसि ॥ ४८

(Foll. 175–78 of MS. Nos. 80–84.) The five villages of the Pargana Nurnagar mentioned in this extract all came into prominence early in the nineteenth century A.D. The village Rājadharagañja was founded by Rājadhara-māṇikya (1785–1804 A.D.) of Tripurā. The accounts that follow of these villages are all fantastic fabrications of Pauranik legends, specially the account of the small village Śivapura, whose inclusion in this list is really surprising. Such legends couched in the Sanskrit language still create a false sense of sanctity among ill-informed people of the localities. This

book contains such fabricated and legendary accounts of thousands of villages mostly of Bengal mentioned in Sanskritized forms with fanciful derivations in many cases. It is surprising that these fantastic accounts still carry weight with many of us. The account of 'Kilakilā' (i.e. Calcutta) has been approvingly cited in the *Viśvakoṣa*, containing stuff like :—

ततः किलकिलादेशे खड्गदग्राममध्यतः ।

हाडापिपपख्खितगेहे निद्यानन्दो भविष्यति ॥   ६६७

Neither Hārāpi (?) Paṇḍita nor his son Nityānanda was born at Khardaha. Besides the two works *Deśāvalivivṛti* and *Pāṇḍavavijaya* the Sanskrit College MSS. referred to above contain extracts from several other works like the *Brahmakhaṇḍa* of the *Bhaviṣyapurāṇa* and the *Mahākalpadrumatantra,* both containing geographical matter.

It should be mentioned here that there are many duplicate copies of parts of these two works in the Sanskrit College, which seems to have been the place from which they were published. The Society's manuscript is an exact copy in a later hand of the Sanskrit College original. We are not aware that any other copies of these two books exist anywhere else. A copy of the *Digvijayaprakāśa* was in the library of late N. N. Vasu; it was sold subsequently to the Varendra Research Museum where it is still preserved. We have no doubt that this copy also originally belonged to the Sanskrit College, from which many parts of the two books are missing. It is, therefore, our surmise that the real authors of these two books lived and wrote at Calcutta and were somehow connected with the library of the Sanskrit College, where they placed their forgeries in huge bundles and successfully duped scholars for over a century.

The only silver line that we could discover in the two books is the fact that they refer to persons and localities which were famous early in the nineteenth century A.D. and many of which are now lost in oblivion partly by the devastating progress of civilization and partly by the ravages of malaria turning extensive tracts into lifeless forests. Such references however garbled and fantastic revive sweet memories of the forgotten past and may not be regarded as absolutely valueless on that account.

'VEDIC INDIA AND THE MIDDLE EAST' AND THE DATE OF ŚIŚUNĀGA.

By Dr. Dines Chandra Sircar, M.A., Ph.D.

I have read with interest Mr. H. K. Deb's paper entitled 'Vedic India and the Middle East', published in the *Journal of the Royal Asiatic Society of Bengal*, Vol. XIV, 1948, pp. 121–43. Of course I am hardly convinced with the author's arguments in favour of his identifications: Arbuda-Kādraveya=Śeṣanāga=Śiśunāga, Asita-Dhānva=Esarhaddon, Matsya-sāṁmada=Mesesimordakos and Tārkṣya=Tearkon, as they do not appear to me more substantial than the superficial similarity between the names of Laṅkā and Lancashire or of Rāma Dāśarathi and the kings called Ramses in early Egyptian history. But I am not going to comment on them in details. What I intend to do in these lines is to draw the attention of scholars to the highly improbable nature of the date, 'the seventh century B.C.', to which king Śiśunāga of Magadha, the ninth *Maṇḍala* of the *Rgveda* and the *Śatapatha Brāhmaṇa* have been ascribed by Mr. Deb. It is, however, not my intention to discuss here in details the problems relating to the dates of the *Rgveda* and the *Śatapatha Brāhmaṇa*. But it is necessary to point out that the composition of the *Rgveda* is placed, even according to the most moderate estimate, in *circa* 1200–800 B.C. (cf. *Cambridge History of India*, Vol. I, pp. 112-13, 697). The ninth *Maṇḍala* of the *Rgveda*, supposed by Mr. Deb to have come into existence under the auspices of Śiśunāga and assigned to the first half of the seventh century B.C., has thus been ascribed to a date which is more than a century later than that of the latest sections of the work according to the most moderate estimate. If this has to be accepted, the admittedly later sections of the first and tenth *Maṇḍalas* would have to be assigned to a still later date. This seems to be improbable in view of the fact that even the latest sections of the *Rgveda* are considered several centuries older than the age of the Buddha (sixth-fifth century B.C.). Again, according to the same moderate estimate the *Brāhmaṇas* were composed in *circa* 800–600 B.C. The *Śatapatha*, which is one of the earlier *Brāhmaṇas*, can hardly be assigned to a date later than 700 B.C., although, if Mr. Deb's theories are accepted, this work, mentioning some Egyptian, Assyrian, Babylonian and Indian kings 'who flourished early in the seventh century B.C.', has to be ascribed to a date not much earlier than 650 B.C. Mr. Deb possibly does not suggest that the author of the *Śatapatha Brāhmaṇa* travelled as far as Egypt in the west; but the fact that no other ancient Indian work has been proved to mention so many kings of distant countries would certainly go against his conjectures.

While it is highly improbable to believe that the entire ninth *Maṇḍala* of the *Rgveda* and the *Śatapatha Brāhmaṇa* were composed after 700 B.C., as suggested by Mr. Deb, it is practically impossible to agree with the view that king Śiśunāga of Magadha flourished in the first half of the seventh century B.C.

There are two conflicting traditions regarding the date of Śiśunāga in relation to that of the Magadhan king Bimbisāra who was an older contemporary of the Buddha. According to one of the Puranic statements (cf. Pargiter, *The Puranic Text of the Dynasties of the Kali Age*, pp. 20-21), Bimbisāra was the fifth king of the dynasty founded by Śiśunāga, while, according to the Ceylonese chronicles (cf. Geiger, *Mahāvaṃsa*, translation, p. xli), Śiśunāga succeeded a Magadhan king who was sixth in descent from Bimbisāra. Roughly speaking, therefore, the above Puranic statement would place Śiśunāga about a century *before* Bimbisāra, while the Ceylonese chronicles place him about a century *after* the same Magadhan king. That however the Puranic tradition about Śiśunāga being the fifth ancestor of Bimbisāra is wrong and that the Ceylonese tradition making the former a contemporary of the sixth descendant of the latter is right are suggested by other traditions recorded by the Purāṇas themselves.

In the first place, the Purāṇas (cf. Pargiter, *op. cit.*, pp. 18-21) represent Śiśunāga as having ruled after the five kings of the Pradyota dynasty of Avanti, who together reigned for 138 years. He seems to be made a contemporary of the latest Pradyota king. Now the Pradyota dynasty was founded by king Caṇḍa-Pradyota-Mahāsena who was a contemporary of king Bimbisāra and his son Ajātaśatru as well as of the Buddha. According to the *Majjhima-nikāya* (III, 7), Ajātaśatru once fortified Rājagṛha because of his fear of an invasion of his capital by Pradyota. Thus this Puranic tradition would place Śiśunāga about a century after Pradyota and therefore also after the latter's contemporaries Bimbisāra and Ajātaśatru of Magadha. This also suits the story of the expansion of Magadha under these rulers. Bimbisāra conquered Aṅga; Ajātaśatru conquered North Bihar and humbled the power of the Kosala king; Śiśunāga extended his power towards the west by humbling the power of the Pradyota house of Avanti. There is another Puranic tradition (cf. Pargiter, *op. cit.*, p. 21) that Śiśunāga placed his son at Vārāṇasī and made Girivraja his own abode. This seems to suggest that, at the time of Śiśunāga's accession to the Magadhan throne, Vārāṇasī formed a part of the kingdom of Magadha and that Śiśunāga was, prior to his accession to the throne, the Magadhan governor of Vārāṇasī. This state of things was possible only sometime after, and not before, the age of Bimbisāra and Ajātaśatru, during which the district round Vārāṇasī, an independent kingdom in earlier times, formed a part of the kingdom of Kosala, and a Kāśīgrāma, indicating a village or a group of villages in that district, was given by the Kosala king to the Magadhan queen as her bath money (cf. Ray Chaudhuri, *Political History of Ancient India*, 1938, p. 170). Ajātaśatru partially humbled the king of Kosala, who had confiscated the Kāśīgrāma after Bimbisāra's death, by compelling him to give back the village. But the annexation of the district round Vārāṇasī to Magadha seems to be due to one of Ajātaśatru's successors. Since therefore Śiśunāga appears to have flourished in an age when Vārāṇasī formed a part of Magadha, he apparently flourished considerably after Bimbisāra and Ajātaśatru.

The Ceylonese tradition as to Śiśunāga flourishing about a century after Bimbisāra and Ajātaśatru is supported also by other evidences. According to a Burmese tradition which probably comes from Ceylon (cf. Geiger, *op. cit.*, p. xliii; Rhys Davids, *Buddhist Suttas*, S.B.E., XI, p. xvi), Śiśunāga's son transferred his capital from Rājagṛha to Pāṭaliputra. Now Rājagṛha was a new city built by Bimbisāra in the suburbs of Girivraja, the old capital of Magadha. If therefore Śiśunāga's son was at first living at Rājagṛha, he and also his father must have flourished sometime after the foundation of the new city by Bimbisāra. Then again the city of

Pāṭaliputra was founded, according to the Purāṇas, by Ajātaśatru's son and successor Udayin in his fourth regnal year (cf. Pargiter, *loc. cit.*). The Jain *Pariśiṣṭaparvan* (cf. Geiger, *loc. cit.*) also says that Udayin transferred his residence from Rājagṛha to Pāṭaliputra. This city was built on a village called Pāṭaligrāma where, according to the *Mahāvagga* (cf. Raychaudhuri, *op. cit.*, p. 171), Ajātaśatru's ministers Sunīdha and Vassakāra are known to have built a fort in order to repel an attack of the Vṛjis of North Bihar. Now, if Śiśunāga's son ruled at Pāṭaliputra, he must have flourished sometime after the foundation of that city by a successor of Ajātaśatru.

According to a statement in the *Mālālaṅkāravatthu* (cf. S.B.E., XI, p. xvi), Śiśunāga made Vaiśālī his capital and from that time Rājagṛha 'lost her rank of royal city which she never afterwards recovered'. Thus Vaiśālī formed a part of the Magadhan kingdom during Śiśunāga's rule. But we know that, in the days of Bimbisāra, Vaiśālī was the capital of the independent Vṛji confederacy and that it was Ajātaśatru who humbled the power of that confederacy and annexed parts or the whole of North Bihar to Magadha. The Magadhan king who made Vaiśālī his abode must have flourished *after* the Magadhan monarch who annexed Vaiśālī to Magadha. This shows therefore that Śiśunāga flourished considerably after Bimbisāra and Ajātaśatru. The Buddhist tradition that the second Buddhist council was held at Vaiśālī during the reign of Śiśunāga's son also supports the evidence of the *Mālālaṅkāravatthu*. Moreover, the statement that Rājagṛha lost for ever its position as a royal city during Śiśunāga's rule apparently points to a date considerably later than the age of Bimbisāra and Ajātaśatru, when it was the capital of Magadha. It is clear that Udayin, son of Ajātaśatru, removed the capital from Rājagṛha to Pāṭaliputra newly built by him; then Śiśunāga once again made Girivraja (old city near Rājagṛha) his abode, although he later transferred his capital to Vaiśālī; next Śiśunāga's son, who had probably been staying at Rājagṛha as *yuvarāja*, removed his headquarters to Pāṭaliputra after his father's death.

The above discussions will show that the Puranic statement as to Śiśunāga flourishing about a century before Bimbisāra is not only contradicted by various Buddhist traditions but also by other statements of the Purāṇas themselves. On the other hand, the Ceylonese tradition placing Śiśunāga about a century after Bimbisāra is supported amongst others by certain traditions recorded in the Purāṇas. It is also interesting to note that the chronology of the houses of Bimbisāra, Śiśunāga, Nanda and Candragupta, as given in the *Mahāvaṁsa* agrees with several known facts of Indian history. According to the *Mahāvaṁsa* (cf. Geiger, *op. cit.*, p. xli), Bimbisāra ruled for 52 years; his son Ajātaśatru for 32 years; his son Udayin for 16 years, his son Anuruddha and grandson Muṇḍa for 8 years; Muṇḍa's son Nāgadāsaka for 24 years; his *amātya* Śiśunāga for 24 years; his son Kālāśoka for 28 years; his ten sons for 22 years; the nine Nandas for 22 years; Candragupta for 24 years; his son Bindusāra for 28 years; his son Aśoka for 37 years. The same work also records three important traditions: that the Buddha died in the 8th regnal year of Ajātaśatru (II, 32); that at the end of the 10th regnal year of Śiśunāga's son a century had gone by since the Buddha's death (IV, 8); and that 218 years had passed from the Buddha's death unto Aśoka's coronation. Now the most reliable tradition about the date of Buddha's death is 486 B.C. supplied by the Cantonese dotted record of 489 A.D. taken from India to China by Saṅghabhadra (cf. Raychaudhuri, *op. cit.*, p. 184), although scholars now usually accept the date 483 A.D. proposed by Fleet and Geiger (*J.R.A.S.*,

1909, pp. 1–34; Geiger, *op. cit.*, p. xxviii).   Thus the following chronology of the Magadhan rulers is suggested.

King	Reign-period	
	(According to 486 B.C. as date of the Buddha's death.)	(According to 483 B.C. as date of the Buddha's death.)
Bimbisāra	546–494 B.C.	543–491 B.C.
Ajātaśatru	494–462 ,,	491–459 ,,
Udayin	462–446 ,,	459–443 ,,
Anuruddha and Munda	446–438 ,,	443–435 ,,
Nāgadāsaka	438–414 ,,	435–411 ,,
Śiśunāga	414–396 ,,	411–393 ,,
Kālāśoka	396–368 ,,	393–365 ,,
Ten sons of Kālāśoka	368–346 ,,	365–343 ,,
Nine Nandas	346–324 ,,	343–321 ,,
Candragupta	324–300 ,,	321–297 ,,
Bindusāra	300–272 ,,	297–269 ,,
Aśoka	272–235 ,,	269–232 ,,

The above chronology based on the Ceylonese traditions agrees remarkably with the following known facts of history: that the last Nanda king was on the throne of Magadha when Alexander was leading his Indian expedition in 327–324 B.C.; that Candragupta, a younger contemporary of Alexander, ascended the Magadhan throne shortly after the Greek king's departure from India; and that Aśoka was a contemporary of Antiochus II Theos of Syria and Western Asia (261–246 B.C.), Ptolemy II Philadelphus of Egypt (285–247 B.C.), Magas of Cyrene (*circa* 285–258 B.C.), Antigonas Gonatas of Macedonia (277–239 B.C.) and Alexander of Epirus (272—*circa* 255 B.C.) or of Corinth (252—*circa* 244 B.C.).   The probable course of the gradual expansion of Magdha, under Bimbisāra, Ajātaśatru, Śiśunāga, Mahāpadma-Nanda, Chandragupta and Aśoka, from a small state in the Patna-Gaya region of South Bihar to a gigantic empire covering the major part of India and Afghanistan should also be borne in mind in this connection.

To ignore all the above facts in believing that the Purāṇas have rightly placed Śiśunāga about a century before Bimbisāra is impossible in the present state of our knowledge, especially in view of the fact that the above Puranic statement is not supported by any evidence worth the name excepting absolutely unwarranted conjectures.

THE CONFLUENCE OF THE GAṄGĀ AND THE YAMUNĀ.

By R. C. MAJUMDAR, M.A., PH.D., F.R.A.S.B.

The Rāmāyaṇa gives a detailed account of the journey of Rāma from the city of Ayodhyā, on the Sarayū, to the Citrakūṭa mountain where he proposed to stay during his life of exile for 14 years.[1] From Ayodhyā he proceeded towards the south and, having crossed successively the four rivers known as Tamasā, Vedaśruti, Gomatī and Syandikā, reached the bank of the Gaṅgā at Śṛṅgaverapura. Of these rivers the Tamasā, or the Eastern Tons, and the Gomatī are well known, and the Syandikā is undoubtedly the modern Sai. The Vedaśruti must have been a rivulet flowing between the Tons and the Gumti and may be easily identified with the Bisui river.[2] Rāma crossed the Gaṅgā in a boat and went to the hermitage (*āśrama*) of Bharadvāja, situated at the *saṅgama* (confluence) of the Gaṅgā and Yamunā.

So far the itinerary is quite clear, but then the difficulty begins. Rāma decided to fix his residence at Citrakūṭa mountain whose distance and bearing from the hermitage or *saṅgama* was given by Bharadvāja. According to his advice Rāma started in the morning, crossed the Yamunā by means of a raft, and then walked for a *krośa* (i.e. about two miles) along the bank of the river, till he arrived at a forest where he hunted animals and roamed at leisure. Having spent the night in a small clearing on the bank of the river, he started next morning. After walking along the southern bank of the Yamunā towards the west for a short distance, he turned south [3] and arrived at Citrakūṭa before dusk. The distance between the *saṅgama* and the Citrakūṭa is expressly said to be 10 *krośa* in one place and 2½ *yojanas* in another,[4] both meaning about 20 miles,[5] and Rāma covered it in less than two days.

Now Citrakūṭa is usually identified with the mountain of the same name, in the Banda District, U.P., about 20 miles N.N.E. of Kalinjar. Apart from the identity of name, this identification is further supported by the fact that the river Mandākinī, which flows near modern Citrakūṭa,

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[1] Bombay Edition, Canto II, Chs. 45-56. The same itinerary, with some additional details, is given in connection with Bharata in Chs. 83-93. The subject has been treated by Pargiter in *JRAS.*, 1894, pp. 231ff., and his conclusions are radically different from mine. This is mainly due to the fact that he has confined himself exclusively to Gorresio's text, which is palpably faulty, and wrongly interpreted some of its passages. I have discussed his views in detail in an Appendix to this paper.

[2] As will be shown in the Appendix, this river was at first identified by Pargiter with the Chaukā, a tributary of the Gogrā, 50 miles above Ayodhyā. But later he evidently gave it up, for he says 'that the river has not hitherto been identified' (Eng. Tr. of *Mārkaṇḍeya Purāṇa*, p. 293). I think we can easily identify it with the Bisui river. Its geographical position between the Tons and the Gumti, and the easy derivation of Bisui from Vedaśruti (Vedsuti—Vedsui—Vidsui—Bisui) support this identification.

[3] *Rāmāyaṇa*, II. 92, 13.

[4] *Rāmāyaṇa*, II. 54, 28; II. 92, 10. Gorresio's text has 3 *yojanas* in the former passage (Ch. 54, v. 29) but 2½ *yojanas* in the latter (Ch. 101, v. 11). We have thus another evidence of its unreliable character.

[5] For *Krośa* and *Yojana* cf. *JRAS.*, 1894, pp. 237-8. I have taken the standard meaning of *yojana* as equivalent to 8 or 9 miles (cf. Apte's Dictionary).

evidently represents the Mandākinī river which, according to Rāmāyaṇa,[1] flowed to the north of Citrakūṭa. But then the distance of this Citrakūṭa from the confluence of the Gaṅgā and the Yamunā, i.e. Allahabad, is about 65 miles. This is nearly three times the distance which is specifically stated in the Rāmāyaṇa and indirectly corroborated by the fact that Rāma covered it in two days.

In view of the fact that the itinerary given in the Rāmāyaṇa has otherwise proved to be fairly accurate [2] we cannot lightly dismiss this particular statement about the distance which is referred to in different words in two different and widely separated passages. We must, therefore, conclude that either the *saṅgama* of the Gaṅgā and Yamunā was much further to the west in those days, or the identification of Citrakūṭa is wrong.

Let us now consider the probability of either of these. It has been tacitly accepted that from time immemorial Allāhābād has been the site of the confluence of the Gaṅgā and the Yamunā. There is no real ground for this supposition, particularly as we know that in some cases the site of such confluence has been considerably shifted within historical times. We know, for example, that the ancient city of Pāṭaliputra (Pāṭnā) was situated at the confluence of the rivers Son and Gaṅgā. But today the Son falls into the Gaṅgā more than twenty miles above Pāṭnā. Even the course of the Gaṅgā just below Allāhābād shifted considerably in comparatively recent times.[3] The site of the confluence of the Gaṅgā and Yamunā also might have, therefore, been shifted from time to time. Apart from general surmises on the analogy of other rivers, we have also some positive evidence in support of such shifting.

Hiuen Tsang says that from Prayāga, at the junction of the Gaṅgā and the Yamunā, he proceeded to Kauśāmbī. For this purpose he had to go south-west, through a forest infested by wild elephants and other fierce animals, for 500 li (about 100 miles). The same distance and direction are also given in the 'Life of Hiuen Tsang,' and this is corroborated by the further statement, in another part of the same book, 'that the pilgrim on leaving Prayāga, journeyed south-west through a jungle for seven days to Kauśāmbī'.[4]

Now as Kosam, which represents the ancient city of Kauśāmbī, is only about 30 miles due west from Allāhābād, scholars at first located Kauśāmbī somewhere in Bāghelkhand.[5] But it is now almost universally accepted

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[1] II. 92, 11; 95, 1. Cf. also *Raghuvaṁśa*, XIII. 48. A river Mālyavatī is also mentioned as flowing near Citrakūṭa in the Bombay Edition (*Rāmāyaṇa*, II. 56, 35), but Gorresio's Text (56, 33) has Mandākinī instead. For the identification of Citrakūṭa cf. *ASR.*, XXI (10–12); XIII (42–54); *JRAS.*, 1894, p. 240. The Mandākinī stream is a tributary of the Paisuni and flows at the distance of a mile from Citrakūṭa hill, but the local Paṇḍits give the name Mandākinī to what is now generally known as Paisuni river (*U.P. District Gazetteer*, Vol. XXI, pp. 17, 224). ●

[2] Rāma is said to have reached the Gaṅgā from the bank of the Tamasā in a single day and a few hours of the night in a chariot, and this is quite reasonable for a distance of about 60 miles. Each stage of journey is indicated, and the place where Rāma spent each night is also mentioned. The distance of 20 miles between Prayāga and Citrakūṭa was covered by Rāma on foot in two days. This is also quite reasonable. Whatever we might think of Rāma's story, there is no doubt that the writer of the passage had an accurate knowledge of the locality and tried to draw as realistic a picture of the journey as possible.

[3] Referring to the course of the Gaṅgā below Allāhābād the *Allahabad District Gazetteer* says: 'The changes in this portion of the river are very great, and near the mouth of the Tons, in the extreme north of Meja and at several other places, there are old beds of the river at a considerable distance from the present channel' (p. 8).

[4] Watters, I. 366; Beal, I. 234; Life, 90-91.

[5] V. A. Smith in *JRAS.*, 1898, p. 503.

that the ruined village of Kosam actually represents the site of Kauśāmbī. No one has, however, even hinted at the logical conclusion that unless we definitely reject, for no reason whatsoever, Hiuen Tsang's specific statement of the distance and direction of Kauśāmbī from Prayāga, supported by the detailed account of his journey[1], we must locate the confluence of the Gaṅgā and the Yamunā about 70 miles further to the east by north of Allāhābād.   In any case Hiuen Tsang's statement certainly opens up the possibility that the site of the *saṅgama* or the confluence of the Gaṅgā and the Yamunā has shifted considerably to the west during the last thirteen centuries, though the name Prayāga has been associated with it all the time.[2]   If we bear this in mind, we shall be less inclined to reject the testimony of the Rāmāyaṇa to the effect that the site of Prayāga-*saṅgama* was 30 or 40 miles to the west of Allāhābād, about 1,000 years or more before the time of Hiuen Tsang.   The shifting of the bed of the Gaṅgā in still earlier times may be inferred from the statement in the Purāṇas that 'when the city of Hastināpura was carried away by the Gaṅgā, the Kuru king Nicakṣu transferred his capital to Kauśāmbī'.[3]   As the ruins of ancient Hastināpur lie on an old bed of the Gaṅgā, there was a further shifting of the bed since the time of Nicakṣu.

The Rāmāyaṇa itself supplies another evidence that the course of the Gaṅgā shifted in the region near Allāhābād. As noted above, Rāma is said to have crossed the Gaṅgā at Śṛṅgaverapura.   This place has been identified by Cunningham with Singror or Sringiverapura, built on a very high bluff, 22 miles to the north-west of Allāhābād.   Once the Gaṅgā flowed by this cliff and undermined its southern face.   The river then deserted the place and only a small branch now passes under Singror in the wide channel where the old stream of the Gaṅgā once swept along.[4]

But apart from this evidence about the change in the course of the Gaṅgā, the identification of the Śṛṅgaverapura with Singror throws interesting light on the identification of Prayāga-*saṅgama*.   It appears from the description in the Rāmāyaṇa that the hermitage of Bharadvāja at the confluence of the Gaṅgā and the Yamunā was not very far from the landing place on the Gaṅgā, opposite Śṛṅgaverapura.   As a matter of fact it is said to be about a *krośa* or 2 miles, though the path lay through

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[1] Dr. B. C. Law tries to reconcile Hiuen Tsang's statement with the actual fact by suggesting that the 'pilgrim went to the country of Kauśāmbī by a round-about way instead of going straight by a short-cut from Prayāga to the city of Kauśāmbī' (*Kauśāmbī in Ancient Literature*, p. 7).   But even if we hold that Kauśāmbī was at the eastern extremity of the country of the same name, Hiuen Tsang could have hardly avoided entering the Kauśāmbī country after a journey of thirty miles or so, unless he deliberately avoided the border of this kingdom in order to complete an useless round-about course of about 100 miles through a 'great forest infested with savage beasts and wild elephants' extremely dangerous to travellers.   Besides, no one in his senses would have avoided a short-cut of thirty miles to the capital city, which was obviously his main objective, and preferred to follow instead a round-about way through a wild and dangerous forest three times that distance.

[2] It seems that Prayāga was the general name of the *saṅgama* or of the whole region in the neighbourhood, though the city on the site was known by other name. Thus according to Harivaṁśa (XXVI. 49) Pratiṣṭhāna, the capital city of Purūravas, was also called Prayāga or was situated in the province of Prayāga.   It is interesting to note in this connection that the Payāga is mentioned, along with the Sarasvatī, in *Majjhima-Nikāya* (I, p. 39) as one of the seven sacred rivers of India.   This river name may have something to do with the name of the *saṅgama* known as Prayāga.

[3] *Dyn. Kali Age*, by Pargiter, p. 5.

[4] *ASR.*, XI. 62.   But according to the *Allahabad District Gazetteer* (p. 300), 'the deep stream now again flows under the cliff which rises to a height of 100 feet above the water.'

dense forest, called Prayāga-*vana*.[1]   According to a verse in the Rāmāyaṇa,
which occurs both in Bombay edition (Chap. 89, v. 21) and Gorresio's text
(Chap. 97, v. 27), Prayāgā-*vana* was just on the other side of the Gaṅgā.
But Gorresio's text has another chapter, immediately following, which is
altogether wanting in the Bombay edition.   V. 6 of the chapter says that
the hermitage of Bharadvāja was about a *krośa* from the Prayāga-*vana*,
but v. 18 adds that Bharata proceeded for 1½ *yojana* before he reached
Prayāga-*vana*.   This self-contradictory passage occurring in a chapter
which is altogether wanting in the other edition, and absolutely redundant
so far as the main narrative is concerned, must be regarded as spurious.
It may be even suspected that the passage was a later addition in order to
reconcile the actual distance of Śṛṅgaverapura from the confluence of the
Gaṅgā and Yamunā at Allāhābād.

In any case, if we accept only the passages authenticated by both the
editions, and the identification of Śṛṅgaverapura with Siṅgror, we must
hold that the Yamunā met the Gaṅgā, almost opposite this place, i.e. at a
point about 20 miles above Allāhābād.   This would considerably reduce
the distance between the *saṅgama* and Citrakūṭa.   Further, as Rāma is
said to have proceeded south after crossing the Gaṅgā, it probably flowed
in a more southerly direction than at present before reaching the Yamunā.
If we presume that the Yamunā, too, had a more southerly course, and the
hermitage of Bharadvāja was at a short distance to the west of the con-
fluence, the actual distance between it and Citrakūṭa might not be widely
different from what is recorded in the Rāmāyaṇa.

So far we have considered the possibility of the confluence of the
Gaṅgā and Yamunā being situated at a distance from Allāhābād.   We
may now consider the other alternative, viz. the probability that there
was a Citrakūṭa mountain nearer Allāhābād.   As already observed, the
present Citrakūṭa mountain not only bears the same name, but the river
Mandākinī flows near it as stated in the Rāmāyaṇa.   There is thus a strong
case in favour of the identification, and besides, no other mountain named
Citrakūṭa is known to us.   There is, however, one detail in the account
of the Rāmāyaṇa which throws some doubt on the identification.   It is
said that on reaching Citrakūṭa Rāma first visited the hermitage of Vālmīki.[2]
Now, both at the beginning and at the end of the Rāmāyaṇa,[3] the hermitage
of Vālmīki is said to be situated near the confluence of the Gaṅgā and the
Tamasā (S. Tons).[4]   Can we therefore locate Citrakūṭa also in the same
region ?   This satisfies the distance as recorded in the Rāmāyaṇa, viz.
10 *krośa* or 20 miles, from the present confluence of the Gaṅgā and the
Yamunā.   But the direction would be all wrong.   For according to the
Rāmāyaṇa, Rāma, after crossing the Yamunā, proceeded to the west along
the bank of this river, whereas the confluence of the Gaṅgā and Tamasā
being to the east of the confluence of the Gaṅgā and Yamunā, Rāma could
not possibly reach it by following the course of the last named river.

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[1] In Ch. 89, v. 22, it is said that on arriving at Prayāga-*vana*, Bharata left behind
his troops and proceeded towards Bharadvāja's hermitage.   In Ch. 90, v. 1, we are
told that the troops were stationed at a distance of one *krośa* from the hermitage.
The dense forest is referred to in Ch. 54, v. 2.

[2] *Rāmāyaṇa* II. 56, 16.

[3] I. 2, 3; VII. 57, 3.

[4] Pargiter holds that the hermitage of Vālmīki was on the Tamasā (E. Tons)
which Rāma had crossed on his way from Ayodhyā to Prayāga (*JRAS.*, 1894, 235).
But it is distinctly stated in *Rāmāyaṇa* VII, Ch. 57, that Lakshmaṇa crossed the
Gaṅgā while taking out Sītā to Vālmīki's hermitage for banishment.   This view is also
followed by Kālidāsa in *Raghuvaṁśa* (XIV. 52).   The Tamasā, on the bank of which
Vālmīki's hermitage stood, must therefore be the E. Tons.

Pargiter, while accepting the identification of Citrakūṭa with the modern hill of that name, has tried to explain away the discrepancy between its present distance from Allāhābād and the statement in the Rāmāyaṇa. In his opinion 'Citrakūṭa would be the range of hills stretching from the river Ken to about twenty miles of Allāhābād. Rāma would strike the eastern end of the chain, which would be, as Bharadvāja says, south with a westerly trend from Prayāga. This distance, too, would agree with the two-and-a-half or three *yojanas* mentioned by him, and suit the two days' journey which Rāma with Sītā spent in traversing it. Reaching that end they would have travelled along the chain and no doubt hermits were scattered along it, and not collected on one single hill. In later times the name may have become restricted to the single hill now called Chitra-kut'.[1]

This explanation appears plausible enough, as there is a distinct and continuous range of hills known as Vindhyāchal range, with an average elevation of about 500 ft. above the lower plateau, stretching from modern Citrakūṭa up to about 20 miles of Allāhābād. But there is one important detail which Pargiter has ignored. Bharadvāja said to Bharata that Rāma was living at a distance of about 2½ *yojanas*, in Citrakūṭa hill, to the north of which flows the Mandākinī, and his cottage was on the other side of that river. The three verses referring to it occur both in Bombay edition (Chap. 92, vv. 10–12) and in Gorresio's text (Chap. 101, vv. 11–13), and may therefore be regarded as genuine. Now the river Mandākinī which flows by the Citrakūṭa hill of the present day must be taken to be the Mandākinī river, and as such it must be located about 2½ *yojanas* or 20 miles distant from the *saṅgama*, though it is really 65 miles from Allāhābād. Thus Pargiter's explanation does not really reconcile the present position of the Gaṅgā-Yamunā-*saṅgama* with its distance from Rāma's hermitage on the Citrakūṭa hill as recorded in Rāmāyaṇa.

There is thus a strong case in favour of the view that the confluence of the Gaṅgā and the Yamunā has shifted both to the east as well as to the west over a considerable distance during the historical period. There is nothing to be surprised at this, for the rivers in the Panjāb are also known to have similarly shifted their beds and, as noted above, the confluence of the Son and the Gaṅgā has shifted more than 20 miles since the days of Candragupta Maurya. If we do not accept this natural possibility, we have to suppose that the author of the Rāmāyaṇa, who is otherwise accurate, made a serious mistake only on this point, and Hiuen Tsang made a deliberately false statement. Of these different alternatives it is perhaps wiser to accept, at least as a provisional hypothesis, that the confluence of the Gaṅgā and the Yamunā has shifted from time to time.

APPENDIX

The Geography of Rāma's exile

In tracing Rāma's journey from Ayodhyā to the bank of the Gaṅgā Pargiter (*JRAS.*, 1894, pp. 231ff.) has exclusively relied on Gorresio's text. It is therefore necessary to compare it with the corresponding passages in the Bombay edition in order to find out the differences between the two and, if possible, to evolve a correct text. In making this comparison, we shall ignore differences in words and phraseology which do not materially affect the sense, and confine our attention to the sequence of events in the journey which have a bearing upon the route followed by

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[1] *JRAS.*, 1894, p. 239.

him. The Bombay edition and Gorresio's text will be referred to respectively as B and G, and the chapters (all in Ayodhyākāṇḍa) and verses will be indicated by Roman and Arabic numerals. Rāma, including his two companions, will be referred to as R.

1. R. reaches Tamasā river and spends there the first night of his exile along with the people of Ayodhyā who followed him (B. XLVI, 1–17; G. XLIV, 1–17).

2. R. decided to leave before the night was over, and while the people were yet asleep, in order to avoid them (*Ibid.*, 18–24).

3. R. asked Sumantra to get the chariot ready, and this being done, crossed the Tamasā (B. 25–29). These verses are wanting in G.

4. R. told Sumantra that in order to put the people off his track he should drive the chariot quickly towards the north, and return after a moment in such a way that the people of Ayodhyā may not follow his movements. Sumantra did so and brought back the car to R. (after a short detour) (B. 30–32; G. 25–27).

After this G. adds two verses (28-29) corresponding to B. 28-29, stating that R. crossed the Tamasā.

Thus B. and G. closely agree,—only G. omits B. 25–27. (R.'s conversation with Sumantra) and puts B. 28-29 (crossing of the Tamasā) after, instead of before, B. 30–32 (asking Sumantra to return after a short detour to the north). The effect of this change is that according to B., R. first crossed the Tamasā and then asked Sumantra to make the detour, whereas according to G., R. crossed the Tamasā after the detour. There is no doubt that G. is faulty, as such a movement would defeat the very object R. had in view, viz. to leave the place before the people of Ayodhyā awoke. It is quite clear that R. crossed the Tamasā first, and then adopted the trick of detour to the north so that the people on the other bank might think that he was proceeding to the north, and not towards the south as he really intended. (It is interesting to note that although Pargiter followed G. he makes R. cross the Tamasā before proceeding north.)

5. The story of Rāma's journey is resumed in B. XLIX and G. XLVI. The first two verses, which are common, tell us that R. proceeded very far during the remaining hours of the night. B. then gives the description of the villages passed through in vv. 3ff. In between the two G. inserts two verses (3-4) which read as follows:—

> *Taṁ syandanam = adhiṣṭhāya sa-bhāryaḥ saparicchadaḥ |*
> *Śrīmatīm = ākulāvartām = atarat = tāṁ mahānadīm ǁ 3*
> *Tām = uttīrya mahābāhuḥ Śrīmac-chivam = akaṇṭakaṁ |*
> *Prapede sa mahā-mārgam=anurūpaṁ śivaṁ śubhaṁ ǁ 4*

These verses, which Pargiter has taken to mean that R. crossed the river Śrīmatī Mahānadī, are wanting in B. That they are interpolations would clearly follow from a comparison of these with G. XLIV, 28-29 which read as follows:—

> *Taṁ syandanam=adhiṣṭhāya Rāghavaḥ saparicchadaḥ |*
> *Śīghraṁ tām=ākulāvarttām=atarat=Tamasā-nadīm ǁ 28*
> *Saṁtīrya ca mahābāhuḥ Śrīmac-chivam=akaṇṭakam |*
> *Prapede Tamasāmārgam=abhayaṁ kṣemadarśanam ǁ*

There is hardly any doubt that through some error these two verses of G. XLIV have been repeated, with slight alterations, in G. XLVI; originally perhaps a copyist's mistake, it was later amended to suit the new context. This follows not only from close verbal agreement between the two, but

also from the significant pronoun *taṁ* (that) which occurs at the very beginning. In the earlier chapter this pronoun was very appropriate because the verse immediately preceding mentions the '*syandana*' (chariot) brought back by Sumantra. But in the later chapter there was no reference to any such '*syandana*', and therefore '*taṁ syandanam*' (that chariot) is meaningless. It would then follow that the two additional verses (3-4) in G. XLVI wanting in B., which otherwise closely agrees with the former, must be rejected, and that Śrīmatī Mahānadī, far from being the name of a river which R. crossed, really refers to the Tamasā.

6.   R. then crossed the river Vedaśruti (B. XLIX. 9; G. XLVI. 10), and proceeding south, crossed the Gomatī (B. 10; G. 11) and another river, named Syandikā in B. 11 and Sarpikā in G. 12. There is hardly any doubt that these two refer to the same river and may be variants of the same name.

7.   R. then reached the Gaṅgā in the evening and stayed at night at Śṛṅgaverapura as the guest of its king Guha, an old friend. (B.L. 12, 26, etc.; G. XLVI. 19, XLVII. 2, etc.).

We are now in a position to discuss the itinerary of Rāma as propounded by Pargiter. After describing Rāma's journey to the bank of the Tamasā, Pargiter continues: 'He was followed thither by the citizens, and to escape them he crossed the river at night with his chariot and gained the Tamasā road' and went northwards. .Proceeding in the new direction he would reach the river Sarayū or its western tributary called now the river Chaukā. The poem says he reached the Śrīmatī Mahānadī. These words appear peculiar as the name of a river. There seems to be no river called the Śrīmatī . . . . . This double name therefore probably means the Sarayū which Rāma would naturally reach . . . . (Next) Rāma crossed the great river Vedaśruti . . . . . The only stream with which it seems identifiable is the modern river Chaukā. After crossing it Rāma resumed his original course and turned southwards. He reached the Gomatī and crossed it probably a little below the modern Lucknow . . . . . The next river which he reached, the Sarpikā, would be the modern Sai . . . . He would have crossed it probably about twenty-five or thirty miles below Rai Barelly, where a road north from Śṛingavera-pura would naturally run' (*JRAS.*, 1894, pp. 235-6).

It will be seen at once that this elaborate theory rests solely on the assumption that after crossing the Tamasā Rāma proceeded north till he reached the Sarayū at a point 50 miles or more above Ayodhyā. He crossed and recrossed the Sarayū—for no purposes whatsoever—and then crossed the Chaukā. All these he could easily have avoided by simply following the western bank of the Sarayū and the Chaukā. Such a course would be fantastic in any case, and particularly so in view of the fact that the ultimate goal of Rāma's journey was the bank of the Gaṅgā on the south. It would also defeat the very object he had in view, viz. to evade the citizens of Ayodhyā. But, there is absolutely no warrant for the assumption that Rāma went north. Pargiter refers to vv. 25-29 of Chap. XLIV of Ādikāṇḍa in support of his view. Ādikāṇḍa is obviously a slip for Ayodhyākāṇḍa. But vv. 25-29 of Chap. XLIV clearly state that at Rāma's direction Sumantra only took the chariot to the north and returned in a moment. It was then that Rāma got into the chariot. So Rāma did not at all proceed towards the north, far less went as far as the Chaukā river.

This one error of Pargiter led to others. Although he admits that Śrīmatī Mahānadī was a peculiar name and no such river was known, he still identifies it with the Sarayū. As we have shown above, the passage

in G. Text containing this name is an interpolation, and Rāma did not cross any such river. As regards Vedaśruti Pargiter identifies it with the Chaukā, but as pointed out above, the Bisui is not only a regular derivation from Vedaśruti, but its position between the Tamasā and the Gomatī exactly corresponds to the statement in the Rāmāyaṇa that Rāma successively crossed these three rivers.

Thus the initial error of taking Rāma far towards the north has forced Pargiter to suggest identifications of Śrīmatī Mahānadī (a river that probably does not exist) and the Vedaśruti which are not supported by any evidence. These errors are again responsible for taking Rāma to Lucknow. It seems quite clear, on the other hand, that Rāma followed the direct southern route roughly corresponding to the present road running along the Railway line in the Fyzabad-Allahabad section of the East Indian Railway. It may be presumed that he crossed the four rivers,—Tons, Bisui, Gumti and Sai—respectively at or near Bharat Kund, Khajurahat, Sultanpur, and Partabgarh stations of that section. The route proposed by Pargiter would cover a distance of about 170 miles from the bank of the Tamasā to Prayāg, as against the direct route of 60 miles suggested by me. The fact that Rāma had made the whole journey in a single day and probably an hour or two of the previous night, is by itself sufficient to repudiate the view of Pargiter, for we can hardly believe that even a fast chariot can cover a distance of 170 miles or so, including the crossing of four rivers, in about 14 or 15 hours. Pargiter's view must therefore be definitely rejected.

REVIEWS AND NOTICES OF BOOKS

THE RAJ GONDS OF ADILABAD: A Peasant Culture of the Deccan. Being Book I of Volume III of The Aboriginal Tribes of Hyderabad series: Myth and Ritual. By Christoph von Furer-Haimendorf in collaboration with Elizabeth von Furer-Haimendorf. Foreword by K. de B. Codrington. Macmillan & Co., Ltd., London, 1949. Pages xvii+449 with 90 illustrations, 33 drawings and four maps. Price Rs.20.

Prof. von Furer-Haimendorf is well known to anthropologists. For a number of years, as Adviser to H.E.H. the Nizam's Government, he was directly responsible for the welfare and administration of this particular group among whom he paid frequent and prolonged visits. He tells of his approach, the difficulties involved and the final winning of their confidence. He is therefore fully qualified to undertake the task to which he has set himself with insight and understanding. The book presents a balanced picture of aboriginal life. Prof. Furer-Haimendorf has no axe to grind. His work is on a solid foundation and he is not seeking to make a sensation. One seems to live in an altogether different climate from that of some recent monographs where certain aspects of primitive life seem greatly over-emphasized. There is evident an objectivity and scientific approach much needed in studies like this.

The Foreword by Dr. Codrington points out some of the pitfalls that anthropologists have fallen into due to inherited national points of view. He emphasizes the great need in India for careful studies of primitive groups before it is too late. 'The world is changing rapidly and India is changing with the world. Her hill and forest tribes are Indian in every sense of the word, and they cannot be left out of this change. They have a future not merely a past.' There is an urgent need to fill up the gaps in the ethnological knowledge of vast areas of India.

This book is a most valuable contribution to this knowledge. In the past the Gonds played an important part in Central India. 'No aboriginal people of India has attained greater prominence on the political scene of past centuries than the large groups of tribes commonly known by the generic term Gond.' They numbered 3,063,753 according to the 1931 census and the author calls them 'the premier aboriginal race of India'.

The volume under review is the first part of Vol. III of the series on the Aboriginal Tribes of Hyderabad. The second part is entitled 'Social Structure and Cultural Change' and is in preparation. This section will contain the Glossary and Index to both parts. It is a pity that an index is not printed with this volume. There are three parts to the book: the first tells of their material and cultural milieu, and covers pages 23–96. The illustrations and line drawings accompanying this and other sections are most helpful. No detail is overlooked. The next part of our book is called 'The Mythological Foundations of the Social Order'. This covers 209 pages in all. It contains a collection of myths and traditions dealing with the ancient history of their clans, the origins of the cult of clan deities and other important aspects of Gond life. He has 'attempted to arrange the myths . . . in such an order as will give as complete and coherent an account as possible of the traditions prevailing among the Gonds of Adilabad State'. Some of the myths deal with the birth of the Gond gods, their liberation and consequent actions. The myth of Jangu Bai which tells 'the full story

of this goddess' miraculous birth and her intervention in the fortunes of the primeval Gonds' also reveals 'other episodes in Gond mythology, not directly connected with Jangu Bai or her cult'. In the next chapter the long myth of Manko has the Gondi and English translation in parallel columns. Many other stories lend themselves to a proper understanding and evaluation of Gond society. There are many inconsistencies and variations and blending with alien elements, but it gives a picture of things as they are in Adilabad.

Part III, called 'The Annual Cycle' is magnificent. In three chapters, devoted respectively to the hot season, the rains, and the cool season, the author with great imagination and skill weaves the pattern of their lives and shows the blend of mythology, economics and daily living in a form that is intriguing. The pulse of rural India beats through it all and it is an authentic voice that is audible in its pages.

The book is well-worth owning. It is most readable, has been produced in a style that has so far seldom been equalled and is highly commended.

<div style="text-align: right">W. G. GRIFFITHS.</div>

INDIA: Ministry of Information and Broadcasting, Publications Division, Indian Art through the Ages. Delhi, 1948. Price Rs.3.

This small brochure, profusely illustrated, is intended to give a short survey of Indian art in its different manifestations from the earliest times to the modern days. It is divided into five sections, Sculpture, Bronzes, Painting, Textiles, and Modern Painting. Within this short conspectus the account in each section cannot but be sketchy. But what one feels on going through the book is a lack of balanced treatment in respect of the representative phases and schools in text as well as in illustrations. This is particularly noticeable in the section on sculpture. It is also difficult to understand why bronzes, representing only a different medium of sculptural expression, have been treated in a separate section instead of being included within that of sculpture. The section on painting has a more balanced account, but a specimen or two of the earlier phases would have made the section more illustrative. The section on textiles implies at least a reference to other forms of industrial arts, but such a reference is unfortunately lacking.

The reproductions are good and in spite of the above drawbacks, more or less inherent in a publication of this nature, the book is expected to serve as a useful and popular guide to the artistic achievements of India in their more important manifestations.

<div style="text-align: right">S. K. SARASWATI.</div>

ISLAMIC RESEARCH ASSOCIATION MISCELLANY. Vol. I. 1948. Published by Oxford University Press. Calcutta. 1949.

This is the first number of what promises to be a valuable series of occasional collection of studies on the different facets of Islamic civilization. The present issue contains papers by well-known scholars from all over the world. It would not do to single out contributors but there are important studies on, for example, a valuable old manuscript of Ibn Nadim's *Fihrist*, on ex-territorial capitulation enjoyed by Muslims in non-Muslim countries, on the Ismaili manuscripts in Hamburg Oriental Seminar, etc. A feature of the publication which may well be adopted by other learned societies in India is its multi-lingualism which enables scholars from non-English

speaking countries to present results of their studies to those workers in the field who do not wish to work in isolation.   A high standard of printing continues the tradition of Islamic Research Association's publications, but even that cannot justify the high price demanded for the issue.

<div align="right">A. B. M. HABIBULLAH.</div>

TREE-WORSHIP AND OPHIOLATRY.   By Vidvan G. Subramania Pillai, Senior Research Lecturer in Tamil, Annamalai University.   Annamalai University Publications, 1948.   Pages—vi, 1–102.

The brochure with a foreword by Shri R. Ramanujachariar, Professor of Philosophy, Annamalai University, deals with the topic of tree and serpent worship, mainly on the basis of numerous references to this practice found scattered in the Tamil Works of various periods.   It also tries to throw light incidentally on the inner significance of the multifarious rites and ceremonies associated with the cults of the tree and serpent. James Fergusson attempted long ago in his voluminous work, '*Tree and Serpent Worship in India*,' mainly on the basis of archaeological data that the people of Ancient India paid regular homage to trees and serpents. The interpretation of many of his data was found objectionable, for it was pointed out that the object of worship in many of the reliefs of Bharhut, Sanchi and Amaravati was not a tree or a serpent, but really the invisible Buddha symbolized by his Bodhi-vṛiksha with his Vajrāsana beneath it or Buddha (not shown) on his seat sheltered by the serpent Muchalinda.   But evidences were also not wanting that the Nāgas (serpents) in various forms and Yakshas mainly residing in different types of trees were held in high veneration by a large number of Indian people.   J. Ph. Vogel has shown in his monograph, *Indian Serpent Lore*, how the Nāga cult was well patronized in Mathura and other regions of India.   A. K. Coomaraswamy in his well-documented work, *The Yakshas*, Parts I and II, has referred occasionally to the different trees serving as the abodes of the Yakshas venerated by the general mass of the people.

The value of the work under notice is that its author has confined his attention to the Tamil land and the data collected by him from the Tamil texts throw an interesting sidelight on the subject.   He, however, does not refer to most of the works mentioned above where identical grounds were covered; he mentions Fergusson only by name without approving his conclusions. Readers should also be chary of accepting one of his hypothesis, which relates to the origin of the worship of Śiva-Liṅga.   He writes (pp. 86ff.) that the practice developed out of that of worshipping the Kanthu, the stump of a tree, so common in his country.   When the tree-stump withered away, a stow pillar was put in its place, and these pillars came to be worshipped as Kanthali and Śiva-Liṅga.   He vehemently denounces any attempt to connect Śiva-Liṅga worship with phallic worship.   But had he cared to study one of the oldest archaeological relics of his own land, he would not have been so vehement in his denunciation.   The Parasuramesvara Śiva-Liṅga still in worship at Gudimallam (near Renigunta, North Arcot) first brought to the notice of scholars by one of his own illustrious country-men, the late T. A. Gopinath Rao, gives the lie direct to such improved hypothesis propounded by the author.

<div align="right">JITENDRA NATH BANERJEA.</div>

TOLKĀPPIYAM—PORULATIKARAM. By E. S. Varadaraja Iyer, Vol. I, Part I, Pages xvi and 206; Vol. I, Part II, 207–584 (Annamalai University, 1948).

Tradition avers that the Tolkāppiyam is the oldest extant work in Tamil. Certainly it is the earliest extant Tamil grammar, but modern scholarship finds it difficult to believe that the work was composed earlier than the first century of the Christian era; some would place it much later. It comprises three *Adikārams* (Parts), *Eḻuttu* (Orthography), *Śol* (Etymology and Accidence), and *Poruḷ*, a comprehensive term which covers themes of love and war together with sections on Prosody, on figures of speech, on sentiments (*Rasas, Meyppāḍu*) and on Idiom and usage. Love forms the subject of four sections (*Iyals*) called *Agattiṇai, Kaḷavu, Karpu* and *Poruḷ* which constitutes the first, third, fourth and fifth in the series of nine *Iyals* contained in the *Adikāram* on *Poruḷ*. These sections are translated in the two parts of Vol. I now under review.

The importance for linguistic studies of a reliable rendering of this ancient and difficult classic of Tamil grammar can hardly be overrated. It is generally known that Sanskrit and Prākrit works of grammar and literature have much to contribute to a proper elucidation of obscurities in the *Tolkāppiyam*. For the pursuit of this line of study the first desideratum is to enable scholars who do not read Tamil to gain a precise idea of the contents of the Tamil work. Ancient Tamil customs and social institutions and conventions are systematically expounded in the different sections of the *Poruḷ-Adikāram*, and a critical study of these against a wider background may be expected to explain the origins of ancient Tamil culture and the sources of its sustenance. The department of Tamil studies in the Annamalai University have therefore chosen well in undertaking this translation. The translator assigns the *Tolkāppiyam* to the third century B.C. and the General Editor, Dr. A. C. Chettiar, to a period 'anterior to 450 B.C., the age commonly assigned to Pāṇini, the Sanskrit grammarian', dates which will command the assent of few critical students. In the interpretation of the *sūtras* reliance is placed mainly on the commentaries of Iḷampūrṇar and Naccinārkkiniyar, both great annotators belonging to periods several centuries later than the date of *Tolkāppiyam*; where the two annotators differ, both are translated. The editor remarks that the translator should have consulted a modern commentary by a former Professor of Tamil in the University. It is somewhat disappointing that the translator does not seem to have thought of closely studying the text of the *sūtras* with a view to reach their natural and proper meaning; commentaries may be helps or hindrances according to the use we make of them, and no modern student should tie himself to a single commentator or shirk the task of judging between different interpretations or criticizing them where necessary.

The plan of the work varies widely between the two parts. In Part I the *sūtras* are not transliterated though the omission is made good in the first few pages of Part II, and the text of the commentaries is not given. Some *sūtras* are not numbered while others are omitted (p. 8). The illustrative stanzas cited in the commentaries are translated also, and indeed the editor hails these translations as 'the greatest merit of the work'! There are lengthy dissertations on sundry topics interspersed with the translations; these are by no means impressive or original, and have little relevance to the context, e.g. that on kingship, administration and so on (pp. 10–32). They appear to be parts of earlier writings of the translator lugged in for reasons best known to him, as we may suspect from the occurrence of

phrases like 'as was already deserved', 'we already observed', which are not justified by what precedes them in the book itself.

But the most serious flaw in the work is that the translation of the *sūtras* themselves is not always accurate. To give perhaps what is an extreme instance—*sūtras* 14 and 15 on p. 9 are simple in themselves and mean in substance that while the behaviour of lovers appropriate to one *tiṇai* or region may be ascribed to a different region in a stanza, the descriptions of nature belonging to two different regions should not get mixed up in one and the same stanza; so also the time appropriate to one region may be ascribed to another. But the translation reads as follows: 'The basic things of one *tiṇai* may go in with those of any other *tiṇai*; but the lands that possess them need not be contiguous. The basic things as well as the products of the soil that are different from the *uripporuḷ* can get mixed with those of another soil; but the love aspects remain the same for each land division as will be seen from the poems of Sangam celebrities' (p. 9). The poems of Sangam celebrities, by the way, have no place in the rendering of a *sūtra* that has not a syllable suggesting the idea. This in fact is a translation of the commentary and not of the corresponding *sūtra*. What can one make, again, of a translation like this: 'When the hero expiates with a view to do away with the sin he had committed by his clandestine love affair and tries to see that it is extinct beyond recognition just like the letters written in the air' (p. 248). One will take exception to some renderings of technical terms like: *munpani* (hemanta) and *pinpani* (śiśira) by 'pre-snow season' and 'post-snow season'. The transliteration of words is inconsistent, e.g. Tholkāppiyar (p. 5) and Tolkāppiyar (p. 12), and 'Nāvishnu Prathivipathi' (p. 11).

This work which must surely have cost much trouble to the author should have been published with more time and care. Hurried publications like this raise a legitimate doubt whether the pressure for the quick results of research in some of our Universities, particularly the younger ones, is not producing the desirable fruit. Whatever that may be, the scholar who does not read Tamil will have to use this book with very great caution if he wishes to avoid pitfalls. We hope that the book will be thoroughly revised and the defects will be avoided scrupulously in the succeeding ones.

K. A. Nilakanta Sastri.

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THE SINE AND COSINE POWER-SERIES IN HINDU MATHEMATICS

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An account was given, in three earlier papers [5, 6, 7], * of some of the notable achievements of the Kerala Hindus of the middle ages in the field of mathematical analysis. In the present paper we propose to discuss another significant achievement of the Keraliyas—a *tour de force* of analytical reasoning which led them to the sine and cosine power-series some two hundred years before Newton and Leibniz claimed them for occidental mathematics.†

The Hindu mathematical literature which has come down to us does not associate these series with the name of any individual mathematician. In fact we are as much in the dark about the identity of the person(s) who first obtained the two series, as we are about the Hindu discoverer(s) of the power-series for the inverse tangent. We can, however, say with some certainty that all the three series came to be accepted as part of the repertory of a mathematician about the year 1500 A.D. when Nīlakaṇṭha published his volume of 'Science Abstracts' ‡ (*Tantrasaṅgraha*). We can also point to external evidence which makes it highly probable that the proofs of the three series were known to Nīlakaṇṭha's compeers and transmitted to his successors either orally or in writing [4, Appendix III] for perhaps two hundred years and more before they appeared in Malayālam, the vernacular of the Kerala country, in a small book of expository mathematics called *Yukti-Bhāṣa* (*circa* 1750). The proofs of the sine and cosine series which we offer to our readers are taken from this Malayālam work, while the enunciations of the series are based on ślokas or verses in *Tantrasaṅgraha* and another Sanskrit work, *Karaṇapaddhati*, supposed to be anonymous and produced a few decades before Nīlakaṇṭha's compendium.

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* Numbers in heavy type within square brackets refer to the bibliography given at the end of this paper.

† Moritz Cantor [1] gives these facts about the European origin of the series. (1) A letter from Collins to Gregory dated December 24, 1670, communicated the series for the sine, the cosine and the arc sine as the discoveries of Newton. (2) About the end of July 1676, Oldenburgh sent to Leibniz a copy of a letter of Newton containing the binomial, the sine and the cosine series. (3) One of the problems occupying the attention of Leibniz in 1693 was the integration of differential equations in series, in particular that of the equation giving rise to the sine series: $a^2 d^2x/dy^2 + x = 0$ which is, in the notation of the present paper, $\rho^2 d^2y/ds^2 + y = 0$. The last-mentioned fact would appear to suggest that Leibniz's approach to the series was different from that of the Hindus. As regards Newton's approach to the series, Cantor does not offer us any material on the basis of which we can make up our minds.

‡ *Tantrasaṅgraha* is more correctly translated as 'a collection of *Tantras*'. The Tantras are a special class of Sanskrit astronomical literature in contradistinction to *Siddhāntas*. (P. C. Sengupta.)

HINDU TERMINOLOGY

Choose on a given circle (of radius ρ) any point between the East and the North points. Then the arc (s) of the circle, having its *mūlam* (= base or beginning) at the East point and its *agram* (= summit or extremity) at the chosen point, is called *iṣṭacāpam* (which means literally 'chosen bow'). The perpendiculars from the chosen point to the East-West line and the North-South line are termed respectively the *bhujājyā* (y, say) and the *koṭijyā* (x, say) through the point*; the distance of the foot of the former perpendicular from the East point ($\rho - x = \bar{x}$, say) is referred to as the *śaram* (meaning literally 'arrow') of the chosen point. When it is found necessary to stress the associations of the *jyā* and the *śaram* with the chosen arc, we may prefix to each of them the adjective *iṣṭa*.

An arc of the circle whose extremities are any two points between the East and the North points may be called *śiṣṭacāpam* (literally 'part of bow'). The difference between the *bhujājyās* through the extremities of the arc is called the *bhujakhaṇḍam* of the *śiṣṭacāpam*; the difference between the *koṭijyās* of the extremities and that between the *śarams* of the extremities are called *koṭikhaṇḍam* and *śarakhaṇḍam* respectively.

The chord of any arc (whether it is an *iṣṭacāpam* or *śiṣṭacāpam*) is termed its *samastajyā*.

ENUNCIATIONS OF THE SINE AND COSINE SERIES

Tantrasaṅgraha gives an enunciation which is not self-contained and runs thus:

Nihatya cāpavargeṇa cāpam tattatphalāni ca
Haretsamūlayugvargaistrijyāvargahataiḥ kramāt
Jīvāptyai sangrahosyaiva vidvānityādina kṛtaḥ
Nihatya cāpavargeṇa rūpam tattatphalāni ca
Haredvimūlayugvargaistriyāvargahataiḥ kramāt
Śarāptyai sangrahosyaiva stenastrityādinā kṛtaḥ.

An English rendering of the passage may be given as follows. *One should (obtain a sequence of terms as follows:) repeatedly multiply the arc by the square of itself and divide by the square of each and every even number increased by that number and then multiplied by the square of the radius. This is (the starting point of) the process of getting at the* (bhujā)jyā *(of the arc), which is fully discussed in (the well-known verse) 'Vidvān, etc.'. One should (next obtain a second sequence thus:) repeatedly multiply the unit of measurement (which is the radius) by the square of the arc and divide by the square of each and every even number decreased by that number and then multiplied by the square of the radius.· This is (the first step in) the process of getting at the* śaram *(of the arc), summarized in the verse 'Stenastrī, etc.'.*

The first sequence is

$$\frac{s^{2n+1}}{(2^2+2)(4^2+4)\ldots.(4n^2+2n)\rho^{2n}} \quad (n=1,2,3\ldots.) \qquad \ldots \quad (1)$$

---

* The terms *cāpam*, *bhujājyā* and *koṭijyā* are generally used for double the lengths thus designated in our definitions. However, these definitions are in conformity with the usage in the particular context of *Yukti-Bhāṣa* which concerns us. Incidentally it may be noticed that *jyā* is a general term for either a chord parallel to one of the primary directions (East-West, North-South) or one half of such a chord. The particular half chords of this kind which figure prominently in our propositions are *bhujājyās*, but since there are similar propositions for *koṭijyās*, *Yukti-Bhāṣa* uses the general term *jyā* for the half chords, merely clarifying the term wherever necessary, by a descriptive epithet such as *piṇḍam* (= section) or *paṭhitam* (= object of study).

IB

and the second

$$\frac{\rho s^{2n}}{(2^2-2)(4^2-4)\ldots\ldots(4n^2-2n)\rho^{2n}}\ (n=1,2,3\ldots.) \quad \ldots \quad \text{(II)}$$

both of them being included in the sequence,

$$\frac{s^n}{n!\,\rho^{n-1}}\ (n=2,3,4\ldots.)\ldots \quad \ldots \quad \ldots \quad \text{(III)}$$

The verses commencing with 'Vidvān' and 'Stenastri', referred to in the above quotation, are the 14th and the 15th of Chapter VI of *Karaṇa-paddhati*. They explain how one can determine the *iṣṭabhujājyā* and *iṣṭaśaram* from certain codified values of the members of (1) for $n = 1, 2, \ldots. 5$, and the members of (II) for $n = 1, 2, \ldots. 6$ worked out on the assumption that $s =$ a quarter of the circumference and $\rho = 3437$ *kalas* $+44$ *vikalas*$+48\frac{22}{60}$ *talparas*.* The method of constructing the series for the *iṣṭabhujājyā* and the *iṣṭaśaram* from the sequences (I) and (II) is explained not in these verses, but in the two immediately preceding these verses:

> Cāpācca tattat phalatopi tadvat
> Cāpāhatādvyādi hatat trimaurvyā
> Labdhāni yugmāni phalānyathotah
> Cāpādayugmāni ca vistarārthāt
>
> Vinyasya coparyupari tyajettat
> Śeṣau bhujākoṭiguṇaú bhavetām

which may be translated thus. *Obtain the results of repeatedly multiplying the arc by itself and then dividing by 2, 3, 4, ... multiplied by the* **trimaurvyā** *or the radius. Write down, below the radius (in a column) the even results (i.e. results corresponding to* $n = 2, 4, 6 \ldots.$ *in* $s^n/n!\,\rho^{n-1}$*), and below the radius (in another column) the odd results (corresponding to* $n = 3, 5, 7, \ldots.$ *in* $s^n/n!\,\rho^{n-1}$*). (After writing down a number of terms in each column) subtract the last term of either column from the one next above it, the remainder from the term next above (the one last take into account) and so on (until the last subtraction is made from the radius in the first column and from the arc in the second). The two (final) remainders are respectively the* **koṭi(jyā)** *and the* **bhujā (jyā**, *to a certain degree of approximation).*

We have therefore the series:

$$x = \rho - \frac{s^2}{2!\,\rho} + \frac{s^4}{4!\,\rho^3} - \ldots. + (-1)^n \frac{s^{2n}}{(2n)!\,\rho^{2n-1}} + o(1),\ n \to \infty,$$

$$y = s - \frac{s^3}{3!\,\rho^2} + \frac{s^5}{5!\,\rho^4} - \ldots. + (-1)^n \frac{s^{2n+1}}{(2n+1)!\,\rho^{2n}} + o(1),\ n \to \infty.$$

Yukti-Bhāṣa regards each of these series as the result of successive corrections, $(-1)^n s^{2n}/(2n)!\,\rho^{2n-1}$ or $(-1)^n s^{2n+1}/(2n+1)!\,\rho^{2n}$ applied to ρ or s

---

* Here *kala* = an arc subtending at the centre an angle of 1 minute, *vikala* = an arc of 1 second, *talpara* = an arc of 1/60 of a second. Since a quarter circumference is 5,400 minutes of arc, it follows that a particular value of $\pi/2$ is assumed in this context. The code words used for the corresponding values of $(\pi/2)^{11}$ $\rho/11!$ and $(\pi/2)^{13}$ $\rho/12!$ are *vidvān* and *stena* respectively. We are indebted to Prof. P. C. Sengupta for pointing out that the value assumed for π in these evaluations corresponds to a value of the radian remarkably close to the modern approximation $3437'\cdot74677078 = 3437' - 44'' - 48''' - 22^{iv}\cdot49$ (in Indian units), and distinct from Āryabhaṭa's approximation $3437' - 44'' - 19'''\cdot425$.

as the case may be, every correction being numerically greater than the true correction necessary. Thus the Malayāḷam commentary makes it clear to us that by taking into account more and more terms in the series for x and y, we approach the true values of x and y more and more closely. The idea of approximation which appears parenthetically in our translation of the *Karaṇapaddhati* verses, is therefore not an interpolation.

SOME. LEMMAS FROM *YUKTI-BHĀṢA*

Certain lemmas will now be stated and proved in the order in which they appear in *Yukti-Bhāṣa*. The right-angled triangle whose hypotenuse is the radius through the mid-point of a *śiṣṭacāpam* and sides are the *bhujā-jyā* and the *koṭijyā* through the mid-point is similar to the right-angled triangle whose hypotenuse is the *samastajyā* of the *śiṣṭacāpam* and sides are the *koṭikhaṇḍam* and the *bhujakhaṇḍam* of the *śiṣṭacāpam*, for the two triangles have their corresponding sides (in the order mentioned) mutually perpendicular. Hence we have the

FUNDAMENTAL LEMMA

$$\frac{Samastajyā \text{ of } śiṣṭacāpam}{\text{radius}} = \frac{koṭi \text{ } khaṇḍam \text{ of } śiṣṭacāpam}{bhujājyā \text{ of middle of } śiṣṭacāpam}$$

$$= \frac{bhujakhaṇḍam \text{ of } śiṣṭacāpam}{koṭijyā \text{ of middle of } śiṣṭacāpam}$$

In the figure, $\overset{\frown}{P_{-1}P_1}$ is the *śiṣṭacāpam*, belonging to a circle with centre o and radius ρ. Its mid-point is P and its *samastajyā* $(P_{-1}P_1)$ is α; the *bhujājyās* of P_{-1}, P_1, P are y_{-1}, y_1, y respectively and their *koṭijyās* x_{-1}, x_1, x respectively. Consequently,

$$\frac{\alpha}{\rho} = \frac{x_{-1} - x_1}{y} = \frac{y_1 - y_{-1}}{x}; \quad \quad \quad \quad (1)$$

or, in central-difference notation,

$$\delta x = -\frac{\alpha}{\rho} y, \quad \delta y = \frac{\alpha}{\rho} x.$$
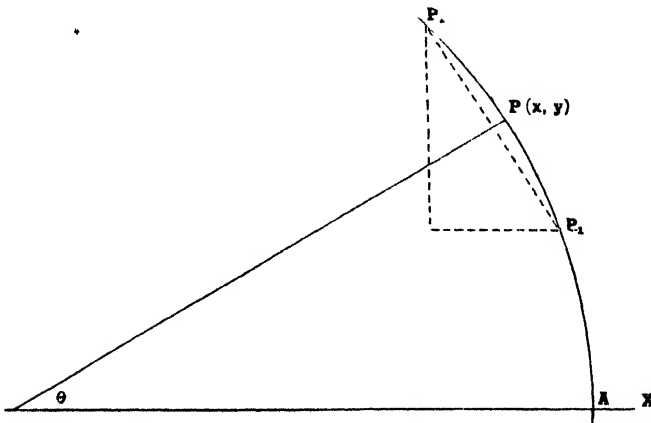
FIG. 1.

If θ, $\theta \pm \delta\theta$ be the angular distances of P, $P_{\pm 1}$ from the East point A of the circle, then $\alpha = $ app. $2\rho\delta\theta$ provided $\delta\theta$ is small, in which case the above relations yield:

$$\cos (\theta + \delta\theta) - \cos (\theta - \delta\theta) = \text{app. } -2\delta\theta \sin \theta,$$

$$\sin (\theta + \delta\theta) - \sin (\theta - \delta\theta) = \text{app. } 2\delta\theta \cos \theta.$$

Note.—(i) The last result was known to Bhāskara (twelfth century) who enunciated it in the form:

$$\text{Instantaneous change in } \sin \theta = \frac{\text{corresponding change in } s}{\rho} \times \cos \theta$$

or

$$\sin (\theta + \delta\theta) - \sin \theta = \frac{\delta s}{\rho} \cos \theta.$$

Bhāskara used a special term *tātkālika bhogya-khaṇḍa* for what we have called the 'instantaneous change' and his argument was much the same as that in *Yukti-Bhāṣa* [3 *].

(ii) The first explicit reference to our fundamental lemma in occidental literature seems to occur in an essay which forms part of a long letter written by Pascal at the beginning of October 1658 and is reproduced by J. M. Child in one of his historical works [2, p. 204, foot-note 20]:

The radius, ρ, is to the ordinate, y, as the hypotenuse, δs, of the infinitesimal right-angled triangle, whose sides are δx, δy, is to its base, δx.

NOTATION. In the remaining lemmas we shall use the notation explained below.

$\widehat{AP}$ is an *iṣṭacāpam* of a circle centre o and radius ρ. It is of length s and divided into n equal *khaṇḍams* or parts by points of division P_r ($r = 1, 2, \dots n-1$); the mid-point of any *cāpakhaṇḍam* $\widehat{P_{r-1}P_r}$ ($P_0 = A$, $P_n = P$) is $P_{r-\frac{1}{2}}$. The *bhujājyā* associated with any of the *cāpams* $\widehat{P_0 P_r}$ ($r = 1, 2, \dots n$) may, for our present purpose, be referred to as a *piṇḍajyā* or a *paṭhitajyā* and denoted by y_r; the corresponding *koṭijyā* and *śaram* being denoted by x_r and $\bar{x}_r$ respectively. The last *piṇḍajyā* (y_n), *koṭijyā* (x_n) and *śaram* ($\rho - x_n$) are the same as the *iṣṭabhujājyā* (y), *iṣṭakoṭijyā* (x) and *iṣṭaśaram* ($\rho - x = \bar{x}$) respectively. The *cāpakhaṇḍasamastajyā* (α, say) is, of course, equal to the *samstajyā* of any *śiṣṭacāpam* such as $\widehat{P_{r-\frac{1}{2}}P_{r+\frac{1}{2}}}$ ($r = 1, 2, \dots n-1$).

LEMMA 1. *The* koṭikhaṇḍam *of the* śiṣṭacāpam $\widehat{P_{r-\frac{1}{2}}P_{r+\frac{1}{2}}}$ *whose extremities are the mid-points* ($P_{r-\frac{1}{2}}$, $P_{r+\frac{1}{2}}$) *of consecutive* cāpakhaṇḍams, *is obtained by multiplying the* bhujājyā *through the common point* (P_r) *of the* cāpakhaṇḍams *by the* cāpakhaṇḍasamastajyā *and then dividing by the radius:*

$$x_{r+\frac{1}{2}} - x_{r-\frac{1}{2}} = -\frac{\alpha}{\rho} y_r \quad (r = 1, 2, \dots, n-1). \qquad \text{.. (2)}$$

Further, multiplying the above koṭikhaṇḍam *by the* cāpakhaṇḍasamas-
tajyā *and then dividing by the radius, we get the difference between the* bhuja-
khaṇḍams *of the consecutive* cāpakhaṇḍams $\widehat{P_rP_{r+1}}$, $\widehat{P_{r-1}P_r}$; *that is to say,*

$$(y_{r+1}-y_r)-(y_r-y_{r-1}) = \frac{\alpha}{\rho}(x_{r+\frac{1}{2}}-x_{r-\frac{1}{2}}) \quad (r = 1, 2, \ldots, n-1). \quad (3)$$

Hence, if we multiply the pinḍajyā *through any point of division,* P_r,
by the square of the cāpakhaṇḍasamastajyā *and divide by the square of
the radius, the result is the difference between the* bhujakhaṇḍams *of the*
cāpakhaṇḍams, $\widehat{P_{r-1}P_r}$, $\widehat{P_rP_{r+1}}$, *on either side of the point of division :*

$$(y_{r+1}-y_r)-(y_r-y_{r-1}) = -\frac{\alpha^2}{\rho^2}y_r \quad (r = 1, 2, \ldots, n-1).^* \quad (4)$$

This difference between *bhujakhaṇḍams* (or, as they are sometimes
referred to, *khaṇḍajyās*) is called *jyākhaṇḍāntaram*. The rule (4) for its
evaluation is a consequence of (2) and (3) which are themselves consequences
of (1). In central-difference notation we can state the rule in the form

$$\delta^2 y_r = -\frac{\alpha^2}{\rho^2}y_r.$$

Now multiply the relations (4) beginning with the last (for which
$r = n-1$) by 1, 2, 3, ... respectively and add them. We then get

LEMMA 2.   *The difference between the last* pinḍajyā *and n times the first*
pinḍajyā *is equal to the 'second sum' of the* pinḍajyās *(excluding the last)
multiplied by the square of the* cāpakhaṇḍasamastajyā *and divided by the
square of the radius. Or, briefly,*

$$y_n - ny_1 = -\frac{\alpha^2}{\rho^2}[y_{n-1}+2y_{n-2}+ \ldots + (n-1)y_1]$$

$$= -\frac{\alpha^2}{\rho^2}[y_1+(y_1+y_2)+ \ldots + (y_1+y_2+ \ldots +y_{n-1})].$$

When n is indefinitely large, the *pinḍajyā* $y_1 = $ app. the *cāpakhaṇḍam*
$s/n = $ app. the *cāpakhaṇḍasamastajyā* α, and so the above result gives the
iṣṭajyacāpāntaram (i.e. difference between the *iṣṭajyā* and the *iṣṭacāpam*):

$$y-s = -\frac{1}{\rho^2}\lim_{n \to \infty}\left(\frac{s}{n}\right)^2[(n-1)y_1+(n-2)y_2+ \ldots +y_{n-1}]. \quad (5)$$

Next, adding the equalities (2), we obtain

LEMMA 3.   *The difference between the* koṭijyā *of the mid-point,* $P_{\frac{1}{2}}$,
of the first cāpakhaṇḍam *and that of the mid-point,* $P_{n-\frac{1}{2}}$, *of the last* cāpa-
khaṇḍam *is the sum of the* pinḍajyās *(excluding the last) multiplied by the*
cāpakhaṇḍasamastajyā *and divided by the radius. In the notation we have
adopted, this means that*

$$x_{n-\frac{1}{2}} - x_{\frac{1}{2}} = -\frac{\alpha}{\rho}(y_1+y_2+ \ldots +y_{n-1}).$$

---

* A referee has kindly drawn our attention to the following facts. (i) What is
presumably the first appearance of the difference rule (4) is in stanza 12 of the Gaṇita
section of *Āryabhaṭīya* a translation of which appears in the *Calcutta University Journal
of Letters*, Vol. 16 (1927). (ii) A later statement of the same rule may be found in
Sūryasiddhānta.

When n is indefinitely large, *koṭijyās* $x_{n-\frac{1}{2}}$, $x_{\frac{1}{2}}$ may be replaced by $x_n = x$, $x_0 = \rho$ respectively and hence we have an expression for the *iṣṭaśaram*:

$$-\bar{x} = x - \rho = -\frac{1}{\rho} \lim_{n \to \infty} \left(\frac{s}{n}\right)(y_1 + y_2 + \ldots y_{n-1}). \quad \ldots \quad (6)$$

LEMMA 4. *Let the* **cāpam** *with* **mūlam** *at the East point,* P_0, *and* **agram** *at a point of division,* P_r, *be of length* s_r *(so that* $s_n = s$*). Straighten the entire* **iṣṭacāpam**, $P_0 P_n$. (i) *On the base* $P_{r-1}P_r$ $(r = 1, 2, \ldots, n)$ *construct a rectangle of height* s_r. *Denote the total area of the rectangles up to* P_r *by* $s_r^{(1)}$.* (ii) *Next, on the base* $P_{r-1}P_r$ $(r = 1, 2, \ldots, n)$ *construct a rectangle of height* $s_r^{(1)}$. *Let the total area of the new rectangles up to* P_r *be* $s_r^{(2)}$. *Define in this way* $s_r^{(3)}$, $s_r^{(4)}$, *etc. Then the sum of all the rectangles in* (i), (ii) $\ldots$ *are* $s_n^{(1)}$, $s_n^{(2)}$ $\ldots$ *respectively. When* n *is indefinitely large, they are called first* **cāpasaṅkalitam**, *second* **cāpasaṅkalitam**, *etc., with respect to the* **cāpam**, *and may be denoted by* $I^{(1)}(s)$, $I^{(2)}(s)$, *etc. Thus*

$$I^{(1)}(s) = \lim_{n \to \infty} \left(\frac{s}{n}\right)[s_1 + s_2 + \ldots + s_n]$$

$$= \lim_{n \to \infty} \frac{s(s + s/n)}{2!} = \frac{s^2}{2!}\dagger$$

$$I^{(2)}(s) = \lim_{n \to \infty} \left(\frac{s}{n}\right)[s_1^{(1)} + s_2^{(1)} + \ldots + s_n^{(1)}]$$

$$= \lim_{n \to \infty} \left(\frac{s}{n}\right)^2 [s_1 + (s_1 + s_2) + \ldots + (s_1 + s_2 + \ldots + s_n)]$$

$$= \lim_{n \to \infty} \left(\frac{s}{n}\right)^2 [ns_1 + (n-1)s_2 + \ldots + s_n]$$

$$= \lim_{n \to \infty} \frac{s(s + s/n)(s + 2s/n)}{3!} = \frac{s^3}{3!}\dagger$$

Using the notation of the integral calculus we can write these results in the form:

$$I^{(1)}(s) = \int_0^s s\,ds, \quad I^{(2)}(s) = \int_0^s \int_0^s s(ds)^2, \text{ etc.,}$$

---

* *Yukti-Bhāṣa* conceives this area as being made up of a single square on $P_0 P_1$, two squares on $P_1 P_2$, etc., taking n to be a very large number such as *parārdham* (10^{17}).

† Calling the upper limit of the variable s with which we are concerned *padam*, *Yukti-Bhāṣa* sums up the results in the form:

First *saṅkalitam* $= \lim_{n \to \infty} \dfrac{Padam\,(Padam + khaṇḍam)}{2!} = \dfrac{(Padam)^2}{2!}$

Second *saṅkalitam* $= \lim_{n \to \infty} \dfrac{Padam\,(Padam + khaṇḍam)\,(Padam + 2\,khaṇḍams)}{3!}$

$$= \frac{(Padam)^3}{3!}$$

The word *saṅkalitam* is used here in the sense of an integral; but, in other places, *Yukti-Bhāṣa* uses the same word to denote a sum [e.g. **6**, Lemma 3(a), (b)].

so that, writing $s = I^{(0)}(s)$, we have

$$I^{(p)}(s) = \int_0^s I^{(p-1)}(s)\,ds = \lim_{n \to \infty} \left(\frac{s}{n}\right)$$

$$\times \left[I^{(p-1)}\left(\frac{s}{n}\right) + I^{(p-1)}\left(\frac{2s}{n}\right) + \ldots + I^{(p-1)}\left(\frac{ns}{s}\right) \right]$$

$$= \frac{s^{p+1}}{(p+1)!} \quad (p = 1, 2, \ldots)$$

The last result is tacitly assumed in the course of the discussion in *Yukti-Bhāṣa*. This is not to be wondered at since we can actually prove the result, using induction and the limit theorem:

$$\lim_{n \to \infty} \frac{1^p + 2^p + \ldots + n^p}{n^{p+1}} = \frac{1}{p+1} \,*$$

which follows at once from another theorem given in *Yukti-Bhāṣa*.

ALTERNATIVE FORMS OF LEMMAS 2, 3. These lemmas can now be expressed more compactly thus.

Iṣṭajyacāpāntaram $= 1/\rho^2$ (second *piṇḍajyasaṅkalitam* with respect to *cāpam*),

or
$$s - y = \frac{1}{\rho^2} \int_0^s \int_0^s y\,(ds)^2. \qquad .. \qquad .. \quad (7)$$

Iṣṭaśaram $= 1/\rho$ (first *piṇḍajyasaṅkalitam* with respect to *cāpam*),

or
$$\rho - x = \frac{1}{\rho} \int_0^s y\,ds. \qquad .. \qquad .. \quad (8)$$

From (7) we have at once

$$s - y = \frac{1}{\rho^2} \int_0^s \int_0^s s\,(ds)^2 - \frac{1}{\rho^2} \int_0^s \int_0^s (s-y)\,(ds)^2$$

$$= \frac{I^{(2)}(s)}{\rho^2} - \frac{1}{\rho^2} \int_0^s \int_0^s (s-y)\,(ds)^2 \quad .. \qquad .. \quad (9)$$

whence, integrating both sides p times, with respect to s from 0 to s we find that, for $p = 1, 2, \ldots$,

$$\int_0^s \int_0^s \ldots \int_0^s (s-y)\,(ds)^p = \frac{I^{(p+2)}(s)}{\rho^2} - \frac{1}{\rho^2} \int_0^s \int_0^s \ldots \int_0^s (s-y)\,(ds)^{p+2}. \,(10)$$

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* The proof of this theorem, as it appears in *Yukti-Bhāṣa*, has been discussed in another paper [6, Lemma 3(a), (b)].

Proofs of the Sine and Cosine Series

We are now in a position to state, in the language of modern mathematics, the proofs of the two series in question. If, in (9), we employ (10) with $p = 2, 4, \ldots (2n-2)$ successively, we obtain

$$s - y = \frac{I^{(2)}(s)}{\rho^2} - \frac{I^{(4)}(s)}{\rho^4} + \ldots + (-1)^{n-1} \frac{I^{(2n)}(s)}{\rho^{2n}}$$

$$+ \frac{(-1)^n}{\rho^{2n}} \int_0^s \int_0^s \ldots \int_0^s (s-y)(ds)^{2n}$$

which gives, when $n \to \infty$,

$$s - y = \frac{I^{(2)}(s)}{\rho^2} - \frac{I^{(4)}(s)}{\rho^4} + \ldots + (-1)^{n-1} \frac{I^{(2n)}(s)}{\rho^{2n}} + \ldots \qquad (11)$$

Next (8) gives

$$\rho - x = \frac{1}{\rho} \int_0^s s \, ds - \frac{1}{\rho} \int_0 (s-y) \, ds$$

$$= \frac{I^{(1)}(s)}{\rho} - \frac{1}{\rho} \int_0^s (s-y) \, ds.$$

Using (10) with $p = 1, 3, \ldots, (2n-3)$ successively, in the above relation, we get

$$\rho - x = \frac{I^{(1)}(s)}{\rho} - \frac{I^{(3)}(s)}{\rho^3} + \ldots + (-1)^{n-1} \frac{I^{(2n-1)}(s)}{\rho^{2n-1}}$$

$$+ \frac{(-1)^n}{\rho^{2n-1}} \int_0^s \int_0^s \ldots \int_0^s (s-y)(ds)^{2n-1}$$

whence, letting $n \to \infty$, we find that

$$\rho - x = \frac{I^{(1)}(s)}{\rho} - \frac{I^{(3)}(s)}{\rho^3} + \ldots + (-1)^{n-1} \frac{I^{(2n-1)}(s)}{\rho^{2n-1}} + \ldots \qquad (12)$$

Thus $s - y$ and $\rho - x$ are each a series of *samskāraphalams* (= results of our study) of the expressions for them in terms of s and y. The *samskāraphalams* are in fact the succession of terms obtained from these expressions by taking repeatedly s instead of y.

If $s = \rho\theta$, then $y = \rho \sin \theta$, $x = \rho \cos \theta$, $I^{(p)}(s) = \rho^{p+1} \theta^{p+1}/(p+1)!$ so that (11) and (12) reduce to Newton's power-series for the sine and the cosine:

$$\sin \theta = \theta - \frac{\theta^3}{3!} + \frac{\theta^5}{5!} - \ldots,$$

$$\cos \theta = 1 - \frac{\theta^2}{2!} + \frac{\theta^4}{4!} - \ldots.$$

The proofs we have given of these two series, taken along with the lemmas on which they are based, are in the nature of a preliminary report on a chapter entitled 'Jyāprakaraṇam' (Theory of the *jyā*) in *Yukti-Bhāṣa*.

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ADDENDUM: NOTE ON THE STYLE OF *YUKTI-BHĀṢA*

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The problem of assigning a date to *Yukti-Bhāṣa* has not engaged the attention of any orientalist so far, and the attempts hitherto made to deal with the question have had to be based on the evidence supplied by a few stray texts. One of these texts describes *Yukti-Bhāṣa* as an exposition of the mathematics of 'planetary motions' after the manner of *Tantra-saṅgraha*, with the inevitable suggestion that the first-named work is of later origin than the second. Another text is a colophon which is found only in some (manuscript) copies of *Yukti-Bhāṣa*, and runs:

Alekhi   Yuktibhāṣa   vipreṇa   Brahmadatta   samjñena   *ye Golapathasthaḥ syuḥ kalirahitāḥ* śodhayantaste.

This colophon is supposed to ascribe the authorship of *Yukti-Bhāṣa*, or at any rate, of a version of the work (presumably the one known to us) to a Brahmin named Brahmadatta and enshrine a Kali chronogram (shown in italics) giving the date of composition of the work as the 17,71,931st day of Kali era (or roughly 1750 A.D.).[1] As there is not much else which can be even provisionally admitted as internal evidence one is compelled to turn to the language and stylistic peculiarities of *Yukti-Bhāṣa* for further light on its origin. It is not desirable to anticipate any conclusion which only a close study of the language can establish. But at the same time the first impression made by the language on an unbiassed reader may be of some value in itself, and I wish to record it, illustrating my remarks by some rather obvious examples from the text.

The most striking thing about *Yukti-Bhāṣa*, apart from its mathematics, is its style which is reminiscent of the fifteenth-century classic *Kṛṣṇagādha*.[2] Although the mathematical terms used in it are almost all Sanskrit, the style is definitely pre-maṇipravāla.[3] No reader can resist the suggestion which is gradually borne in upon him as he picks his way through the

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[1] The date 1639 A.D. given by K. Mukunda Marar and C. T. Rajagopal [4] is incorrect if we accept Prof. P. C. Sengupta's arguments (in the note which follows this addendum) for identifying the Kali Ahargaṇa 17,71,931 with the Julian Day 23,60,396 or the 11th of June, 1750 A.D. Of course, the question whether this date marks the completion of the original *Yukti-Bhāṣa* or of a later edition of the work (based on earlier ones) due to Brahmadatta, has still to be answered.

[2] This is a poem about Śrī Kṛṣṇa by Cerusseri Nambūdiri, for which T. K. Bala-krishnan Nair suggests the date 1454 A.D. in the introduction to *Cerusseri Bhāratam*.

[3] During the sixteenth and seventeenth centuries an admixture of Malayāḷam and Sanskrit known as 'maṇipravāḷa' (maṇi = gem and pravāḷa = coral, standing respectively for Malayāḷam and Sanskrit) was the prevailing literary fashion.

mathematics of *Yukti-Bhāṣa*, that he has before him a sample of the earliest extant prose in Malayāḷam. A characteristic of such prose is that it has not yet weaned itself from the influence of poetry and shows a preference for constructions like 'Ennāluṇṭu cila eḷuppam' which we find in many places in *Yukti-Bhāṣa*. Such peculiarities of construction may prove to be of help in fixing an upper limit to the period likely to have given birth to *Yukti-Bhāṣa*, particularly if it can be shown that they do not occur in works produced after a date.

There is a line of inquiry, with this purpose in view, which must suggest itself to readers of *Yukti-Bhāṣa*, who know anything at all about the development of Malayāḷam literature. Caldwell,[1] after studying the formation of the demonstrative pronouns of the third person singular in the various Dravidian languages, laid down the now familiar principle: 'Four demonstrative bases are recognized by one or other of the Dravidian dialects, each of which is a pure vowel, viz. *a* the remote, *i* the proximate, and *u* the medial demonstrative, together with *e* which is the suffix of emphasis in most of the dialects.' This principle may be supplemented by another which has an immediate application to the inquiry on hand. Even as early as Eḷuttaccan, the most popular Malayāḷam writer of the sixteenth century, the medial demonstrative *u* had gone out of use, only the remote *a* and the proximate *i* continuing to be in service. One must therefore attach some significance to the fact that the base *u*, combined with 'tu', i.e. the usage 'utu' is favoured by both *Yukti-Bhāṣa* and *Kṛṣṇagādha* but seldom by Eḷuttaccan. In other words, one cannot proceed to date *Yukti-Bhāṣa* without taking note of the large number of words like 'Guṇiccūtākum', 'Guṇippūtayi', 'Irippūtum ceyyum', 'Kūtuṅnūtum', etc., which are common to this work and *Kṛṣṇagādha* but almost entirely absent from the writings of the latter half of the sixteenth century.

There are other stylistic peculiarities which stamp the language of *Yukti-Bhāṣa* as archaic. For instance, there is, in old Malayāḷam, a distinction between 'atu' (remote demonstrative pronoun, neuter, singular) on the one hand, and 'ava' (remote demonstrative pronoun, neuter, plural) on the other. This distinction is invariably respected by the author of *Yukti-Bhāṣa* who uses archaisms like 'samkhyakaḷāvunnava' but never once a modern combination such as 'cilatu' (= a few) or 'palatu' (= many) where strict grammar would require 'ava' in place of 'atu'. As examples of other kinds of archaisms one may mention 'Kalpikkēṇṭuvatu' which is preferred to its 'lōpa-sandhi' form 'Kalpikkēṇṭatu' in current use and 'Guṇikkilumām' which contains the termination 'ām' (short for 'ākum') found only in old works. A complete catalogue of such archaisms, including words like 'Ariyāyiṭṭirikkum', 'Guṇippū', 'Kalpippū' 'Kalpiyāykil' and various others, can in fact be made without much difficulty. But I do not pursue the task since my main concern in this appendix is to explain intelligibly my first reaction to *Yukti-Bhāṣa* considered purely as literature.

I am aware that what I have said has not led to any definite conclusion as regards the date to be assigned to *Yukti-Bhāṣa*. I believe nevertheless that linguistic evidence will ultimately incline scholars to the view that *Yukti-Bhāṣa*, although it might have been committed to writing in the seventeenth century, originated in the first half of the sixteenth century— that is to say, was planned to the last detail (so as to facilitate memorization!) at a time when the predominant literary influence was still that of Cerussēri and the older masters who preceded Eḷutaccan.

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[1] *Comparative Grammar of Dravidian Languages* (1875), p. 314.

A SPECIAL NOTE: ON THE MEANING OF THE KALI AHARGAṆA AS
TO THE DATE OF THE WORK YUKTI-BHĀṢA AS GIVEN IN
PROF. GEORGE'S ADDENDUM TO THE PAPER BY
RAJAGOPAL AND VENKATARAMAN

By P. C. Sengupta, Calcutta

1. The first point that needs clearing definitely is the Zero
day of the *Kali Ahargaṇa* or the epoch of the
beginning of the *Kali*-era.
On Tuesday, April 13, 1948 A.D., the *Kali Ahargaṇa*
according to the methods of the *Khaṇḍa Khādyaka*
of Brahmagupta and the *Sūrya-siddhānta* works

out to be	18,44,190 days.
J. Days for the date	24,32,655 ,,
The difference in J. Days for the Zero day of *Kali* *Ahargaṇa*	5,88,465 ,,
Now add the days of Julian calendar for 4,000 yrs.	14,61,000 ,,
Total	20,49,565
J. Days for 899 A.D. on January 1	20,49,418
Difference	47
Subtract the days for January, 899 A.D.	30
	17th Feb.

Hence on the 17th Feb., 899 A.D., J. Days	20,49,565 days.
Now subtract 4,000 Julian Years, or	14,61,000 ,,
J. Days for Feb. 17, −3101 A.D. or 3102 B.C.	5,88,465 ,,

Hence the conclusion is that the Zero day of the *Kali*
Ahargaṇa is February 17, 3102 B.C. or −3101 A.D.
astronomical year, and that by adding 5,88,465 to
the *Kali Ahargaṇa* we have the J. days for the date.
Kali Ahargaṇa read by Prof. George as time indication
in the *Yukti-Bhāṣā* a Malayāḷam commentary on

the *Tantrasaṁgraha* of Nilakantha, is	17,71,931
To get the J. Days for the date, add	5,88,465
Or J. Days for the date	23,60,396
Now J. Days for January 1, 1740 A.D.	23,60,235
Difference	161 ,,
Deduct days from Jan. 1 to 31st May of the year	150 ,,
	11th June, 1750 A.D.

The date arrived at is thus the 11th June, 1750 A.D.

Hence the date as appeared in Prof. George's paper as about 1639 A.D.
is wrong. The reasoning set forth above in settling the date will not be
intelligible to anyone who is not accustomed to use a table like '*Periode
Julienne*' as given in the *Conn. Des Temps* before the section of '*Explication*'.
Hence I add two other methods:—

(I) The Zero date of the *Kali*-epoch has been shown above as
February 17, 3102 B.C.

This *Ahargaṇa* shows that 17,71,930 days were elapsed from the epoch of the *Kali*-era on the previous day, the day in question was the 17,71,931st day from the same epoch. The *Kali*-epoch is the 17th February, 3102 B.C. (or −3101 A.D. of the astronomical reckoning).

Now 17,71,931 = 365.25 ×4851 +103.25.

This shows that 4,851 Julian Years were elapsed and it was the 103rd day of the year arrived at. The process is:

To −3101 A.D. 17th February,

add 4,851 J. Years + 103 days.

The sum = 1750 A.D., 103rd day counting from February 17.

= 1750 A.D., 31st May according to the Julian calendar.

To this result we have to add 11 days to have the date by the Gregorian calendar.

Hence the date comes out as the 11th June, 1750 A.D.

(II) It is well known that the beginning of the *Kali*-era is placed at −3179 of the Saka year elapsed.

Now 17,71,931 = 365.25875 ×4851 +62 days nearly, 365.25875 days is the length of the Indian Solar year according to the *Khaṇḍa Khādyaka* of Brahmagupta. Now:—

To −3179 of Saka elapsed + 0 days,

add 4,851 years +62 days.

The sum =1672 of Saka elapsed +62 days.

This leads to the day of *Mithuna Saṁkramaṇa* of the Saka elapsed 1672 or of the Saka current 1673 as it is reckoned in South India. By adding 78 to 1672 we have the English year 1750 A.D. as before. The day of *Mithuna Saṁkramaṇa* is now 14th June, two centuries before it was about 12th or 11th June.

The dates of the works, viz.: *Tantrasaṁgraha, Karaṇa Paddhati* and *Yukti-Bhāṣā*, should be finally settled by *a most sifting enquiry* before the claims for originality in them made by the writers of the paper can be accepted by the international historians of Mathematics. The claims relate to the well-known expansions:—

(*a*) Gregory's expansion for

$$\tan^{-1}x = x - \frac{x^3}{3} + \frac{x^5}{5} - \frac{x^7}{7} + \dots .$$

(*b*) Newton's expansions for

$$(i) \quad \sin x = x - \frac{x^3}{\lfloor 3} + \frac{x^5}{\lfloor 5} - \frac{x^7}{\lfloor 7} + \dots .$$

$$(ii) \quad \cos x = 1 - \frac{x^2}{\lfloor 2} + \frac{x^4}{\lfloor 4} - \frac{x^6}{\lfloor 6} + \dots .$$

All the available manuscripts should be subjected to a thorough examination. The possibility of foreign influence in the shape of later additions to the originals should be very carefully looked into.

HAEMOLYSIS BY BILE SALTS

By A. C. Roy

(Communicated by Dr. K. N. Bagchi)

Some of the bile salts are known to exhibit marked atypical characteristics in their haemolytic behaviour. Mac Lean and Hutchinson (1909) found that the sodium salts of cholalic, choleic and glycocholic acid were capable of producing haemolysis in the ordinary way when strong doses were used but exhibited marked peculiarities in more dilute solutions, the same haemolytic effect being produced by widely divergent amounts of the salts under similar conditions. Amongst the bile salts, the most widely studied, however, are sodium taurocholate and sodium glycocholate, but the data available regarding their haemolytic behaviour are rather conflicting.

Ponder (1921) pointed out that sodium glyco: holate presented no atypical characteristics in its haemolytic behaviour and behaved in a manner similar to that found in the cases of sodium taurocholate, saponin and other haemolytic agents. Later on (1922), however, he reported that sodium glycocholate haemolyzed more rapidly in dilutions of 1 in 1,000 or thereabouts than in higher concentrations. He also found that sodium glycocholate was a much weaker haemolytic agent compared to the taurocholate. Shattuck (1928) and Yeager (1929) using chicken and human red blood cells respectively found that the time-dilution curves of some specimens of sodium taurocholate showed an S-shaped bend near the origin. Sen *et al.* (1929-30) from a study of the haemolytic action of sodium taurocholate on sheep red blood cells found that when comparatively higher concentrations of the cells and the lysin were used, it exhibited atypical characteristics similar to sodium glycocholate but at lower concentrations, the time-dilution curve was perfectly normal. They also found that sodium glycocholate might show either a greater or feebler haemolytic action than sodium taurocholate depending on the particular concentration ranges in which the comparison was made.

From a study of the action of several brands of these bile salts it appears to us that their haemolytic behaviour depends not only upon the particular brand of the lysin employed but also upon the species of erythrocytes concerned. The difference in the behaviour of different brands of a particular lysin may ordinarily be attributed to a difference in the technique of their preparation involving contamination with various impurities, but the problem becomes more complicated when variations in the susceptibility of the different species of erythrocytes towards a particular haemolysin is taken into consideration. An extreme instance of such divergence is furnished by the haemolytic behaviour of cobra venom. Certain species of erythrocytes such as those of the dog, the cat, the guinea-pig and of human beings are known to be very susceptible to its haemolytic action, while there are others such as those of the sheep, the goat, the ox and the buffalo which are absolutely resistant; the erythrocytes of some other species of animals occupying intermediate positions in this respect.

As sheep and human red blood cells [1] are known to occupy more or less extreme positions in the scale of susceptibility not only with respect to haemolysis effected by cobra venom and saponin but also in relation to their fragility in hypotonic saline, where the order is reversed (Ryvosch series), .the haemolytic behaviour of three available brands of sodium taurocholate, viz. those of Merck, Kahlbaum and DIFCO and also that of Merck's sodium glycocholate were studied with respect to both sheep and human red blood cells (representing more or less extreme types of cell resistance). The pH and surface tension of the lysins at the different concentrations were also simultaneously determined as these were considered likely to have modifying influence upon their haemolytic behaviour.

Technique employed

Haemolysis was studied in the same general manner as described earlier (1940). 0·3 c.c. of a 5% suspension of thrice washed sheep or human red blood cells in normal saline was taken in small test tubes, different amounts of normal saline were then added to these in such a way that after the addition of the required amounts of the lysin and other components of the system if there be any, the total volume came up to 1·0 c.c. in each case. Just after the addition of the lysin, the time was noted (by means of a stop-watch), the contents of the tube immediately mixed by giving it a few quick turns between the palms and the time for complete haemolysis or the extent of haemolysis after a certain interval of time, as the case may be, was noted. The solutions and suspensions used in this connection were all made up in normal saline prepared from conductivity water and all test tubes, pipettes and other glass wares were scrupulously clean and sterilized.

The pH and surface tension of the same dilution of the lysin (in normal saline) as is obtained in each haemolytic experiment were also determined as far as possible simultaneously with the addition of the lysin to the r.b.c., the former by means of Hellige's comparator and the latter with du Noüy's tensiometer, direct readings from the dial being taken. The experiments were all done at laboratory temperatures.

The tables (Tables I, II, III, IV) given at the end of the paper show the results of such determinations.

The haemolytic activity of each of these preparations and its bearing on the pH and surface tension of the solutions at the respective concentrations are better brought out by means of curves (Figs. 1, 2, 3, 4).

If we compare the haemolytic behaviour of the two Merck's preparations (Tables I and II, Figs. 1 and 2) which show the most atypical characteristics, it appears that the curves are all essentially of the same type, each consisting of a few distinct stages. Initially, i.e. at the higher concentrations, the curve indicates the typical behaviour of a somewhat weaker haemolysin up to a certain dilution and follows more or less a straight course. With increase of dilution, however, there is a gradual reassertion of the activity which becomes more and more intense till it attains a maximum. From this point there is again a gradual decline of activity with further increase of dilution.

The Kahlbaum's taurocholate (Table III, Fig. 3) appears to have a somewhat weaker haemolytic action than the corresponding Merck's preparation and but for some irregularities in its behaviour towards human

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[1] Human red blood cells though not as susceptible to cobra venom haemolysis as those of the dog or the guinea-pig, have this advantage that the washed suspension of the former is less prone to autolysis than the latter and therefore easier to keep.

r.b.c. at the higher dilutions, it yields more or less typical time-dilution curves.

Fig. 1.
Sodium taurocholate (Merck)

o———o Haemolysis with Sheep r.b.c.
x———x Haemolysis with Human r.b.c.

Fig. 2.
Sodium glycocholate
(Merck)

o———o Haemolysis with Sheep r.b.c.
x———x Haemolysis with Human r.b.c.

FIG. 3.
Sodium taurocholate
(Kahlbaum)

o ——— o   Haemolysis with Sheep r.b.c.
x ——— x   Haemolysis with Human r.b.c.
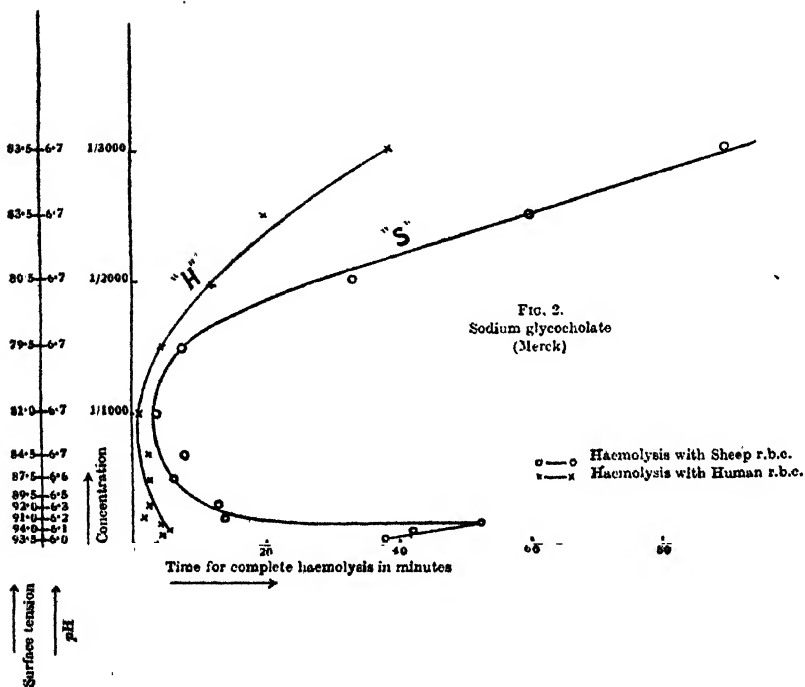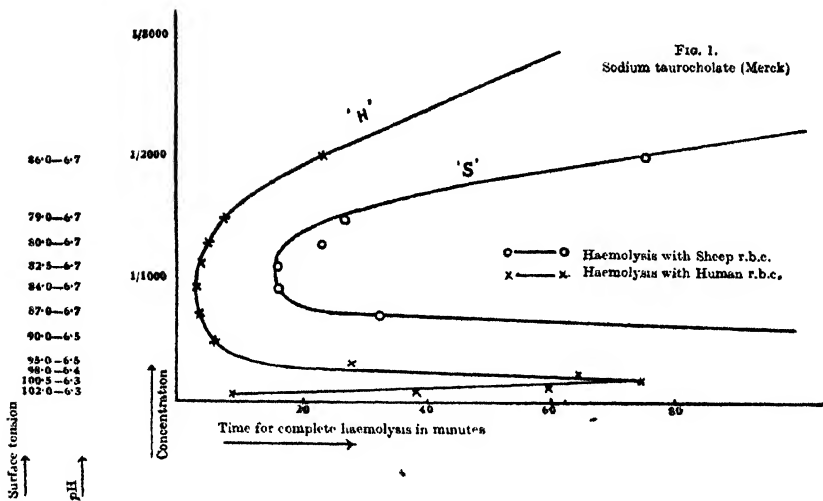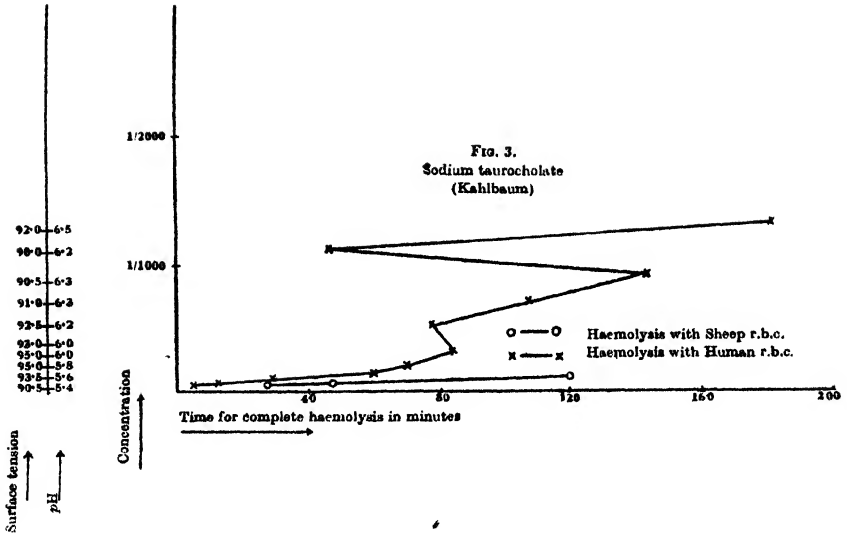
The DIFCO-taurocholate (Table IV, Fig. 4) presents no anomalies in its haemolytic behaviour and it appears to be the most haemolytic of all the different brands of bile salts studied.

FIG. 4.
Sodium taurocholate
(DIFCO)

o ——— o   Haemolysis with Sheep r.b.c.
x ——— x   Haemolysis with Human r.b.c.
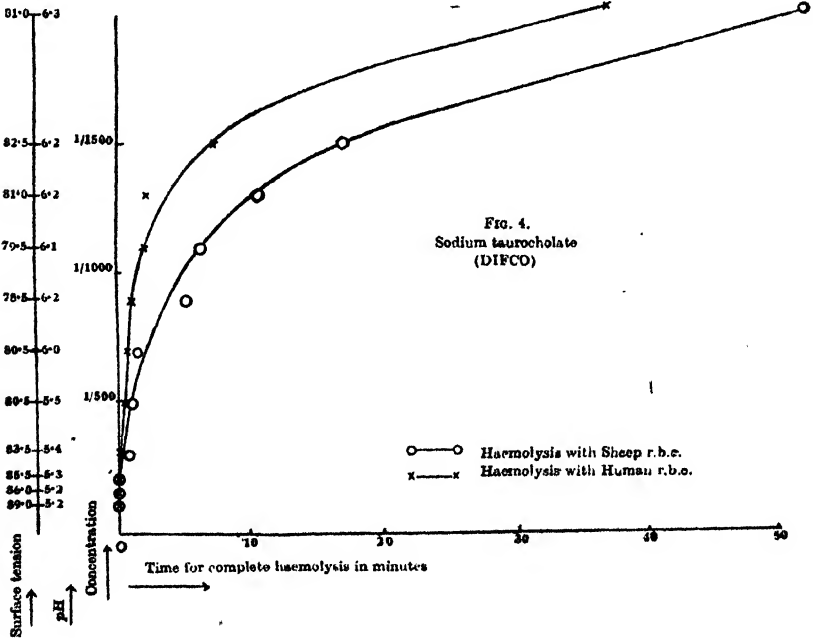
It will also appear that the haemolytic curves, obtained with each of these bile salts with respect to sheep and human red blood cells, run closely parallel, the former being the more resistant of the two in this respect.

2B

Discussion of the results

Various theories have been proposed from time to time to explain the anomalous haemolytic behaviour of some of these bile salts. Sen and Roy (1930-31) believed that these anomalies were liable to appear if the system was on the alkaline side of neutrality. Gordon (1933) likewise believed these irregularities to be the result of the system having a particular pH, usually in the neighbourhood of 7·0. When the system is at pH 6·0 the time-dilution curve, according to him, has the usual form. Ponder (1934), on the other hand, considered these irregularities to be due to the physical instability of the lysins at particular dilutions rather to any essential difference in the way in which the cells and the lysins react. He observed, 'The more one works with soaps and bile salts the more is one impressed by the fact that the irregularities observed are related to the physical instability of the lysins and that the atypical forms of time-dilution and percentage haemolysis curves are due rather to one's inability to reproduce one's own experimental conditions than to the curves being essentially different in form from those met with in the case of saponin and the more stable lysins.'

Previous workers, who used mostly Merck's preparations, took it for granted that these specimens of bile salts were pure. In Merck's 'Index' (1929) none of their sodium taurocholate or sodium glycocholate is claimed to be pure and each is stated to be mixed with the other as impurity. Evidently these specimens of bile salts are qualitatively the same and that labelled ' taurocholate' has only a higher percentage of taurocholate than of glycocholate and their 'glycocholate' has likewise a preponderance of glycocholate over the taurocholate content. The results of analysis of dried specimens of these preparations also seem to corroborate such assumption. As taurocholic acid contains sulphur and glycocholic acid does not, the percentage of taurocholate in a particular specimen of bile salt may be ascertained from its sulphur content. Calculated on that basis, well-dried specimen of Merck's ' sodium taurocholate' is found to contain only 56% of pure sodium taurocholate, the rest (44%) presumably consisting of sodium glycocholate, and their 'glycocholate' has about 28% of sodium taurocholate mixed with it. Kahlbaum's and DIFCO's tauro-cholates are likewise found to contain 60 and 47% of pure sodium tauro-cholate respectively and it is conceivable that the remaining portions of these preparations also consist mainly of sodium glycocholate.

If we examine the haemolytic behaviour of the two Merck's preparations in the light of these findings, we find that a higher glycocholate content of the specimen is associated with a greater haemolytic activity both with respect to sheep and human red blood cells, the former appearing to be uniformly the more resistant of the two species of erythrocytes used. A higher taurocholate content, on the other hand, is characterized by a much feebler haemolytic effect. Pure sodium glycocholate therefore appears to be much more haemolytic than a pure specimen of sodium taurocholate.

The peculiar shape of the haemolytic curves, obtained with Merck's preparations, may become explicable if we suppose that in a mixture con-sisting of sodium taurocholate and sodium glycocholate (as these Merck's specimens appear really to be) so long as the concentration of taurocholate remains relatively high, the haemolytic effects of glycocholate are not mani-fest to any appreciable extent and the taurocholate is the dominant factor in determining its haemolytic behaviour, but as its concentration decreases with dilution, the glycocholate asserts itself to a gradually increasing extent till a maximum haemolytic effect is produced. The curve thereafter

represents the haemolytic characteristics of sodium glycocholate alone. The actual shape of the curve in any particular case, however, appears to be determined both by the relative taurocholate and glycocholate contents of the specimen as well as by the susceptibility of the species of erythrocytes concerned. For example, with Merck's taurocholate (56% taurocholate) and the more susceptible human r.b.c. (Fig. 1 'H') as well as with Merck's glycocholate (28% taurocholate) and the more resistant sheep r.b.c. (Fig. 2 'S'), the curves are almost alike, the greater activity of the lysin in the latter case being to a certain extent compensated by the greater susceptibility of the r.b.c. in the former. With Merck's glycocholate and human r.b.c. (Fig. 2 'H'), the initial lagging effect of taurocholate is hardly manifest and the glycocholate effect is more prominent, as this combination is favourable for maximum haemolytic activity. With Merck's taurocholate and sheep cells (Fig. 1 'S'), the curve is of the same general type but with difference that the taurocholate effect is more pronounced and the effects due to glycocholate consequently less marked than with the other combinations.

The atypical haemolytic curves, obtained with certain specimens of bile salts, therefore do not appear to be due to the inherent properties of perfectly pure specimens of these salts but rather represent the combined effects of a mixture, the constituents of which act more or less antagonistically.

If we compare the pH values and the haemolytic activity of these preparations at the different concentrations, especially near about the abnormal zone, we do not find any proportionality suggestive of possible correlation between these two properties. The surface tension values also do not undergo any abrupt change indicating probable instability of these lysins at particular concentrations. The bearing of surface tension on haemolytic activity has been discussed earlier (1943).

With Kahlbaum's taurocholate (60% taurocholate), the curves (Fig. 3) appear to be of the same general type, but with these the taurocholate effect is more pronounced and the effects due to glycocholate consequently less marked than in the case of the corresponding Merck's preparation. With the more resistant sheep cells, the glycocholate effect fails to manifest itself, but with the more susceptible human red blood cells it is felt at certain concentrations only. The somewhat more acid character of this brand of bile salt might also have some modifying effects upon its haemolytic behaviour.

That the reaction of the system has a modifying influence upon the course of haemolysis has been known for some time. Mond (1925) found that a slight increase in the H-ion concentration beyond the neutral point leads to the outpouring of haemoglobin, while on the alkaline side, there is a broad zone of resistance. Sen, Roy and Mitra (1929-30) found that traces of acids accelerate and traces of alkalies retard the haemolytic action of sodium taurocholate and this has since then been confirmed by other workers.

The accelerating action of traces of acids on haemolysis, produced by the bile salts, is well exemplified in case of DIFCO-taurocholate (taurocholate, 47%) where the initial lagging effect of taurocholate is not manifest at all (Fig. 4, Table IV), probably because on account of its greater acid reactions at the higher concentrations, haemolysis is considerably accelerated in that very region where otherwise the taurocholate effect would have been manifest, resulting in typical but somewhat accelerated time-dilution curves. It may be noted that here also the haemolytic effects on sheep and human red blood cells run closely parallel, and the more resistant character of the sheep cells is well maintained.

The pronounced acid character of this brand is well evidenced by the formation of a brownish colour (characteristic of acid haematin) and the development of turbidity after haemolysis is complete (already referred to, Table IV). The turbidity is evidently due to the precipitation of haemoglobin, as with a solution of haemoglobin (1%) exactly similar results are obtained. Solutions of the other brands of bile salts studied not only do not produce any turbidity with a solution of haemoglobin but cause a clarification of the somewhat opalescent solution.

SUMMARY AND CONCLUSIONS

1. Four different brands of bile salts have been studied with a view to explaining, if possible, the abnormal haemolytic behaviour observed with respect to some of them.

2. Of these, Merck's sodium taurocholate and sodium glycocholate yield the most atypical time-dilution curves.

3. From the specifications given in Merck's 'Index' as well as from the results of analysis these preparations appear to be mere mixtures of sodium taurocholate and sodium glycocholate, differing only quantitatively.

4. A higher glycocholate content of a specimen is found to be associated with a greater haemolytic activity both with respect to sheep and human r.b.c., the former appearing to be uniformly the more resistant of the two species of erythrocytes used. A higher taurocholate content, on the other hand, is characterized by a feebler haemolytic effect.

5. The atypical haemolytic curves obtained with certain specimens of bile salts do not appear to be due to the inherent properties of perfectly pure specimens of these salts, but rather represent the combined effects of a mixture, the constituents of which act more or less antagonistically.

6. From a simultaneous study of the pH, surface tension and haemolytic activity of these lysins at different dilutions, their haemolytic aberrations do not appear to be due either to the system having a particular pH near about the abnormal zone or to the physical instability of the lysin at particular dilutions as has hitherto been supposed. The reaction of the system has, however, a marked influence upon their haemolytic activity, an acid reaction favouring acceleration of the rate of haemolysis.

$N.B.$—The surface tension figures in Figs. 2 and 3 should be read as 84·0 and 90·5 instead of 83·5 and 90·0 respectively.

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TABLE I

Sodium taurocholate (Merck)
(contains 55·9% of pure sodium taurocholate)
Temperature—22°C.

	Concn. of the lysin.	With sheep r.b.c.		With human r.b.c.	pH	Surface tension.
		Haemolysis in		Time taken for complete haemolysis		
		2 hrs.	21 hrs.			
1	1/50	—	1·0	9′ 0″	6·3	102·0
2	1/75	--	0·5	39′ 0″	6·3	102·0
3	1/100	—	0·1	60′ 0″	6·3	100·5
4	1/150	—	0·05	75′ 0″	6·3	100·5
5	1/200	-	0·1	65′ 0″	6·4	98·0
6	1/300	—	0·9	28′ 0″	6·5	95·0
7	1/500	0·3	1·0	6′ 0″	6·5	90·0
		Time taken for complete haemolysis				
8	1/700	33′ 0″		3′ 0″	6·7	87·0
9	1/900	16′ 0″		3′ 0″	6·7	84·0
10	1/1100	16′ 0″		4′ 0″	6·7	82·5
11	1/1300	23′ 0″		5′ 0″	6·7	80·0
12	1/1500	27′ 0″		8′ 0″	6·7	79·0
13	1/2000	76′ 0″		23′ 0″	6·7	86·0

1·0 = Complete haemolysis.
— = No haemolysis.
′ = Minute.
″ = Second.

TABLE II

Sodium glycocholate (Merck)
(contains 27·9% of pure sodium taurocholate)
Temperature—25°C.

	Concn. of the lysin.	Time taken for complete haemolysis.		pH	Surface tension.
		With sheep r.b.c.	With human r.b.c.		
1	1/50	38′ 0″	4′ 30″	6·0	93·5
2	1/100	42′ 0″	5′ 30″	6·1	94·0
3	1/150	52′ 0″	4′ 30″	6·2	91·0
4	1/200	13′ 0″	1′ 35″	6·3	92·0
5	1/300	12′ 0″	2′ 30″	6·5	89·5
6	1/500	6′ 30″	2′ 30″	6·6	87·5
7	1/700	7′ 35″	2′ 30″	6·7	84·5
8	1/1000	3′ 40″	1′ 0″	6·7	81·0
9	1/1500	7′ 30″	4′ 30″	6·7	79·5
10	1/2000	33′ 0″	12′ 0″	6·7	80·5
11	1/2500	60′ 0″	20′ 0″	6·7	83·5
12	1/3000	90′ 0″	39′ 0″	6·7	84·0

TABLE III

Sodium taurocholate (*Kahlbaum*)
(contains 60% of pure sodium taurocholate)

Temperature—22°C.

	Concn. of lysin.	Time taken for complete haemolysis		With human r.b.c.	pH	Surface tension.
		With sheep r.b.c.				
1	1/50	27′ 0″		4′ 0″	5·4	90·5
2	1/75	47′ 0″		11′ 0″	5·7	89·0
		Haemolysis in				
		2 hrs.	21 hrs.			
3	1/100	0·95	1·0	29′ 0″	5·6	93·5
4	1/150	0·2	1·0	60′ 0″	5·8	95·0
5	1/200	0·1	1·0	70′ 0″	6·0	95·0
6	1/300	0·1	1·0	84′ 0″	6·0	93·0
7	1/500	0·05	1·0	78′ 0″	6·2	92·5
8	1/700	0·05	0·98	107′ 0″	6·3	91·0
9	1/900	0·05	0·98	143′ 0″	6·3	90·5
10	1/1100	0·05	0·98	46′ 0″	6·2	90·5
11	1/1300	0·05	0·80	182′ 0″	6·5	92·0
12	1/1500	0·05	0·60	0·98 (2 hrs.) 1·0 (21 hrs.)	6·3	92·0

TABLE IV

Sodium taurocholate (DIFCO)*

(contains 47% of pure sodium taurocholate)

Temperature—23°C.

	Concn. of lysin.	Time taken for complete haemolysis.		pH	Surface tension.	Remarks.
		With sheep r.b.c.	With human r.b.c.			
1	1/100	Immediate	Immediate	5·2	89·0	When haemolysis was complete a clear solu- tion was obtained but after a short time (10–15 minutes), the first four tubes of each set became opalescent. This opacity gradu- ally increased in ex- tent and on the fol- lowing day opacity was found to have developed in almost all the tubes, being proportional to the concentration of the lysin. Again, the first few tubes of each set developed a brownish colour after haemolysis was com- plete (characteristic of acid haemolysis).
2	1/150	0′ 5″	Ditto	5·2	86·0	
3	1/200	0′ 5″	0′ 5″	5·3	85·5	
4	1/300	0′ 50″	0′ 10″	5·4	83·5	
5	1/500	1′ 0″	0′ 30″	5·5	80·5	
6	1/700	1′ 25″	0′ 35″	6·0	80·5	
7	1/900	5′ 0″	1′ 0″	6·2	78·5	
8	1/1100	6′ 0″	2′ 0″	6·1	79·5	
9	1/1300	10′ 30″	2′ 10″	6·2	81·0	
10	1/1500	17′ 0″	7′ 0″	6·2	82·5	
11	1/2000	52′ 0″	37′ 0″	6·3	81·0	

* Of the different brands of bile salts tested the DIFCO brand appears to be the most hygroscopic. After some time, the content of the bottle sets into a hard mass but its haemolytic activity does not seem to be appreciably affected by this trans- formation.

IBN AL-HAITHAM ON THE PARABOLOIDAL FOCUSSING MIRROR

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INTRODUCTION

Al-Ḥasan bin al-Ḥasan bin al-Haitham, otherwise Abū 'Ali al-Baṣrī, and known in Europe as Alhazen,[1] was born in the year 965 A.D. at Basra, and died in the year 1039 A.D. in Cairo, where latterly he had carried out his researches in the vicinity of Al-Azhar.[2] He was one of the great figures of the Middle Ages, and apart from his fundamental investigations into the science of optics which concern us here, displayed that many-sided competence characteristic of the leading Arabic philosophers. 'Er war ein vortrefflicher Mensch, besaſs hohe Intelligenz und groſses Wissen, es kam ihm keiner seiner Zeit gleich, ja nicht einmal nahe in den mathematischen Wissenschaften. Er war ausdauernd in der Arbeit, fruchtbar als Schriftsteller und sehr enthaltsam in Leben.'[3]

The greatest achievement in optics of Ibn al-Haitham was his treatise of that name,[4] of which it was believed that the Latin version alone remained.[5] Professor Mustafā Nazīf Bey has, however, recently discussed the Arabic text, discovered in Istanbul, in his valuable work published in Cairo.[6] Ibn al-Haitham made a special study of, amongst other problems, the reflection and refraction of light, the camera obscura, and the focussing of light and heat by curved mirrors, and is also remembered by the Problem of Alhazen, viz.: Given a reflecting surface of a certain shape, the object-position and the position of the eye, to determine the point of reflection on the reflecting surface. The present paper gives an interpretation of a work of Ibn al-Haitham on the reflecting mirror of parabolic longitudinal section on the basis of the MS. in the India (now Commonwealth Relations) Office in London.[7] Although mediaeval Arabic scientific literature has been ably treated in Germany, especially by Eilhard Wiedemann and his school at Erlangen,[8] English research in the field of Arabic physics is particularly

[1] *Vide* E. Narducci. Trattato D'Ottica D'Al Hazen. Bullettino Boncompagni, IV, p. 21. (1871.)

[2] *Vide* Ibn al-Qiftī (died 1248/49 A.D.): Tārīkh al-ḥukamā.

[3] H. Suter. Die Mathematiker und Astronomen der Araber und ihre Werke. Leipzig, 1900, p. 91.

[4] Kitāb al-manāzir.

[5] Opticae thesaurus Alhazeni Arabis libri septem, nunc primum editi. Euisdem liber de crepusculis et nubium ascensionibus, etc. a Fed. Risnero, Basel 1572.

Dr. Charles Singer has listed eight MSS. (13th–15th centuries), in English libraries, of the Latin translation of Alhazen: F. Risner's was the first printed version. (*Vide* Studies in the History and Method of Science, Vol. II, p. 393, Oxford, 1921.)

[6] M. Nazīf Bey. Al-Hasan ibn al-Haitham. His optical studies and discoveries. Vol. I, 1942; Vol. II, 1943; Nūri Press, Cairo. In Arabic.

[7] E. Loth. Catalogue of Arabic MSS. in the Library of the India Office (754, 5). There is also another MS. at Leyden. (Cod. 161 (3) Gol. No. 1010 of catalogue.)

[8] See particularly, Ibn al-Haitams Schrift über parabolische Hohlspiegel (J. L. Heiberg and E. Wiedemann) in Bibliotheca Mathematica, 3rd series, Vol. 10, pp. 201–237. Leipzig (1909-1910). Here is a German version together with the Latin text.

lacking.[1] This is the first of a series of papers for which, therefore, we offer no apology, in spite of the prior treatment of certain aspects in German and in Arabic.   It is hoped thereby that a small breach will be filled in English literature dealing with the history of physics: the mediaeval Arabic field being little known, there is value in the interpretation of whatever MSS. we may possess.[2]

The literal rendering has been adhered to closely, and where significant departures have been made in the use of technical terms these have been indicated in the notes: occasionally a few words have been added for clarity, and such words are shewn in brackets.   The MS., probably 17th century A.D., is in a neat Naskhī hand; there are few errors in writing, and these lead to no difficulties of interpretation.   For the sake of brevity in the mathematical portion of the text, we have ventured to use the usual signs for 'therefore', equality, angle, addition, multiplication, the index[3] for 'squared', and so on; *but it should be made at once clear that no such symbolism was used by Ibn al-Haitham*, except in the case of letters coming together as in angle or line, e.g. ‏ز‎ for HZ, ‏كجح‎ for KJH, when a simple 'bar' is used.   The argument in the original MS. is continuous as in an essay, and there is no semblance of modern mathematical format.

As for the immediate basis of Ibn al-Haitham's treatment of the paraboloidal focussing mirror there are two aspects, the mathematical and the physical; the former involves the legacy of Greek thought upon the conic sections, especially the parabola, and Ibn al-Haitham mentions Apollonius in particular, though there were others[4]; the latter leads us to the generally-accepted statement amongst Muslim writers[5] that Diokles was the discoverer of the paraboloidal mirror, other Greeks having used either an arrangement of plane mirrors to focus the light and heat, or the logical consequent, a concave spherical mirror.[6]

In the Name of God the Compassionate the Merciful.   And my guidance is only from God.

A TREATISE BY AL-ḤASAN IBN AL-ḤASAN IBN AL-ḤAITHAM ON THE MIRRORS[7] WHICH CAUSE BURNING BY VIRTUE OF (CONIC) SECTIONS.[8]

One of the noblest things which geometricians conceived and about which the ancients vied with one another, and by which the remarkable

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[1] Professor George Sarton of Harvard has, however, written about Ibn al-Haitham in his monumental Introduction to the History of Science (Vol. I, pp. 721–723, Baltimore, 1927) and has included valuable reviews and notes in the journal *Isis*.

[2] See Legacy of Islam, Oxford, 1931. Article: Science and Medicine.   (Max Meyerhof), p. 311.

[3] *Vide* Ibn al-Qiftī (died 1248/49 A.D.) : Tārīkh al-ḥukamā.

[4] Sir T. L. Heath.   History of Greek Mathematics.

[5] For example, in the Encyclopaedia of Al-Singārī (Sakhāwī, Anṣārī).   The work of Diokles is also mentioned in the Commentary of Eutokius on the Book of the Sphere and Cylinder of Archimedes. (*Vide* Archimedes, Opera Omnia. Edited J. L. Heiberg.   Vol. III, pp. 78, 152, 188.)

[6] See the text below, first paragraph.

For the use of a number of plane mirrors arranged to produce burning, see Tract of Alexander (Gotha, Kat. W. Pertsch. No. 1348; Paris, Cat. de Slane No. 2825).

[7] ‏المرآة‎

[8] ‏القطوع‎ = sections. Sing. ‏القطع‎. This term is used where we would use the term 'conics'; to accord with modern usage we have written 'conic sections' in full. The parabola is the conic section implied in this treatise.

properties of geometrical figures were revealed in conjunction with their physical consequences, is the making of mirrors which burn by reflection [1] of sunlight. In adopting them, they followed various methods. For they found that light [2] is reflected from the surfaces of simple plane mirrors, and also from the surfaces of spherical mirrors, and that the places to which the light is reflected vary according to the proportions (of the mirrors). But it became clear to them that the ray [3] which is reflected from a plane mirror to one point is reflected only from one point, and that which is reflected from a spherical mirror is reflected from the circumference of one of the circles which fall within that sphere (of which the mirror forms a part). The proofs of that are evident in their books. Some of them adopted numerous plane mirrors added together, from all of which rays were reflected to one point. Some adopted the concave spherical mirrors, and some adopted many spherical mirrors, the rays from which were reflected to one point, so that burning might be strong. Those who adopted these mirrors are famous, such as Archimedes and Anthemius and others. Next it occurred to them to think about the properties of the figures from which rays are reflected. Thus they investigated the properties of the conic sections,[4] and found that in the case of the concave surface of the paraboloid [5] the rays are reflected from the whole of its surface to one and the same point. So it became evident that burning which arises from a mirror of this shape is stronger than the burning of all mirrors of other shapes. But they did not explain in a convincing manner either the proof of this condition [6] or their way of arriving at it. And in view of the great benefits and the general uses in that, we have decided to explain it and make it clear, so that those may learn it who have a desire to know facts, and that we may teach it to anyone whose enthusiasm is focussed on outstanding achievements. Therefore we have explained it in this essay and summarized the proof of the knowledge of its facts. We have also mentioned the way to be followed in adopting it and arranging its apparatus, and have indicated the principles which geometricians use with all kinds of mirrors, so that anybody who seeks it might find his way to it, and he who desires might attain it.

Premisses agreed upon.—The rays of the sun proceed from the body of the sun to the surfaces of all types of mirrors, and to all objects, on straight lines.

All rays falling on plane mirrors are reflected from the surfaces of the mirrors at equal angles; and all the rays falling on concave mirrors make equal angles with the plane surfaces tangential to these surfaces (mirrors) at the points where the rays fall. By the ray which is reflected at equal angles I mean that the reflected light subtends, together with the straight line mutually separating the plane of incidence [7] from the plane surface of the reflector, or of the surface tangential to the concave mirror, two equal angles.

And the rays which proceed along the straight lines which end at the surface of all kinds of mirrors, and are reflected at equal angles, whether

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[1] ألاِنْعِكاس

[2] الضّوء = light.

[3] الشُّعاع = ray. The terms 'light' and 'ray' are frequently interchanged.

[4] القَطْع المَكافى = conic section.   [5] المُجسّم المَكافى

[6] المَعنى This word is also used for 'idea'.

[7] We have used a modern term here in order to simplify the text.

from plane mirrors or from the surfaces tangential to concave mirrors—
I mean the lines which are reflected and represent the reflected rays—are
also reflected along these lines. And by the plane surface tangential to
the concave surface is meant that surface which has only one common
point with the concave surface. By the surface of the reflected line and
the reflected ray is meant the surface in which these two lines lie, i.e. the
line itself and the line which, together with it, subtends an angle.

Proof.[1]—The axis of any parabola [2] is shown (Fig. 1) and a distance
equal to one quarter of its parameter [3] is marked off. Thus if every line
which is within the parabola, and parallel to the axis, and ending at the
curve [4] is reflected to the point which marks off the fourth part, the two
lines together with the tangent [5] to the curve subtend two equal angles
at that point, e.g. the parabola ABG and its axis AD, L its parameter.
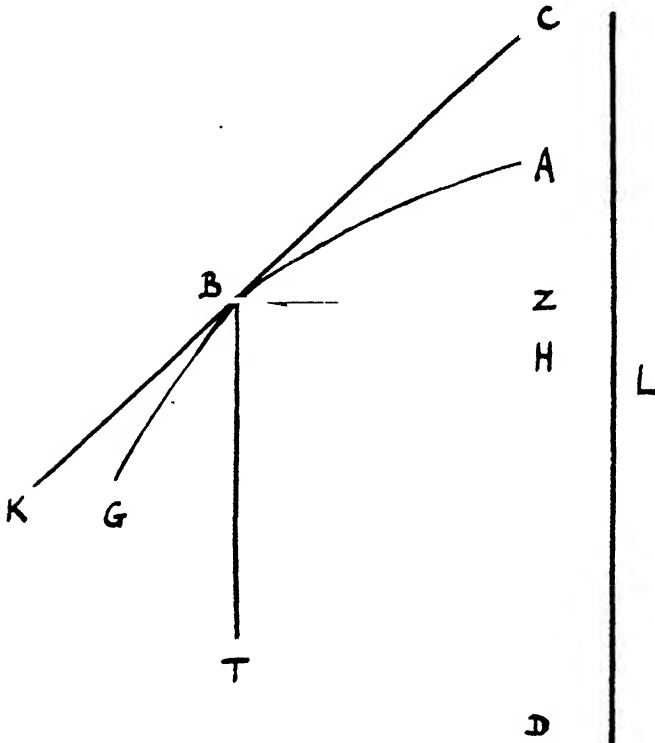
From AD the distance AH is marked off equal to $\frac{1}{4}L$. TB is drawn
parallel to DA, and B and H joined, and the tangent KBC drawn. Suppose
that $\angle TBK = \angle HBC$.

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[1] اَلْبُرْهَان عَلَى ٱلْمَعْنَى ٱلْمَقْصُود ; abbreviated to 'Proof'.

[2] See ref. 19. Rendered as 'parabola'.   [3] ٱلضِّلْع ٱلْقَائِم

[4] See ref. 19. Rendered as 'curve'.

[5] (ٱلْخَط) ٱلْمُمَاس

(I) First let $\angle BHC$ be acute.

   (i) By the method of analysis[1] it may be supposed that
$$\angle TBK = \angle HBC.$$
Now since the line TB is parallel to DA,
$$\angle TBK = \angle BCD;$$
also since $\angle TBK = \angle CBH,$

then $\angle CBH = \angle BCH.$

$\therefore$ The line $BH =$ the line $HC.$

Thus $BH^2 = HC^2.$

We draw BZ perpendicular to the axis.
$$\therefore\ HZ^2 + ZB^2 = HC^2$$
but $BZ^2 = AZ \times L,$[2]

L being the parameter, which the esteemed Apollonius has explained in his book on the Conic Sections.

Thus $HZ^2 + (AZ \times L) = HC^2.$

But $HA = \tfrac{1}{4}L,$

Thus $(ZA \times 4AH) + HZ^2 = HC^2.$

$$\therefore\ AC = ZA.$$

But this is so because BC is a tangent and BZ is perpendicular[3] (to DC).

   (ii) By the method of synthesis,[4] conditions remaining unaltered, I say, therefore, that $\angle TBK = \angle HBC.$

Proof.—We draw BZ perpendicular (to DC). Now since BC is tangential to the curve and BZ is perpendicular (to DC) then ZA will equal the line AC.

And $(4HA \times AZ) + HZ^2 = HC^2.$

But $HA = \tfrac{1}{4}L,$

$$\therefore\ (4HA \times ZA) = L \times ZA$$
$$\therefore\ (L \times ZA) + HZ^2 = HC^2.$$

But $(L \times ZA) = BZ^2$ because BZ is a perpendicular.

$$\therefore\ BZ^2 + HZ^2 = CH^2$$

But $BZ^2 + HZ^2 = HB^2$

$$\therefore\ HB^2 = HC^2$$
$$\therefore\ HB = HC.$$
$$\therefore\ \angle HBC = \angle HCB.$$

And also TB is parallel to DA,

$$\therefore\ \angle TBK = \angle HCB$$
$$\therefore\ \angle HBC = \angle TBK.$$

Similarly for every line which is drawn parallel to the axis and ends at (is reflected to) the point H, and together with HA subtends an acute angle; and that is what we wished to demonstrate.

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[1] طَرِيقُ التَّحليل

[2] The well-known property of the parabola, written $y^2 = Lx$, L being the parameter.

[3] عَلَى التَّرْتِيبِ   This is not the modern term.

[4] طَرِيقُ التَّركيب

(II) Let us retain conditions as before, and let BH together with HA subtend a right angle (Fig. 2). I say that $\angle TBK = \angle HBC$.
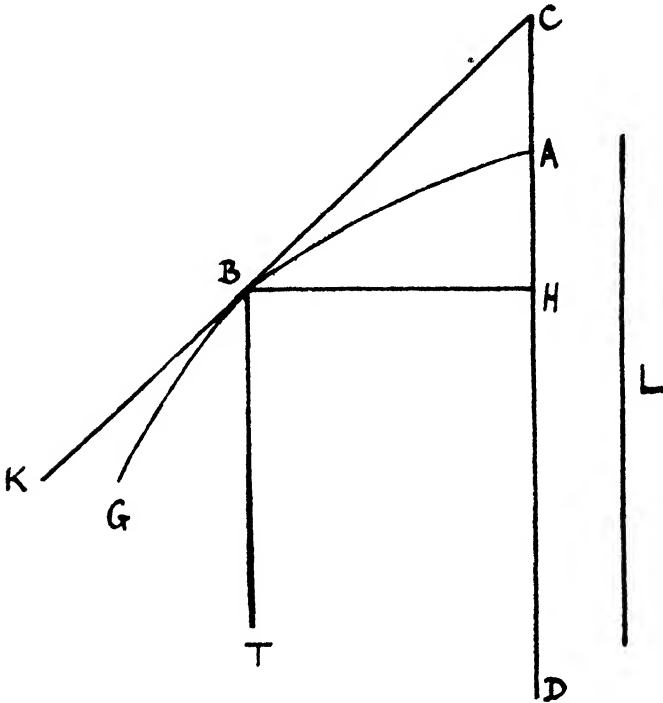
FIG. 2.

(i) By the method of analysis, we suppose that the two angles are equal.

$\therefore$ Since the line TB is parallel to the line AD,

$$\angle TBK = \angle HCB;$$

but $\qquad \angle TBK = \angle HBC.$ (Given.)

$$\therefore \angle HBC = \angle HCB$$
$$\therefore \text{line } BH = \text{line } HC$$
$$\therefore HB^2 = HC^2.$$

But $\qquad HB^2 = HA \times L,$

since L is the parameter and BH is on a right angle (perp. to CD)

$$\therefore (HA \times L) = HC^2.$$

But $\qquad (HA \times L) = \tfrac{1}{4}L^2$

because $\qquad HA = \tfrac{1}{4}L$

$$\therefore HC^2 = \tfrac{1}{4}L^2$$
$$\therefore HC = \tfrac{1}{2}L;$$

and $\qquad HA = \tfrac{1}{4}L,$

$$\therefore AC = \tfrac{1}{4}L.$$
$$\therefore \text{Line } HA = \text{line } AC.$$

But this is so, because BC is a tangent and BH is a perpendicular (to CD).

(ii) By the method of synthesis. Suppose conditions unaltered. I say that $\angle TBK = \angle HBC.$

Proof.—The line BC is a tangent to the curve and BH is a perpendicular (to CD).

$$\therefore \text{ Line } HA = \text{line } AC, \text{ and } HA = \tfrac{1}{4}L.$$
$$\therefore HC = \tfrac{1}{2}L$$
$$\therefore HC^2 = \tfrac{1}{4}L^2;$$

but $\quad HA \times L = \tfrac{1}{4}L^2$ because $HA = \tfrac{1}{4}L,$

$$\therefore HA \times L = HC^2.$$

But $\quad HA \times L = HB^2$ because BH is a perpendicular (to CD).

$$\therefore BH^2 = HC^2$$
$$\therefore \text{ line } BH = \text{line } HC$$
$$\therefore \angle HBC = \angle HCB.$$

And since line TB is parallel to line DC, then

$$\angle TBK = \angle HCB;$$

also

$$\angle HBC = \angle HCB,$$
$$\therefore \angle TBK = \angle HBC,$$

and that is what we wished to prove.

(III) Retain conditions as before, and let $\angle BHC$ be obtuse (Fig. 3). I say that $\angle TBK = \angle HBC$.
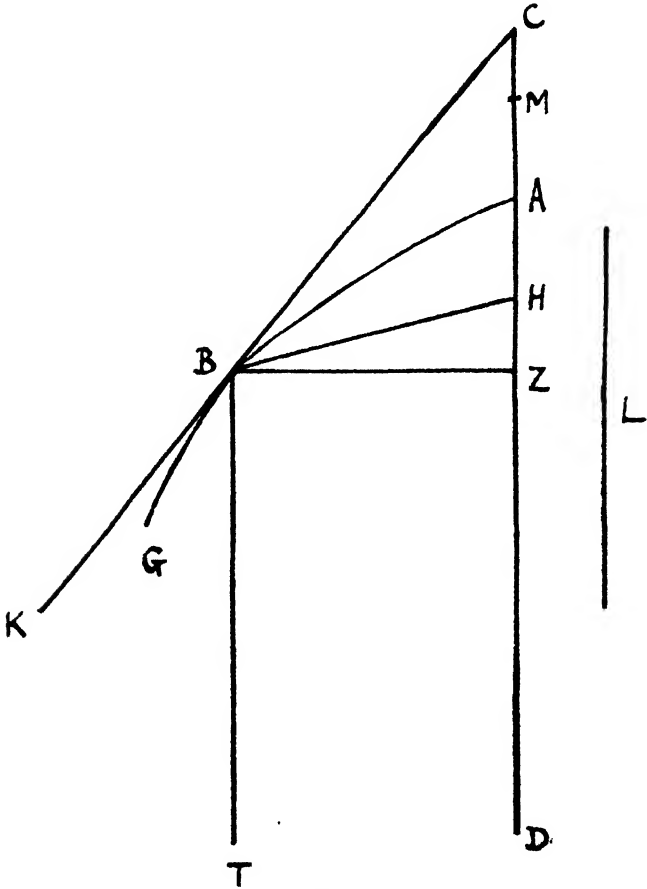
FIG. 3.

(i) By the method of analysis, we suppose that this is so.

Now since the line TB is parallel to the line DC,

$$\angle TBK = \angle HCB.$$

And $$\angle TBK = \angle HBC. \quad \text{(Given.)}$$
$$\therefore \angle HBC = \angle HCB,$$
$$\therefore \text{line } HB = \text{line } HC,$$
$$\therefore BH^2 = HC^2.$$

Draw BZ perpendicular (to CD). Then $BZ^2 + ZH^2 = HC^2$.

But $$BZ^2 = AZ \times L,$$
$$\therefore (AZ \times L) + ZH^2 = HC^2.$$

But $$HA = \tfrac{1}{4}L,$$
$$\therefore (ZA \times 4AH) + ZH^2 = HC^2.$$

Make $$AM = AH,$$
$$\therefore (ZA \times 4AH) + ZH^2 = ZM^2 = HC^2 \ ^{(1)}$$
$$\therefore ZM = CH.$$

HM, which is common to both, is subtracted; there remains

$$ZH = MC.$$
Now $$HA = AM,$$
$$\therefore ZA = AC;$$

but it is so because BC is a tangent to the curve and BZ is a perpendicular (to CD).

(ii) By the method of synthesis. Suppose conditions unaltered. I say that $\angle TBK = \angle HBC$.

Proof.—We draw BZ perpendicular (to CD). Now since BC is a tangent to the curve and BZ is a perpendicular (to CD), the line $ZA =$ the line AC.

We make $$AM = AH,$$
then there remains $$ZH = MC,$$
Thus $$ZM = HC$$
$$\therefore ZM^2 = HC^2.$$
But $$(ZA \times 4AH) + HZ^2 = ZM^2$$
$$\therefore (ZA \times 4AH) + HZ^2 = HC^2.$$
But $$(ZA \times 4AH) = ZA \times L \text{ because } HA = \tfrac{1}{4}L$$
$$\therefore (ZA \times L) + ZH^2 = HC^2.$$
But $$(ZA \times L) = BZ^2 \text{ because } BZ \text{ is a perpendicular.}$$
$$\therefore BZ^2 + ZH^2 = HC^2.$$
Now $$BZ^2 + ZH^2 = BH^2$$
$$\therefore BH^2 = HC^2$$
$$\therefore BH = HC,$$
$$\therefore \angle HBC = \angle HCB.$$
But $$\angle HCB = \angle TBK \text{ because line } TB \text{ is parallel}$$
$$\text{to line } DC.$$

$$\therefore \angle HBC = \angle TBK.$$

Similarly for every line which is drawn in the conic, which together with the line HC subtends near to the apex an obtuse angle. And every line which is drawn in the conic parallel to the axis, and is reflected to a certain point,[2] subtends, together with the tangent, two equal angles; and that is what we wished to demonstrate.

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[1] Euclid, Elements Bk. II, Prop. 8.
[2] I.e. point H. Letter H absent from text.

In the case of every conic section (parabola), if the axis is kept fixed
and the section is rotated until it returns to the position of starting, it
forms a solid of revolution, and also forms, in the medium which surrounds
it, whatever that medium is, a (hollow) concave surface. If any plane
surface proceeds from the axis and intersects that concave surface, the
mutual separation is a conic section, equal to the first conic section which
generated the concave surface, and its axis is the (original) axis. For
example, the section ABG (Fig. 4) is a conic section and its axis is AD.
The line GD is perpendicular to it. AD is kept fixed and the section is
rotated till it returns to its starting position, and it has formed out of its
confines a concave surface, the base of which is the circle GHZ which is
formed from the rotation of the point G; and the apex (of the surface) is
the point A. A plane surface proceeds at random from the axis AD and
cuts the concave surface; the mutual separation is the line ACH. I say
that the line ACH is a conic section equal to the section ABG.
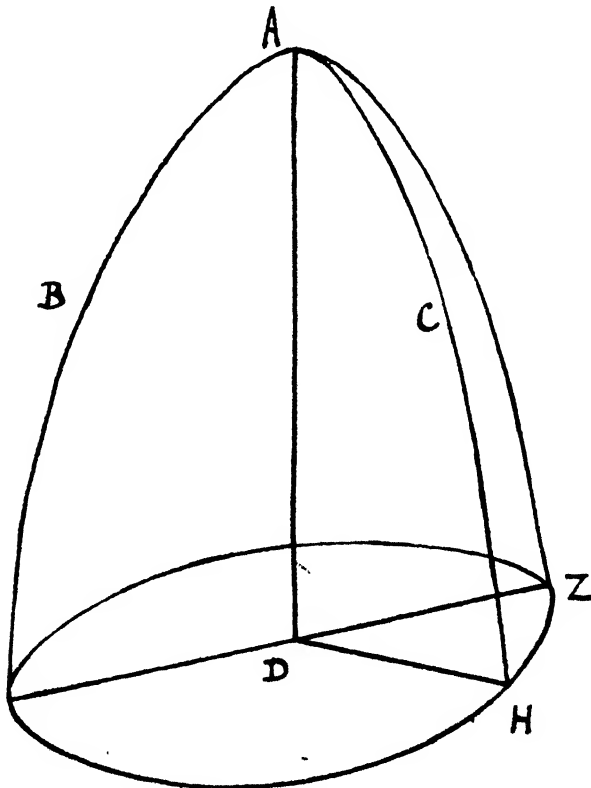
FIG. 4.

Proof of that.—We join HD and imagine the first section $ABGD$
moving round the axis AD.

Therefore, if the point G ends at the point H, the line DG is super-
imposed on the line DH, and the surface $ABGD$ on the surface $ACHD$, and
they become one surface, because they are two equal surfaces; and since
the conic section ABG has generated the concave surface, the line (boundary)
$ABGD$ is always, however the section is rotated, the mutual separation

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between the concave surface and the conic section. If, therefore, the surface $ABGD$ is superimposed on the surface $ACHD$, the mutual separation between it and the concave surface would be the line ABG; and the mutual separation between the surface which is superimposed on it, and becomes with it one surface, between this and the concave surface is the line ACH. Therefore the line ABG is congruent with the line ACH and both become one line, and the whole of one surface becomes equal to the (other) surface. Therefore the line ACH is a conic section equal to the section ABG, and its axis is AD; and that is what we wished to show.

From the end of the axis of any surface which has the same concavity as the paraboloid, a distance equal to one quarter of the parameter of the section which generated it, is marked off. Every line which is drawn parallel to its axis and which ends at the concave surface, and is reflected to that point ($\frac{1}{4}L$ from the end), subtends, together with the tangent to the concave surface, which is the mutual separation between the reflected line and the plane surface which is tangential to the concave surface, two equal angles. For example, a surface (Fig. 5) with the same concavity as the paraboloid, whose apex is A, and whose base is the circle GZH, and whose axis is AD. The line AC equal to one quarter of the parameter of the section which generated it, is marked off. The line TB is drawn parallel to the axis, and reflected to the point C. I say that the two lines TB and BC subtend, together with the tangent to the concave surface, which (tangent) lies in their own plane, two equal angles.
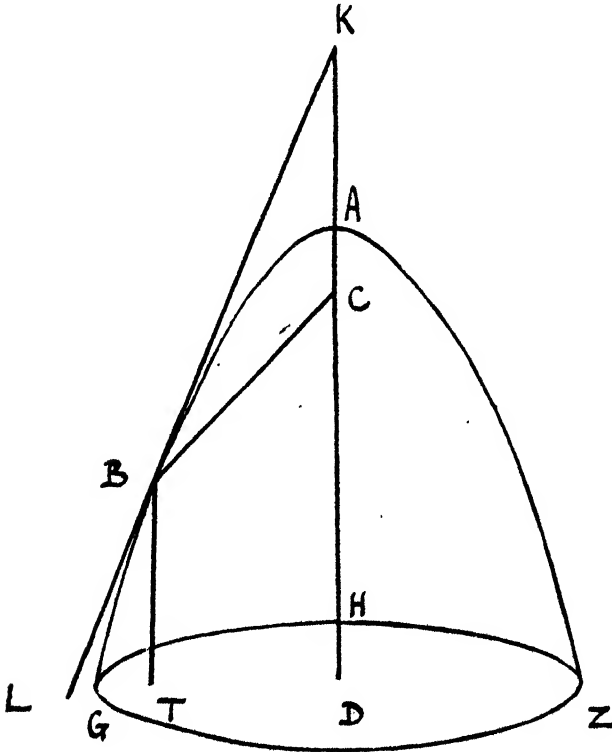
Fig. 5.

Proof of that.—The lines TB and DA are parallel, therefore they are in one plane; and the lines BC and AD are intersecting, therefore they are in one plane, viz. the plane of the two parallel lines. We produce the surface $BTDA$ until it cuts the concave surface and the plane surface which is tangential to it, at the point B. Thus it forms in it a conic section (parabola), equal to the conic section which it formed, as we explained in the figure above, and its axis is the same axis.

Let that section be $ABGZ$. It also forms a straight line in the plane surface tangential to it. Let that line be KBL. The line KBL is tangential to the concave surface because it meets it at one point only. Similarly it is also tangential to the parabola because it meets it at one point only. Now since the line KBL is tangential to the section, and the line AC is one quarter of its parameter, and the line TB is parallel to the line AD and has been reflected to the point C, then the lines TB and BC subtend, together with the line KBL, two equal angles, as was explained above. Now therefore the lines TB and BC subtend, together with the tangent to the concave surface—which tangent is the mutual separation between the plane of the two lines TB and BC and the surface tangential to the concave surface—two equal angles; and similarly it is evident that every line which is drawn parallel to the axis and ends at the concave surface, and is reflected to the point C, would satisfy the same conditions; and that is what we wished to demonstrate.

If the surface of any mirror with the same concavity as the paraboloid is placed opposite the body of the sun so that the axis (of the mirror) is in a direct line with its body, rays proceed from the body of the sun to the whole of its surface, and are reflected to one point on its axis, and the distance (of this point) from the apex (pole) of the surface is equal to one quarter of the parameter of the section which generated that surface. Example (Fig. 6): the surface of a mirror with the same concavity as the paraboloid whose apex is the point A, whose base is the circle GDB, and whose axis is AD. The point C is at a distance from the point A equal to one quarter of the parameter of the parabola which generated the surface. It is placed opposite to the sun, which is represented by the circle T, in such a way that the axis AD, should it be produced, would end at the point T which is inside the body of the sun. I say that rays proceed from the body of the sun to the whole extent of this surface, and all of them are reflected to the point C.
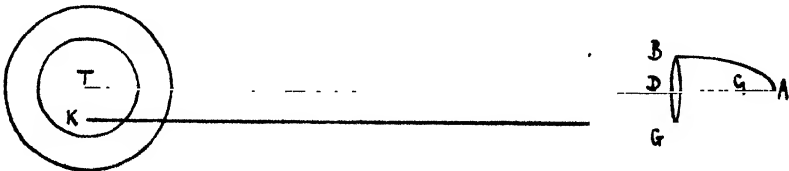
FIG. 6.

Proof of that.—All the rays which proceed from the body of the sun proceed along straight lines.

Thus the ray which proceeds from point T to point A proceeds along the line TD.

We imagine a point at random on the reflecting surface, on the circumference of its base, and let it be point G, and let us suppose a line GK proceeding from the point G parallel to the line AT. Thus, if the line GK is produced it falls on the body of the sun, because the separation between

it and the line AT is a small quantity which has no significance in the body of the sun. Therefore it falls always near the point T, and the point T is inside the body of the sun. Therefore it falls in the body of the sun. Thus let it fall on the point K. Thus the ray which proceeds from the point K to the point G proceeds along the line KG. Similarly, any line which proceeds parallel to the axis, from any point on the area of the (base of the) surface, ends at the body of the sun. And thus the ray which proceeds from that point to the point which is on the surface of the reflector proceeds along that line, for it is evident that rays proceed from the body of the sun to the whole extent of the reflecting surface on lines parallel to the axis. Therefore I say that all of them are reflected to the point C.

And since the surface AGB has the same concavity as the paraboloid, all the lines parallel to its axis, if they terminate at it (AGB) and are reflected to the point C, would subtend, together with the straight lines which proceed in their planes tangentially to the concave surface, equal angles, as is clear in the figure above. And the straight lines which proceed to the reflecting surfaces are reflected at equal angles with the lines tangential to the reflecting surfaces which (latter) are in the planes of the reflected lines.[1] And the rays which proceed along these (last named) lines are reflected along such lines. The rays which proceed from the body of the sun along the lines, parallel to the axis to the whole extent of the surface of the concave (paraboloidal) reflector, are reflected along those lines which end at the point C. And it has been made clear that rays proceed from the body of the sun to the whole extent of the reflecting surface along lines parallel to the axis; and the rays which proceed to the whole extent of the concave reflecting surface of the same concavity as the paraboloid, and which are parallel to the axis, are all reflected to the point C, the distance of which from the pole of the surface equals one quarter of the parameter; and that is what we wished to demonstrate.

Having made clear that the rays which proceed from the body of the sun to the whole surface of the mirror with the same concavity as the paraboloid, and which are parallel to its axis, are all reflected to one point, we now explain how the mirror which has this shape is adopted. We take a plate of good steel of any size we desire, and let it represent the plate $ABGD$ (Fig. 7)[2] and make out of it a part of any conic whatever, and let this be the section of the parabola AHG; let the plate be cut along the line AHG. As to how the parabola and other (conic) sections are made by means of a tool, this was mentioned by several geometricians, although they did not actually make them with precision. And we have explained in a treatise,[3] in which we mentioned the making of all conic sections by means of a tool, how we make any section we require to such a precision that it cannot be exceeded in a material[4]; such is the drawing of the circle with the compasses—although that[5] is difficult—at any diameter we

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[1] A condensed statement of the two laws of reflection.

[2] Fig. 7 though in the original MS. is not essential. Fig. 8a could be used.

[3] See E. Wiedemann. Festschrift für J. Rosenthal, Leipzig, 1906, p. 172. Zeitschrift für Vermessungswesen, Vol. 39. (1910.)

[4] In contrast with pure theory. Ibn al-Haitham realized the practical limitations. اَلْمَادَّة = material.

[5] ذَلِكَ أَلْقَمْل = lit. 'that cutting'.

Perhaps in error for ذَلِكَ أَلْفَعْل = that action, i.e. the drawing of the circle, etc.

require; and its angle of inclination [1] could be any angle we want, its parameter any line we want. Any portion we wanted from the parabola, whether from near the apex or from the middle (could be attained), and its distance from the apex could be any distance required. From which (treatise) emerges clearly how we can produce the conic section from the plate, and were this not so this work would become long and mixed with what is not properly of it; we could have mentioned the matter here, but it has been dealt with in a more fitting place.
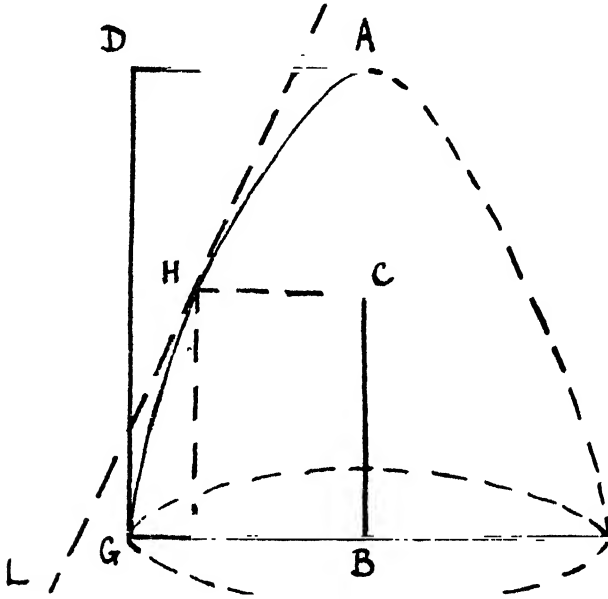
FIG. 7.

Thus we produce on the plate *ABGD* a portion of the parabola, and let it be the part *AHG*. The plate is then cut along the section. Then we sharpen its edges so that they cut anything they pass over. We then take another plate of steel with a slight thickness and cut it along the same conic section, and then the edge is worked on with a file until the iron[2] is filed down. Then a concave mirror of steel is taken of any size, so long as it is near to what is required. If the portion (Fig. 8*b*) which we took out from the parabola is from near the apex, such as section *AHGB* (Fig. 8*a*) we make that mirror into the shape of a half-egg (Fig. 8*d*), and if the piece from the parabola is from the middle of the parabola (Fig. 8*c*) such as the section *AHCB* (Fig. 8*a*), we make both plates each of the shape of the section *AHCB*, and make one of them sharp and the other filed down smooth; then make the mirror to the shape of a ring (Fig. 8*e*). Next we place the filed-down plate on the concavity of the mirror and then file it down (further) until it covers the whole surface of the mirror. When we finish that we fit

ز᾽ِاوِيَة ُالتَّرْتِيب ¹

This refers to an ordinate of the parabola, the angle being measured from the axis.

² Ibn al-Haitham mentions both 'iron' and 'steel'.

the mirror in the instrument called the 'turntable',[1] on the centre of the circle of its base, and on the apex (of the mirror) if it is egg-shaped, or on the centre of the outer circle if it is a ring. The sharp-edged plate is placed on the concavity of the mirror, and (the mirror) rotated in the way that we cut (astronomical) instruments, until the edge of that plate meets the whole surface of the mirror, and all roughness in it is removed and it becomes as smooth as possible. When this is done its surface becomes the surface of
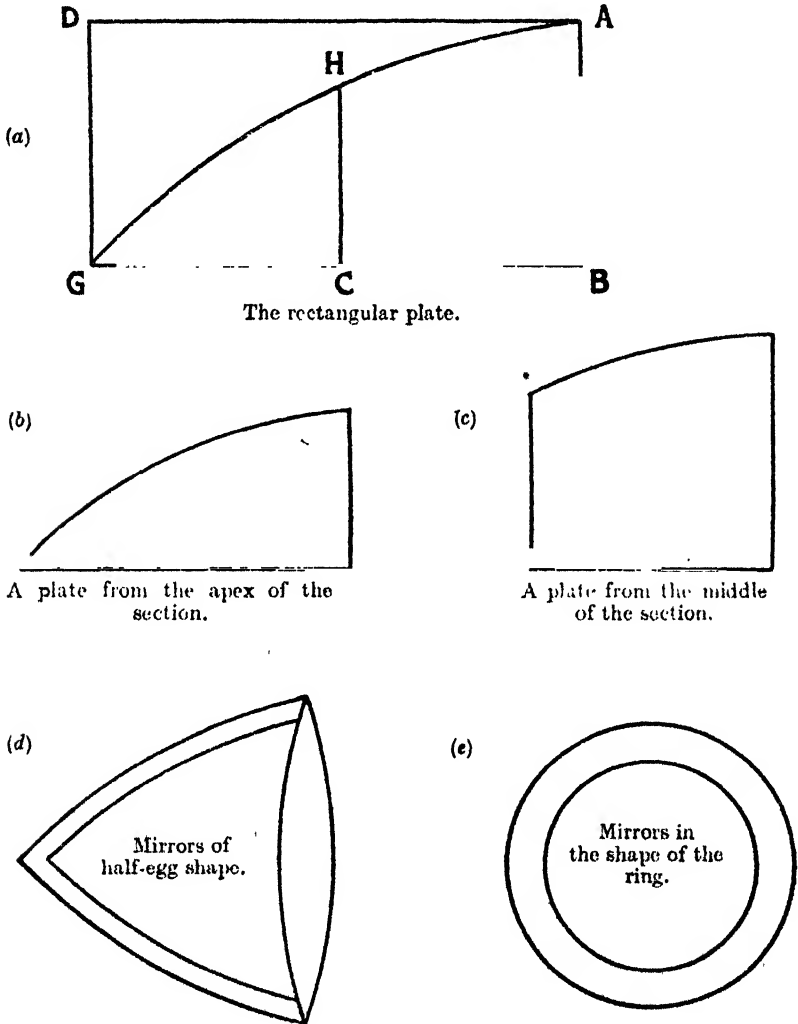
(a)

The rectangular plate.

(b)

A plate from the apex of the section.

(c)

A plate from the middle of the section.

(d)

Mirrors of half-egg shape.

(e)

Mirrors in the shape of the ring.

FIG. 8.

the paraboloid and it is of the shape which we intended.   Then it is polished and used, and this is its form.   This is the summary of the whole discourse on burning mirrors which are of the shape of paraboloids.

As to how we make a burning mirror of this shape so that its burning is at a certain distance which we require, the distance is found from the axis; if we want the mirror to be egg-shaped, we suppose a plate of steel such as $ABGD$ (Fig. 9) and scribe on it a straight line such as BG, and imagine the required distance such as GZ, and reproduce on the plate a part of the parabola from near its apex, such as the portion AHG; so that its apex would be the point G, its axis BG, and its parameter 4 times GZ. And we have said before that we have explained in its correct place in 'The construction of (conic) sections,'[1] how that can be found out.   Thus if we produce on the plate the parabola AHG according to this description the line ZG will be one quarter of the parameter; and it was made clear that all the rays which fall on the mirror, made from the parabola AHG, are reflected to the point Z, and (so) the distance of the point Z from the mirror is the required distance.   Thus the burning of the egg-shaped focussing mirror (made) from the section AHG is at the point Z, the distance of which from the mirror is the required distance.   We thus make from the parabola AHG an egg-shaped mirror by the process described above, so that its burning is at the required distance.
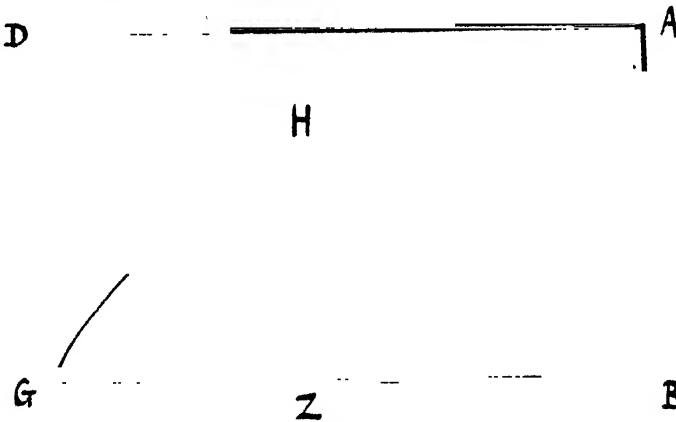
Fig. 9.

And if the mirror is to be in the shape of a ring we imagine a plate such as $ABGD$ (Fig. 10) and scribe on it a straight line such as the line BG, and suppose a straight line at random such as the line C, and add it to the distance (x) at which we wish the burning to be.   We then make on the plate a part of a parabola, from its middle, whose axis would be BG and parameter 4 times C, and the distance of the point from the apex of the parabola would be equal to the line made up of the given distance (x) and line C; and we have explained the idea also in our book[2] on the construction of conic sections.

Thus if we represent on the plate a part of a parabola according to this description, such as the part AH, we imagine the line BG produced along the surface and cutting AH produced.   Let it (AH) meet the axis at the point Z, and let us imagine $ZT = C$.   Now since the section AHZ

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[1], [2] See ref. 3 on p. 36.   E. Wiedemann.   'Treatise' and 'book' refer to the same work.
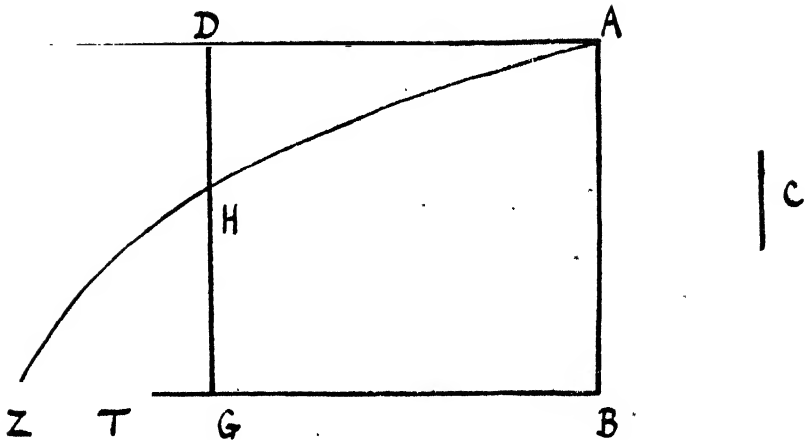
FIG. 10.

is a parabola whose axis is BZ and whose parameter is 4 times TZ, which (TZ) is equal to C, TZ would be one quarter of the parameter; thus all the rays which fall on the mirror made from any part of the parabola AHZ, are reflected to the point T, and since we have supposed the distance of the part AH from the apex of the parabola to be equal to the given distance (x) plus the line C, and $TZ = C$, then the line GZ equals the given distance (x) plus line C. Thus their remains GT equal to the given distance (x). Thus the burning of the total[1] mirror from the section AH, which is ring-shaped, would be at the point T whose distance from the mirror is the given distance (x). So we make from the section AH a mirror in the form of a ring by the process described above, whence its burning would be at the given distance.

So this discourse covers the whole making of burning mirrors which are of this (paraboloidal) shape, and they are the strongest of all burning mirrors because the rays are reflected from the whole of their surface to one point, and that is what we intended in this treatise. Thus ends the discourse on the burning mirrors, and praise be to God. May God bestow His blessings upon Muḥammad and his kindred.

FINAL REMARKS

In this treatise, Ibn al-Haitham displays elaborate and careful argument (verbose it seems to modern students now familiar with optical reflection), emphasizes clearly the maximum heating effect at the precise focus to be attained with the paraboloid, and reveals an insight into experimental technique. Though the essential basis of his work is Greek, there is a refreshing appeal to quantitative practical procedure quite alien to the contemporary European thought.

Indeed, it is also clear that some of the originality, in optics especially, but also to a certain degree in scientific method, formerly attributed to Roger Bacon (1214–1292), can now be traced to Ibn al-Haitham.

In conclusion, we express our indebtedness to Mr. E. C. Sutton, of the Commonwealth Relations Office, who has kindly attended to our requirements respecting MSS.

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[1] The unusual word الملتئمة (lit. 'united') seems to have been ignored in the German and Latin versions.

GEOMETRICAL INTERPRETATION OF THE MOTION OF THE SUN, MOON AND THE FIVE PLANETS AS FOUND IN THE MATHEMATICAL SYNTAXIS OF PTOLEMY AND IN THE HINDU ASTRONOMICAL WORKS

By Dr. Mrs. Bina Chatterjee

(Communicated by Dr. K. N. Bagchi)

A detailed chronological study of the achievements of the ancient Hindus in mathematics and astronomy is very difficult, because so many of their ancient works, references to which are found in their later literature, are lost and also because the dates of some of their old extant works are still objects of great dispute. The subject, however, has been unnecessarily made more complicated by those scholars, who in their exaggerated admiration for the Greek mathematicians and astronomers have tried their utmost to establish an ultimate Greek origin for practically everything that is found in the Hindu mathematical and astronomical works. Consequently, it is their firm belief that the planetary system of the Hindus represented by the epicyclic and excentric methods, is bodily borrowed by them from the Greeks. The object of this thesis is to discuss to what extent this view is tenable, with special reference to the Mathematical Syntaxis of Ptolemy, the famous Alexandrian astronomer of the second century and to the great Hindu classics on mathematics and astronomy, viz. Āryabhaṭīya of Āryabhaṭa (499 A.D.), Pañcasiddhāntikā of Varāhamihira (550 A.D.), Brahma-sphuṭasiddhānta of Brahmagupta (628 A.D.), Śiṣyadhīvṛddhida of Lalla (ninth century), Siddhāntaśiromaṇi of Bhāskarācārya (1150 A.D.) and Sūryasiddhānta.[1]

GREEK TRIGONOMETRY

First to deal with the Greek Planetary system, the only extant work, in which the epicyclic and excentric methods are fully discussed, is Ptolemy's Mathematical Syntaxis. To understand these methods it is necessary to know the nature of Greek Trigonometry in the time of Ptolemy. In the eleventh chapter of the first book of the M.S., Ptolemy gives what he calls 'Κανόνιον τῶν ἐν κύκλῳ εὐθειῶν'[2] or 'A Table of lines within a circle', that is, a Table of Chords. This table gives the lengths of chords subtending arcs of a circle in terms of its diameter, the arcs ranging from ¼ degree to 180 degrees at intervals of ¼ degrees.[3] The circumference of the circle is 360 degrees and the diameter is 120 units in length. With the help of this table, when the length of the arc of a circle is known, the corresponding length of the chord can be calculated, and vice versa. This is the trigonometrical property used by Ptolemy throughout his work.

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[1] The original author of this work is not known. The work existed before Varāha-mihira, who most probably introduced the epicyclic theory into it and gave a short summary of it in the P.S. Interpolations were made by one or more later astronomers, whose names are, however, not known. Professor Sen Gupta has proved that the composite work, as it is found today, may date from the fifth to the eleventh century (see S.S. translated by Burgess, Introduction).

[2] Instead of ∼ accent on η and ω, ∧ accent has been used for printing facilities.

[3] In the previous chapter Ptolemy discusses in detail the geometrical methods on which this table is based.

MOTION OF THE SUN ACCORDING TO PTOLEMY

Ptolemy devotes the third book of the M.S. to the motion of the sun. According to him the solar year consists of $365\frac{1}{4}-\frac{1}{300} = 365 \cdot 24666\ldots$ days, and, consequently, the sun's mean daily motion is $59^{I}\ 8^{II}\ 17^{III}\ 13^{IV}\ 12^{V}\ 31^{VI}$, expressed in sexagesimal fractions. In the second chapter he gives tables of the sun's mean hourly, daily, monthly and yearly motions and also a table of its mean motion in 18 years. In the third chapter he defines the epicyclic and the excentric methods. He says, that the motion of the universe westward and that of the planets eastward are uniform and circular.[1] Any irregularities in the motion are only apparent and are due to the position and order of these circles in their respective spheres. This apparent variation can be explained by either of the two simple and primary hypotheses. If it is assumed that the motion of a planet, as observed from the centre of the universe, where the earth is supposed to be, takes place in the plane of the ecliptic, concentric with the universe, then, either its circle of uniform motion is not concentric with the universe or it is concentric but the planet itself moves on another circle carried by it and called epicycle. This will be clear from the following diagrams:—

(1)   (2)
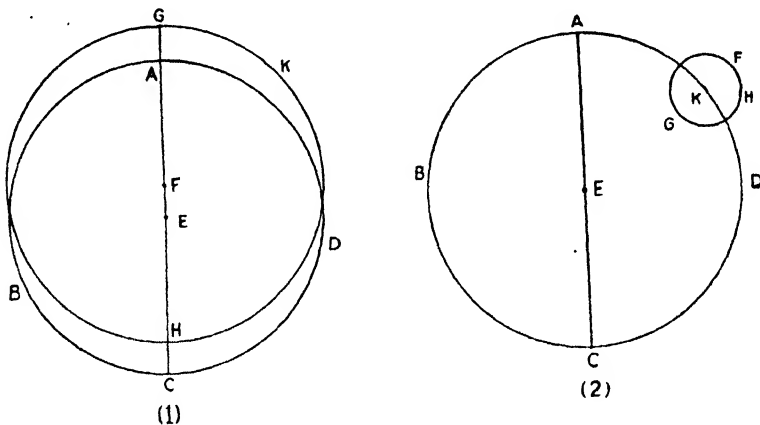
First the excentric system. Let, in fig. 1, $ABCD$ be the circle in the plane of the ecliptic and concentric with the universe, with centre as E, which is the centre of the earth. Then if the motion of a planet as observed from E is along the circle $ABCD$, then the centre of the circle of its uniform motion is not at E but at F, a point on the diameter AEC and the circle of uniform motion is GHK equal to the circle $ABCD$.

Now the epicyclic system. Again let $ABCD$ in fig. 2, be the circle in the plane of the ecliptic, with E the centre of the earth, as centre. Let FGH be the epicycle of the planet, with centre K on the circle $ABCD$. Then the planet moves uniformly about FGH, while K moves uniformly about $ABCD$.

Then Ptolemy gives a geometrical proof to show that according to either of these hypotheses, the planet appears to describe in equal times unequal arcs of the ecliptic.[2] After this he proves that according to the

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[1] In the original Greek the words are ' ὁμαλαὶ μέν εἰσιν πᾶσαι καὶ ἐγκύκλιοι τῇ φύσει ' (see Vol. I, p. 216).

[2] Vol. I, pp. 216–218.

excentric hypothesis, the motion of the planet is always minimum, when it is at the apogee of the excentric circle and maximum, when it is at its perigee; but according to the epicyclic hypothesis, its motion is least, when it is at the apogee of the epicycle, provided it is moving westward and the centre of the epicycle is moving eastward; but if the centre of the epicycle and the planet at the apogee of the epicycle are both moving eastward, then at that point the planet will have its maximum motion. The proofs given by Ptolemy are as follows:

(1) (2)
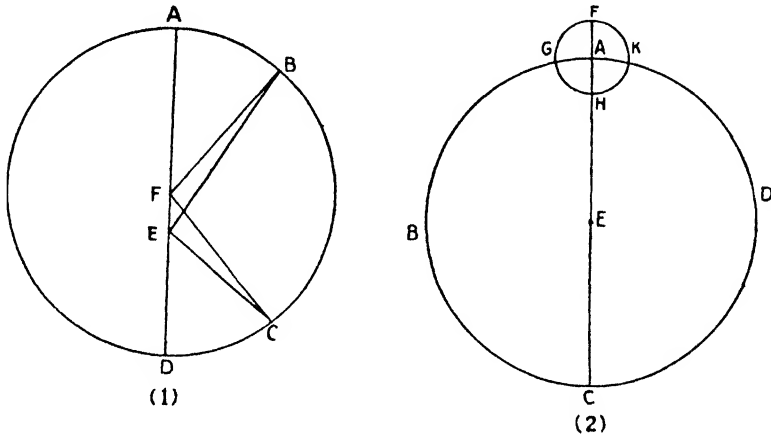
· Let in fig. 1, E be the centre of the earth. Let $ABCD$, with centre F, be the excentric circle of a planet. Let A be the apogee and D the perigee. Let the arcs AB and DC be equal. Then

$$\angle AEB < \angle AFB$$
$$< \angle DFC$$
$$< \angle DEC.$$

This is always the case. Thus according to the excentric hypothesis, the planet's greatest and least motions are respectively at its perigee and apogee.

Again in fig. 2, let $ABCD$ be the circle concentric with the universe having E as its centre. Let A and C be its apogee and perigee respectively. Let $FGHK$ be the epicycle of the planet with A as centre. Let F and H be the apogee and perigee on the epicycle. The epicycle is moving eastward along $ABCD$. If the planet at F also moves eastward as from F to G, then there it has its greatest motion, because it is moving in the same direction as its epicycle. But if the planet at F moves westward as from F to K, then there it has its least motion, because it moves in a direction contrary to that of its epicycle.

Ptolemy further adds that in the case of bodies having only one inequality, both the hypotheses are applicable to the phenomena, provided the following conditions are fulfilled:—

1. The ratio of the radius of the excentric circle to the distance between the centres of the earth and excentric circle is equal to the ratio of the radius of the concentric circle carrying the epicycle to the radius of the epicycle.

2. The time taken by the planet to describe the excentric circle is equal to that taken by the epicycle to describe the concentric circle.

3. The planet moves along the epicycle at the same rate as the epicycle in the concentric and when at apogee it moves westward.

Ptolemy illustrates his statement by proving with the help of both methods, that a planet has its greatest equation of centre, when at an apparent distance of a quadrant from its apogee. Hence he concludes that by the excentric hypothesis, the time from the least motion, which takes place at the apogee, to the mean motion, which takes place at the point of the excentric, where the planet has its greatest equation of centre, is greater than the time from the mean motion to the greatest motion, which takes place at the perigee. The same is the case by the epicyclic hypothesis, provided the motion of the planet at the apogee of the epicycle is westward, because as has been proved before, it will only then have its least motion at the apogee. But by the epicyclic hypothesis, when the planet at the apogee of the epicycle moves eastward and, consequently, has its greatest motion at the apogee and least motion at its perigee, then the time from greatest to mean motion is greater than the time from mean to least motion.

Ptolemy continues that when the bodies have a double inequality, both these hypotheses should be combined to explain the phenomena.[1]
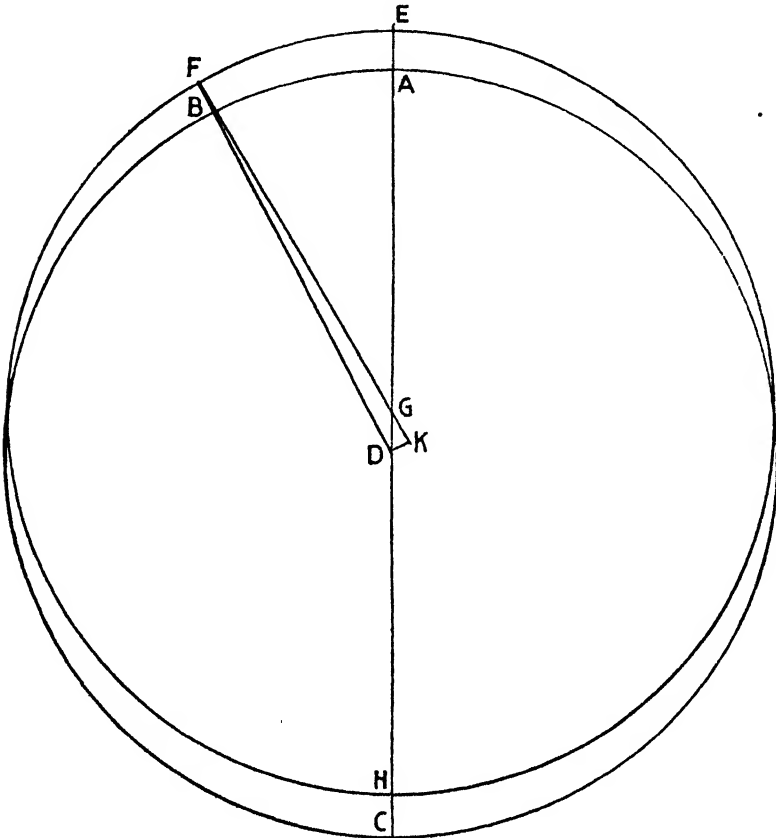
In the next chapter from his own observations of the lengths of the four astronomical seasons, Ptolemy establishes that the position of the sun's apogee in his time is 65° 30′ and its maximum eccentricity or radius of its epicycle is 2^p $29\frac{1}{2}′$, (p denotes each of the 120 parts of the diameter)

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[1] This will be made clear later, when dealing with the planets.

when the radius of the concentric or excentric is 60^P, and, consequently, its greatest equation of centre is $2° 23'$. These, he says, agree with those given by Hipparchus.

In the fifth chapter Ptolemy gives the geometrical methods of finding the true place of the sun, when its mean longitude is given.

First the excentric method will be explained (see fig. on p. 44).

Let ABC be the ecliptic with D, the centre of the earth, as centre and radius as 60^P. Let ADC be the apse line. Let G be a point on ALC such that $DG = 2^P 30' =$ sun's eccentricity. Let EFH be the sun's excentric circle, the centre of which is G and radius is 60^P. Let E and H be respectively the apogee and perigee of the excentric circle. Let the sun be at F so that the arc EF or mean distance of the sun from its apogee is 30 degrees. Let FD be joined cutting the concentric in B. Then B is the sun's true place. Draw DK perpendicular to FG produced.

Now since arc $EF = 30°$,

$$\text{therefore } \angle EGF = 30°, \text{ when 4 right angles are } 360°,$$
$$= 60°, \text{ when 2 right angles are } 360°,$$
$$= \angle DGK.$$

Therefore when the circumference of the circle circumscribing the right-angled triangle DGK is $360°$, the arc subtended by the chord DK is $60°$ and that subtended by GK is its supplement or $120°$.

Therefore by Ptolemy's Table of Chords, if LG is 120^P, $DK = 60^P$ and $GK = 103^P 55'$.

So when $DG = 2^P 30'$, then $DK = 1^P 15'$ and $GK = 2^P 10'$.

So $FK = FG+GK = 60^P+2^P 10' = 62^P 10'$.

So $FD = \sqrt{FK^2+DK^2} = 62^P 11'$ nearly.

Now since when $FD = 62^P 11'$, then $DK = 1^P 15'$, therefore, when $FD = 120^P$, then $DK = 2^P 25'$. Then if the circumference of the circle circumscribing the right angled triangle FDK is $360°$, and $FD = 120^P$ and $DK = 2^P 25'$, then again from Ptolemy's Table of Chords, arc $DK = 2° 18'$.

So $\angle DFK = 2° 18'$, when 2 right angles are $360°$,
$$= 1° 9', \text{ when 4 right angles are } 360°,$$
$$= \text{sun's equation of centre, when its mean distance from}$$
the apogee is $30°$.

So its true distance from the apogee
$$= \text{arc } AB$$
$$= \angle ADB$$
$$= \angle EGF - \angle DFG$$
$$= 30° - 1° 9'$$
$$= 28° 51'.$$

Now the epicyclic method will be explained (see fig. on p. 46).

Let ABC be the ecliptic with D, the centre of the earth, as centre and radius as 60^P. Let ADC be its apse line. Let FGK be the sun's epicycle with its centre H on the circle ABC, so that arc $AH = 30°$, and its radius as $2^P 30'$. Let F and G be respectively its apogee and perigee. Let K be the sun's position on the epicycle so that arc FK is also $30°$. Let $FHGD$ be joined. Let KD be joined cutting the ecliptic in L. Then L is the sun's true place. Join KH and draw KM perpendicular to FD.

Since arc $FK = 30°$,
therefore $\angle FHK = 30°$, when 4 right angles are 360°,
$\qquad = 60°$, when 2 right angles are 360°.
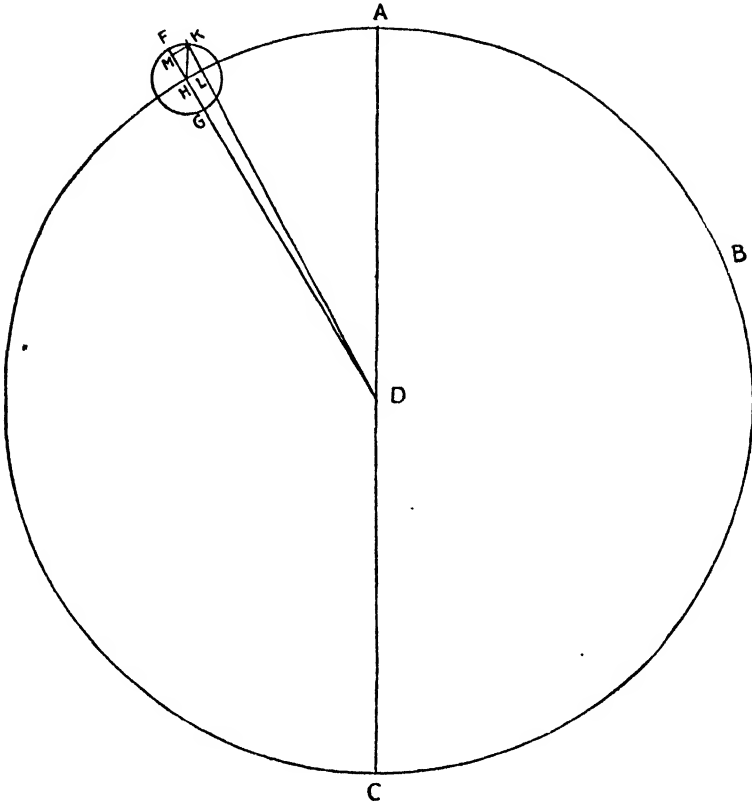
So when the circumference of the circle circumscribing the right-angled triangle HKM is 360°, then arc $KM = 60°$ and arc MH, its supplement, is 120°.

Therefore if HK, the diameter of the circle, is 120^P, then by Ptolemy's Table of Chords, chord $KM = 60^P$ and chord $MH = 103^P\ 55'$.

So when HK, the radius of the epicycle, is $2^P\ 30'$, then $KM = 1^P\ 15'$ and $MH = 2^P\ 10'$.

So $MD = MH + HD = 2^P\ 10' + 60^P = 62^P\ 10'$.

So $DK = \sqrt{KM^2 + MD^2} = 62^P\ 11'$.

Now when $DK = 62^P\ 11'$, then $KM = 1^P\ 15'$, therefore when $DK = 120^P$, then $KM = 2^P\ 25'$. So when the circumference of the circle circumscribing the right-angled triangle KMD is 360°, by Ptolemy's Table of Chords, the arc subtended by KM is $2°\ 18'$.

So $\angle KDM = 2°\ 18'$, when 2 right angles are 360°,
$\qquad = 1°\ 9'$, when 4 right angles are 360°,
$\qquad =$ sun's equation of centre, when its mean distance from the apogee is 30°.

So its true distance from the apogee

$$= \text{arc } AL$$
$$= \angle ADL$$
$$= \angle ADH - \angle LDM$$
$$= 30° - 1° \, 9'$$
$$= 28° \, 51'.$$

Thus both the excentric and epicyclic methods give the same result.

Ptolemy gives two more examples showing how to find the true place of the sun, both by the excentric and epicyclic methods, when its mean distance from the perigee is given.

In the next chapter Ptolemy gives a table of equations of centre of the sun, calculated in the above manner, for intervals of 6° for each of the two quadrants on either side of the apogee and for intervals of 3° for each of the two quadrants on either side of the perigee. A smaller interval for the quadrants on either side of the perigee is chosen, because there the equations change more rapidly.

The eighth chapter gives rules for calculating the sun's true longitude on any day using the tables of mean motions and equations of centre.

This completes the account of the sun's motion according to Ptolemy.

The motion of the Moon according to Ptolemy

The M.S. also contains a theory of the moon. In the third chapter of the fourth book Ptolemy gives the various periodic motions of the moon. According to him the mean daily motion of the moon in longitude is 13° 10$^\text{I}$ 34$^\text{II}$ 58$^\text{III}$ 33$^\text{IV}$ 30$^\text{V}$ 30$^\text{VI}$, expressed in sexagesimal fractions. This is the same as that given by Hipparchus. The motion in anomaly and that in argument of latitude are respectively 13° 3$^\text{I}$ 53$^\text{II}$ 56$^\text{III}$ 17$^\text{IV}$ 51$^\text{V}$ 59$^\text{VI}$ and 13° 13$^\text{I}$ 45$^\text{II}$ 39$^\text{III}$ 48$^\text{IV}$ 56$^\text{V}$ 37$^\text{VI}$ according to Ptolemy but according to Hipparchus they are respectively 13° 3$^\text{I}$ 53$^\text{II}$ 56$^\text{III}$ 29$^\text{IV}$ 38$^\text{V}$ 38$^\text{VI}$ and 13° 13$^\text{I}$ 45$^\text{II}$ 39$^\text{III}$ 40$^\text{IV}$ 17$^\text{V}$ 19$^\text{VI}$. In the remaining chapters of this book, Ptolemy deals with the first inequality of the moon following the epicyclic method, which is described above.

All the predecessors of Ptolemy including Hipparchus knew only one inequality of the moon, viz. its equation of centre. This inequality was represented, as in the case of the sun, either by an excentric or by an epicycle. According to the excentric hypothesis, the moon moves eastward on the excentric circle with its mean motion and the centre of the excentric circle revolves round the earth at a rate equal to the difference between the motion in longitude and the motion in anomaly of the moon. According to the epicyclic hypothesis, there is first of all a circle concentric with the ecliptic and described in the same plane. To this circle is inclined another concentric circle at an angle of 5°, the greatest latitude of the moon. This circle revolves uniformly in a westward direction about the centre of the ecliptic at a rate equal to the difference between the motion in the argument of latitude and that in the longitude of the moon. This circle carries an epicycle, the centre of which moves eastward at a rate equal to the motion in the argument of latitude. The resulting motion of the centre represents, therefore, the motion in longitude of the moon. The moon moves on the circumference of the epicycle in a westward direction at a rate equal to its motion in anomaly. This motion thus represents the moon's motion in anomaly.

This was the theory of the moon before Ptolemy developed it by his remarkable discovery of the evection of the moon.

From the observations recorded by Hipparchus and also from those made by Ptolemy, the latter finds that the moon has not only one inequality as his predecessors thought, but it has a second inequality also. The former he calls the inequality with regard to the ecliptic or the moon's equation of centre and the latter he calls the inequality with regard to the sun or evection. This makes the geometrical interpretation of the moon's motion different from that of the sun. Ptolemy states his theory in a very complicated thesis in part of the fifth book of the M.S. The theory is illustrated by the following diagram.
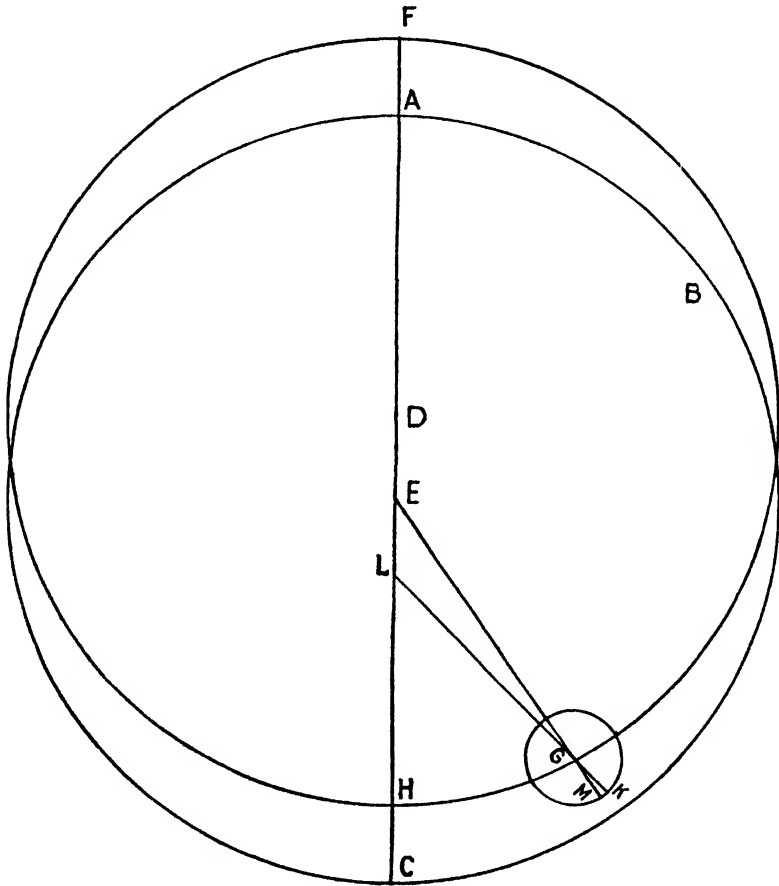
Let ABC be a circle concentric with the ecliptic with E as the centre and radius as $49^p\ 41'$. Let AEC be a vertical diameter in it. Take a point D on it such that $DE = 10^p\ 19'$. Then, with centre D and radius $49^p\ 41'$ draw a circle, which is the moon's excentric circle. Let F and H be its apogee and perigee respectively. The centre of the moon's epicycle lies on this circle. Let G be the centre. With G as centre and radius $5^p\ 15'$ draw a circle, which is the moon's epicycle. To make the calculated results tally with the observations, Ptolemy assumes that the centre of the epicycle moves on the excentric circle eastwards in such a manner that it coincides

with the apogee of the excentric circle on the days of full moons and of the conjunctions of the sun and moon and it coincides with the perigee of the excentric circle at quadratures. Thus the epicycle moves round the excentric twice in the mean synodic month and so the distance of the centre of the epicycle from the apogee of the excentric circle or the angle FEG is nearly twice the moon's elongation from the sun. The moon moves westward in the epicycle at a rate equal to the daily motion of the anomaly. Again to make the observed results agree with the calculated results, especially when the moon is in places intermediate between the syzygies and the quadratures, Ptolemy makes a further assumption called *Prosneusis*. Ptolemy assumes that the line of apse in the epicycle does not pass through the centre of the earth, but through a point on the side away from the centre of the excentric and at a distance equal to that between the centre of the earth and the centre of the excentric. In the above diagram, if K is the apogee of the epicycle with centre G, from which the motion in anomaly of the moon is measured, then KG, the line of apse of the epicycle, does not pass through E, but through a point L on the diameter ADE, such that LE is equal to DE and L is always on the side of E away from D. K is called the mean apogee. The point M, where EG produced cuts the epicycle, is the apparent apogee. M coincides with K at times of syzygies and quadratures but at intermediate times oscillates a little on both sides of K.[1]

Now will be explained how to find geometrically the moon's true place, when its mean place is known.

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[1] Godfray has explained Ptolemy's theory in the following manner:

To represent this new inequality, which was subsequently called the Evection, Ptolemy imagined an excentric in the circumference of which the centre of an epicycle moved while the moon moved in the circumference of the epicycle.

The centre of the excentric and of the epicycle he supposed in syzygy at the same time, and both on the same side of the earth.
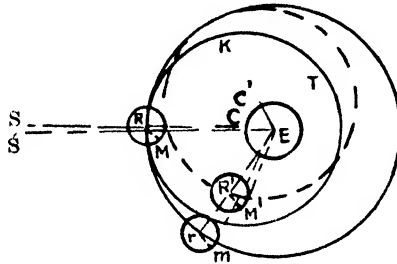
Thus, if E represent the earth,

S . . . . Sun,
M . . . . Moon,
c the centre of the excentric RKT is in syzygy,
R, the centre of the epicycle, would also be in syzygy.

Now conceive c, the centre of the excentric, to describe a small circle about E in a retrograde direction cc', while R, the centre of the epicycle, moves in the opposite direction, in such a manner that each of the angles $S'Ec'$, $S'ER'$ may be equal to the synodical motion of the moon, that is, her mean angular motion from the sun; SES' being the motion of the sun in the same time.

Now the first inequality was accounted for by supposing the epicycle RM to move into the position rm, r and R being at the same distance from E, and rm parallel to RM,[*] the first inequality being the angle rEm. But when the centre of the epicycle is at R', and $R'M'$ is parallel to rm, the inequality becomes $R'EM'$, and we have a second correction or inequality mEM' (Lunar Theory of Godfray, pp. 108-109).

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[*] For simplicity we leave out of consideration the motion of the apse.

Let ABC be the moon's excentric circle, with D as the centre and A and C as its apogee and perigee respectively. Let E be the centre of the ecliptic, so that DE is 10^P $19'$, when EA is 60^P. Let B be the centre of the moon's epicycle and F and G be its apogee and perigee respectively. Let EM be also 10^P $19'$. Let BM be joined cutting the epicycle in K and L, so that they are respectively the mean apogee and perigee. Let H be the place of the moon on the epicycle travelling westward from F. It is required to find the angle HEF, the difference between the moon's mean and true places. Join BD and HB. Draw DN, MO and HP perpendiculars to FBE.
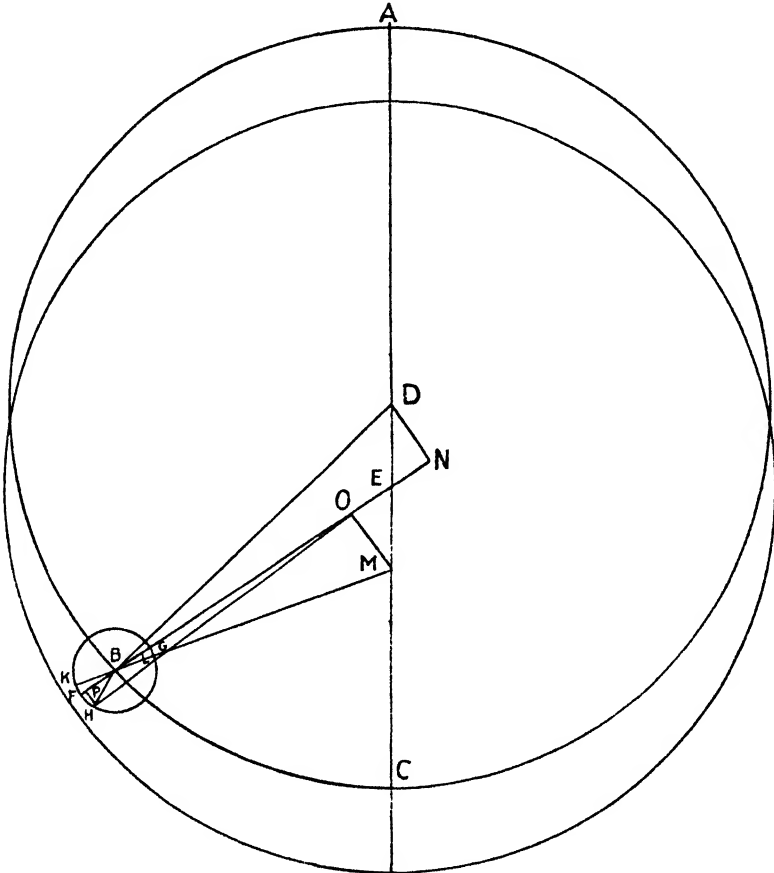
Now let the sun's mean place be 12^c $27°$ $20'$ of Leo and let the moon's distance from the mean apogee in the epicycle be $333°$ $12'$. Then the moon's elongation from the sun is $45°$ $15'$.

According to Ptolemy's theory, the angle AEB, the distance of the epicycle from A, the apogee of the excentric, is 2 times $45°$ $15'$ or $90°$ $30'$, when 4 right angles are $360°$, or $181°$, when 2 right angles are $360°$.

So angle $AEN = 89°$ $30'$, when 4 right angles are $360°$,
$\qquad\qquad = 179°$, when 2 right angles are $360°$.

Then if the circumference of the circle circumscribing the right-angled triangle DEN is $360°$, then arc $DN = 179°$ and arc $EN = 1°$. So from

Ptolemy's Table of Chords, chord $DN = 119^P\ 59'$ and chord $EN = 1^P\ 3'$, when $DE = 120^P$.

So if $DE = 10^P\ 19'$, then $DB = 49^P\ 41'$, then $DN = 10^P\ 19'$ nearly and $EN = 5'$ nearly.

Since the two right-angled triangles DEN and MEO are congruent, therefore $DN = MO = 10^P\ 19'$ and $EN = EO = 0^P\ 5'$.

Since $BN^2 = DB^2 - DN^2$,

$$
\begin{aligned}
\text{therefore}\quad BN &= \sqrt{DB^2 - DN^2} \\
&= 48^P\ 36'.
\end{aligned}
$$

$$
\begin{aligned}
\text{Therefore}\quad BE &= BN - EN \\
&= 48^P\ 36' - 5' \\
&= 48^P\ 31'.
\end{aligned}
$$

$$
\begin{aligned}
\text{Therefore}\quad BO &= BE - EO \\
&= 48^P\ 31' - 5' \\
&= 48^P\ 26'.
\end{aligned}
$$

Since $BM^2 = BO^2 + MO^2$,

$$
\begin{aligned}
\text{therefore}\quad BM &= \sqrt{BO^2 + MO^2} \\
&= 49^P\ 31'.
\end{aligned}
$$

Thus $BM = 49^P\ 31'$, when $MO = 10^P\ 19'$.

So when $BM = 120^P$, then $MO = 25^P$.

So when the circumference of the circle circumscribing the right-angled triangle BMO is $360°$, by Ptolemy's Table of Chords, arc $MO = 24°\ 3'$.

So $\angle MBO = 24°\ 3'$, when 2 right angles are $360°$,

$$= 12°\ 1', \text{ when 4 right angles are } 360°.$$

So arc $KF = \angle KBF = \angle MBO = 12°\ 1'$.

Now since the moon is $333°\ 12'$ westward from K, the mean apogee, so arc $KH = 360° - 333°\ 12'$

$$= 26°\ 48'.$$

So arc $FH = 26°\ 48' - 12°\ 1'$

$$= 14°\ 47'.$$

So $\angle FBH = 14°\ 47'$, when 4 right angles are $360°$,

$$= 29°\ 34', \text{ when 2 right angles are } 360°.$$

So if the circumference of the circle circumscribing the right-angled triangle BHP is $360°$, then arc $HP = 29°\ 34'$ and arc $PB = 150°\ 26'$.

So by Ptolemy's Table of Chords, chord $HP = 30^P\ 37'$, and chord $PB = 116^P\ 2'$, when BH, the hypotenuse, is 120^P.

So when BH, the radius of the epicycle, is $5^P\ 15'$, then $HP = 1^P\ 20'$ and $PB = 5^P\ 5'$.

$$
\begin{aligned}
\text{So}\quad PE &= PB + BE \\
&= 5^P\ 5' + 48^P\ 31' \\
&= 53^P\ 36'.
\end{aligned}
$$

$$
\begin{aligned}
\text{So}\quad HE &= \sqrt{HP^2 + PE^2} \\
&= 53^P\ 37'.
\end{aligned}
$$

Thus when $HE = 53^P\ 37'$, $HP = 1^P\ 20'$.

So when $HE = 120^P$, $HP = 2^P\ 59'$.

Therefore if the circumference of the circle circumscribing the right-angled triangle HPE is 360°, by Ptolemy's Table of Chords, arc $HP = 2° 52'$.

So $\angle HEP = 2° 52'$, when 2 right angles are 360°,

$= 1° 26'$, when 4 right angles are 360°,

$=$ difference between the moon's mean and true places.

Hence is obtained the moon's true place.

In the eighth chapter of the fifth book Ptolemy gives tables of the general lunar inequality and in the ninth chapter he gives rules for calculating the moon's true place from these tables.

This is in brief Ptolemy's theory of the moon.

Motion of the Five Planets according to Ptolemy

Turning to the theory of the motion of the five planets, it is clear from the second chapter of the ninth book of the M.S. that the predecessors of Ptolemy were not acquainted with the two inequalities of a planet and, consequently, they were not successful in their attempts to establish a theory of the planetary motion. Even Hipparchus found it difficult to formulate a theory. He only arranged the observations as systematically as possible and came to the conclusion that each planet had two inequalities and the amount of retrogradation of each was different. He also thought that it might be necessary to combine the epicyclic and excentric theories to explain this double inequality. Thus it appears that Ptolemy was the first Greek astronomer to establish a theory on the motion of the five planets by means of epicyclic and excentric methods. The last five books of the M.S. are given to this subject.

As to the order of the planets in the celestial sphere, Ptolemy accepts that which was assumed by the ancients, viz. Moon, Mercury, Venus, Sun, Mars, Jupiter and Saturn from the earth upwards. He again emphasizes that, as in the case of the sun and moon, the apparent irregularities of the planets are accounted for my means of uniform and circular motions.[1]

Of the two inequalities of a planet, the one with respect to the sun is called solar inequality and the one with respect to the zodiacal divisions is called zodiacal inequality.

According to Ptolemy the mean daily motions in longitude of Saturn, Jupiter, Mars, Venus and Mercury are respectively $2^I 0^{II} 33^{III} 31^{IV} 28^V 51^{VI}$, $4^I 59^{II} 14^{III} 26^{IV} 46^V 31^{VI}$, $31^I 26^{II} 36^{III} 53^{IV} 51^V 33^{VI}$, $59^I 8^{II} 17^{III} 13^{IV} 12^V 31^{VI}$ and $59^I 8^{II} 17^{III} 13^{IV} 12^V 31^{VI}$, expressed in sexagesimal fractions, the last two being the same as that of the sun. The motion in longitude is the motion of the centre of the epicycle. The daily mean motions in anomaly of the three superior planets, Saturn, Jupiter and Mars, are found by subtracting their respective mean motions in longitude from that of the sun. Hence they are $57^I 7^{II} 43^{III} 41^{IV} 43^V 40^{VI}$, $54^I 9^{II} 2^{III} 46^{IV} 26^V$ and $27^I 41^{II} 40^{III} 19^{IV} 20^V 58^{VI}$ respectively. Those of Venus and Mercury are respectively $36^I 59^{II} 25^{III} 53^{IV} 11^V 28^{VI}$ and $3° 6^I 24^{II} 6^{III} 59^{IV}$

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[1] Incidentally Ptolemy introduces here his version of the cosmic universe. The original Greek reads as follows: ' προκειμένου δ' ἡμῖν τοῦ καὶ σελήνης τὰς φαινομένας αὐτῶν ἀνωμαλίας πάσας ἀποδεῖξαι δι' ὁμαλῶν καὶ ἐγκυκλίων κινήσεων ἀποτελουμένας, τούτων μὲν οἰκείων ὄντων τῇ φύσει τῶν θείων, ἀταξίας δὲ καὶ ἀνομοιότητος ἀλλοτρίων,' or, 'Our present task is to prove all the apparent inequalities of all the five planets, as in the case of the sun and moon, which are completed by means of uniform and circular motions—these being in keeping with the nature of the divine, whereas disorder and irregularity are different'. (Vol. II, p. 208).

$35^{\text{v}} 50^{\text{vi}}$ (see IX. 3).   The motion in anomaly is the motion of the planet in the epicycle.   In IX. 4, Ptolemy gives tables of the mean hourly, daily, monthly, yearly, etc., motions in longitude and anomaly of the five planets. In IX. 5-6, he discusses the geometrical constructions to represent the inequalities of the five planets.   This is briefly as follows.
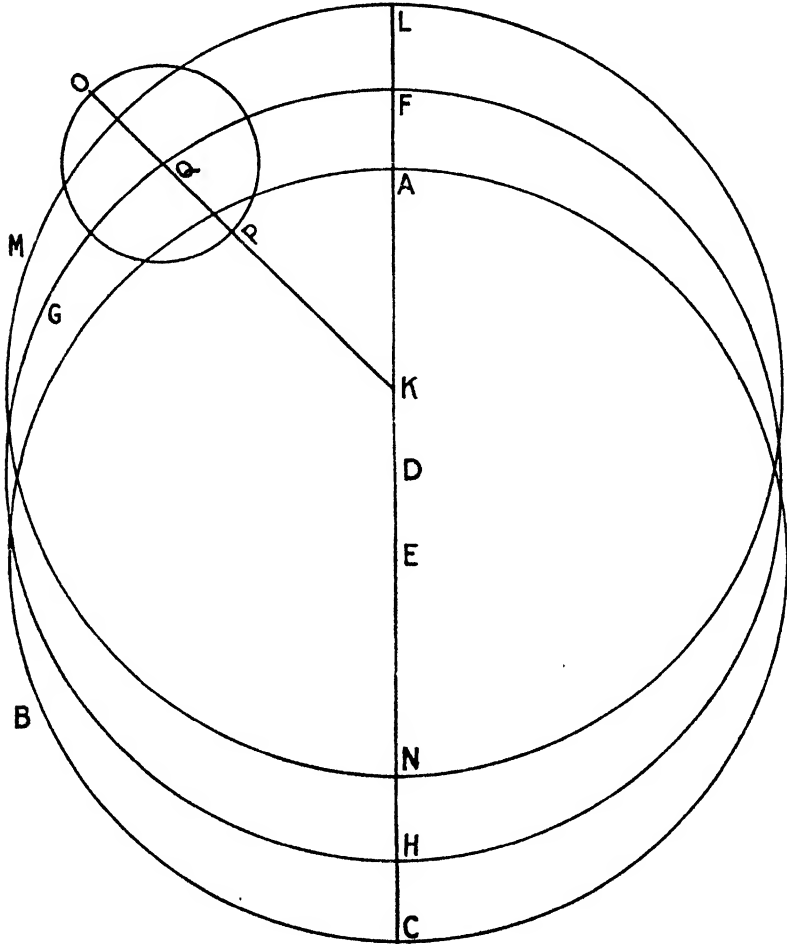
A planet's inequality with respect to the sun is best represented by means of the epicyclic system.   Ptolemy says that the epicyclic system must be used here, because it is found from observations of the various positions of the planet with regard to the sun in the same zodiacal division that the time from the greatest to the mean motion is greater than the time from the mean to the least motion and this fact does not follow from the excentric hypothesis (see p. **44**).   But it can be made to fit in with the epicyclic hypothesis, if it is supposed that the planet has the greatest motion at the apogee, that is, if the planet is supposed to move eastward from it.   Then Ptolemy says that observing the zodiacal arcs corresponding to the same position of a planet with respect to the sun, it is found that the time from least to mean motion is greater than the time from the mean to

greatest motion. This fact can be made to fit with both the hypotheses, but since the epicyclic system must be used for the determination of the first inequality, so the excentric system will be used for the second inequality. Thus in the case of planets with two inequalities, Ptolemy combines the epicyclic and excentric systems.

Besides combining both the hypotheses, Ptolemy introduces some more complications, which will best be explained by means of diagrams. It must also be pointed out that Ptolemy's theory of Mercury is slightly different from that of the other planets and the latter will be first explained.

Let ABC be a circle concentric with the ecliptic, with E, the centre of the earth, as centre. Let AEC be a vertical diameter, A and C being the apogee and perigee respectively. Let K be the centre of the excentric circle LMN of any planet. Let D be the middle point of EK. Let FGH be a circle with centre as D and equal to the circle ABC. The centre of the epicycle of the planet lies on this circle. Let it be Q. Draw the epicycle with Q as centre (see fig. on p. 53).

Ptolemy assumes the following conditions:—

1. The plane of the excentric circle is inclined to the plane of the ecliptic and the plane of the epicycle is inclined to the plane of the excentric circle. This is assumed to account for the motion of the planet in latitude. But when the motion of the planet in longitude alone is considered, this assumption may be dispensed with and the planes of the excentric and the epicycle may be considered to be the same as that of the ecliptic, because no considerable difference in the motion in longitude arises thereby.

2. OQP, the diameter of the epicycle, revolves eastward uniformly about K, at a rate equal to the mean daily motion in longitude of the planet. Thus Q, the centre of the epicycle, moves uniformly on the excentric FGH.

3. The planet moves uniformly along the epicycle such that it completes its revolution with respect to the diameter directed towards K, in a period equal to that of its mean anomaly.

4. The planet moves in such a way that when at the apogee of the epicycle, it is moving eastward. It is only then that the planet will have its greatest motion at the apogee and the least motion at the perigee. This assumption will save the observed phenomenon that in case of all planets, the time from greatest to mean motion is greater than that from the mean to least motion.[1]

5. The whole plane moves uniformly eastward about E at the rate of $1°$ in 100 years.[2]

It is very interesting to note here that Ptolemy rejects the simple excentric theory of his predecessors. From observations he finds that the centre of equal distances is not the same as the centre of uniform motion or in other words, the centre of the circle carrying the epicycle differs from the centre of the excentric circle. Thus there are 3 centres—E, the centre of the earth; D, the centre of the excentric carrying the epicycle or the centre of equal distances, and K, the centre of the excentric or the centre of uniform motion.

The following is the theory of Mercury :

Let ABC be a circle with centre as E, the centre of the earth and concentric with the ecliptic. Let AEC be its diameter and A and C its apogee and perigee respectively. Let D, a point on AEC, be the centre of the excentric circle FGH, of Mercury. Let K be a point on $ADEC$, such that

$DK = DE$. Now the centre of the excentric circle carrying the epicycle moves about K westward always at a distance equal to KD from K. Let it be L at a certain position. With L as centre draw a circle MNO equal to the circle ABC. Let P, a point on the circle MNO, be the centre of the epicycle of Mercury. Describe the epicycle and let QPR be its diameter.
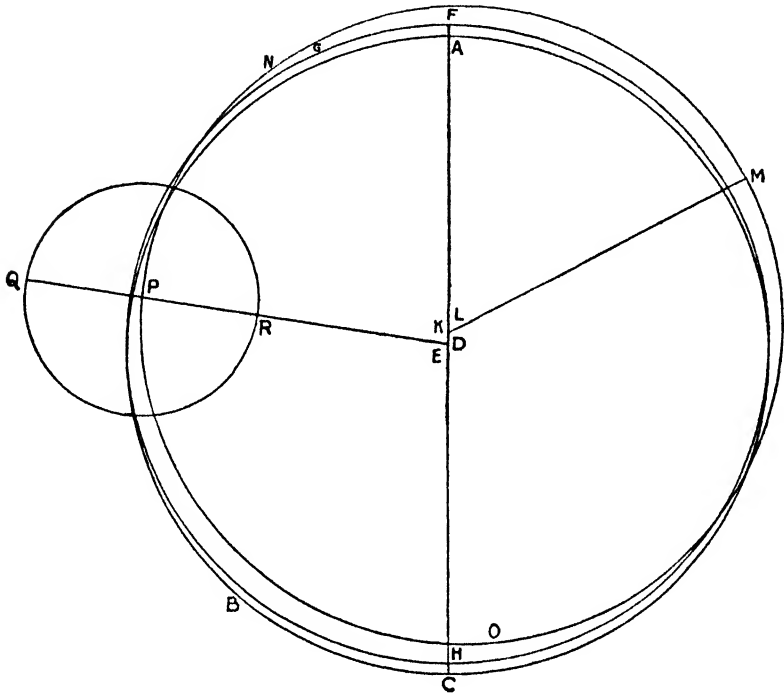
Besides assuming all the conditions as in the case of other planets, Ptolemy assumes one more in the case of Mercury. Here the centre of the excentric circle carrying the epicycle is not fixed as in the case of the other planets, but it moves. It moves uniformly about K westward and at the same rate as that of P, the centre of the epicycle, eastward. This centre of the moveable excentric will coincide with D, the centre of the fixed excentric, once in each revolution and thus Mercury is at the perigee twice in one revolution.

In the books IX–XI, Ptolemy, from observations, calculates the apogees, excentricities and the radii of the epicycles of the five planets. These are given below.

Apogees at the time of Ptolemy,

Mercury	..	.. 10° of Libra.
Venus	..	.. 25° of Taurus.
Mars	..	.. 25° 30′ of Cancer.
Jupiter	..	.. 11° of Virgo.
Saturn	..	.. 23° of Scorpio.

The distance between the centre of the earth and that of the circle of uniform motion, that is, ED for Mercury (see fig. above) and EK for the other planets (see fig. on p. 53):—

Mercury	..	.. 3^{P}
Venus	..	.. $2^{\mathrm{P}} 30′$

Mars	..	..	12^P
Jupiter	..	..	$5^P\ 30'$
Saturn	..	..	$6^P\ 50'$

The distance between the centre of the earth and that of the excentric circle carrying the epicycle, that is, ED (see fig. on p. 53):—

Venus	..	..	$1^P\ 15'$
Mars	..	..	6^P
Jupiter	..	..	$2^P\ 45'$
Saturn	..	..	$3^P\ 25'$

In the case of Mercury the distance between the centre of the earth and the point about which the centre of the excentric carrying the epicycle moves, that is, EK (see fig. on p. 55), is 6^P and the distance between this latter point and the centre of the excentric circle carrying the epicycle, that is, KL (see fig. on p. 55), is always 3^P.

In the case of every planet the radius of the concentric or excentric circle is 60^P, while the radii of the epicycles of Mercury, Venus, Mars, Jupiter and Saturn are respectively $22^P\ 30'$, $43^P\ 10'$, $39^P\ 30'$, $11^P\ 30'$ and $6^P\ 30'$.
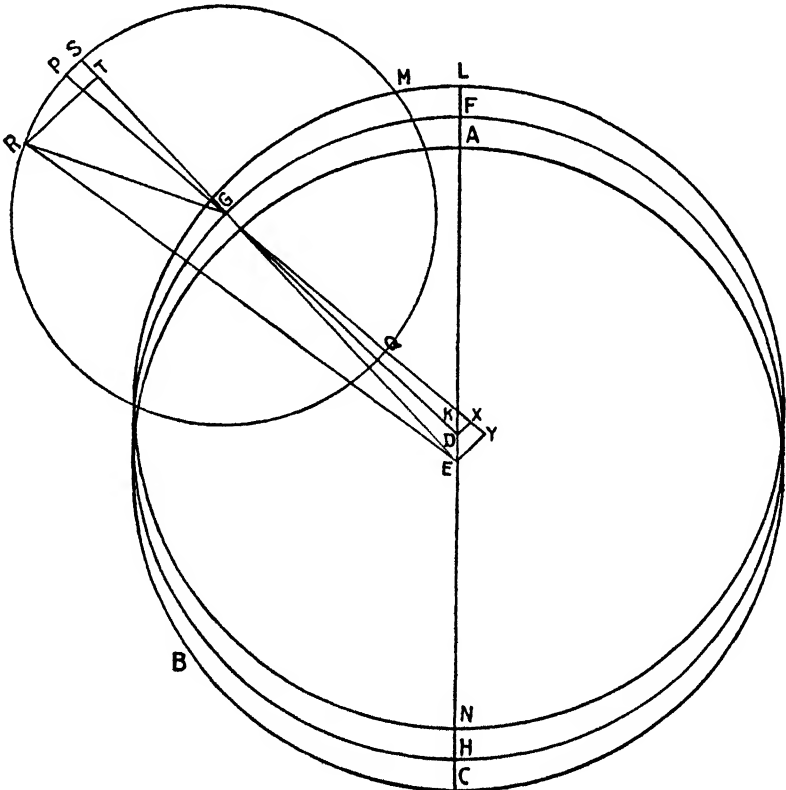
In the ninth chapter of the book XI, Ptolemy gives the geometrical method of finding the true place of a planet, when its mean distance from the

apogee of its excentric circle or its mean longitude and its mean distance from the apogee of its epicycle or its mean motion in anomaly with regard to the sun are given. This method is illustrated below. Take the case of, say, Mars.

Let ABC be the circle concentric with the ecliptic, having its centre as E, the centre of the earth and radius equal to 60^P. Let A and C be its apogee and perigee respectively. Let FGH be the excentric circle, equal to the circle ABC, which carries the epicycle of Mars. Let its centre D be such that DE is 6^P. Let F and H be its apogee and perigee respectively. Let LMN be a circle equal to ABC with centre K such that EK is 12^P. This is the circle of uniform motion. Let L and N be its apogee and perigee respectively. Let G be the centre of the epicycle of Mars with a radius of 39^P $30'$ and P and Q be its apogee and perigee respectively. Let R be the position of the planet on the epicycle. Let EG be joined and produced to meet the epicycle at S. Let ER be joined. Let RT be drawn perpendicular to ES. Let DX and EY be drawn perpendiculars on $PGQK$ produced. Let GD and GR be joined.

The mean distance of Mars from the apogee of its excentric circle, that is, angle LKG is given and its mean distance from the apogee of its epicycle, that is, angle PGR is given. It is required to find its true distance from the apogee of its excentric circle or angle LER.

Now $\angle LKG = \angle DKX$
$$= \alpha, \text{ say, when 4 right angles are } 360°,$$
$$= 2\alpha, \text{ when 2 right angles are } 360°.$$

Therefore arc $DX = 2\alpha$, when the circumference of the circle circumscribing the right-angled triangle DKX is $360°$.

Therefore arc $KX = 180° - 2\alpha$.

So chords DX and KX are known from Ptolemy's Table of Chords, when the hypotenuse DK is 120^P.

So chords DX and KX are calculated when DK is 6^P. Let them be x and y respectively.

Thus chord $EY = 2$ chord $DX = 2x$ and chord $KY = 2$ chord $KX = 2y$.

Since D is the middle point of EK and DX is parallel to EY, so chord $XY = y$.

$$GX = \sqrt{GD^2 - DX^2} = \sqrt{60^2 - x^2} = a, \text{ say.}$$
So $GY = GX + XY = a + y$.
So $GE = \sqrt{GY^2 + EY^2} = \sqrt{(a+y)^2 + (2y)^2} = b, \text{ say.}$
Thus when $GE = b$, $EY = 2y$.
So when $GE = 120^P$, $EY = c$, say.

Therefore from Ptolemy's Table of Chords arc EY is known and hence angle EGY, when 2 right angles are $360°$. Let it be β.

Let $\angle PGR = \gamma$, when 4 right angles are $360°$,
$$= 2\gamma, \text{ when 2 right angles are } 360°.$$

So $\angle SGR = \angle TGR$
$$= \angle SGP + \angle PGR$$
$$= \angle EGY + \angle PGR$$
$$= \beta + 2\gamma.$$
$$= \delta, \text{ say.}$$

2

Therefore from Ptolemy's Table of Chords arc $RT' = \delta$ when the circumference of the circle circumscribing the right-angled triangle TGR is 360°. So arc $TG = 180° - \delta$.

Thus from Ptolemy's Table of Chords, chords RT and TG are known when RG, the hypotenuse, is 120^P. So they are known when RG, the radius of the epicycle, is 39^P 30'. Let them be d and e respectively.

Therefore $TE = TG + GE$
$= e + b$
$= f$, say, is known.

Therefore $RE = \sqrt{RT^2 + TE^2} = g$, say, is known.

When $RE = g$, $RT = d$. Thus when $RE = 120^P$, RT is known. It is, say, h.

Thus from Ptolemy's Table of Chords arc RT is known, when the circumference of the circle circumscribing the right-angled triangle RET is 360°.

Thus angle RET = arc RT is known when 2 right angles are 360°, and, consequently, is known, when 4 right angles are 360°.

Thus angle LER, which is required, is known.

In the eleventh chapter Ptolemy gives tables showing the values of the inequalities of the planets in different positions and in the last chapter he gives rules to use these tables to find the true longitude of a planet on any day.

The foregoing sections show how the epicyclic and excentric methods were used by Ptolemy to explain the motions of the sun, moon and the five planets.

The Planetary System of the Hindus

In the planetary system conceived by the Hindus, the earth is at the centre of the universe and it is fixed. The stars and planets move round it from east to west in concentric circular orbits with a common drive constituted by the wind called Pravaha. They complete one revolution in one day. In terms of their radial distance from the earth they are in the following order:—Moon, Mercury, Venus, Sun, Mars, Jupiter and Saturn and the Stars. In the course of their motion the sun, moon and the five planets fall behind the stars, each losing an equal distance daily, so that they appear to move eastward, each at a rate of 11,858,717 Yojanas per day. Thus according to the Hindu astronomers all the planets move eastward in their orbits with the same velocity. But since the dimensions of their orbits are unequal, so their apparent motions, being in inverse ratio of the orbits, differ from one another. The daily motion westward of each planet is equal to the difference between 11,858,717 Yojanas and the circumference of its orbit.

Ancient Hindu Planetary Theory

The astronomers even in ancient[1] days noticed that the motion of a planet is not regular. They assigned the causes of this irregularity in motion to invisible deities situated at the Mandocca or apogee, at the Śīghrocca or apex of quick motion and at the Pāta or node. In the case of an inferior planet, the mean planet has the same velocity as that of the mean sun while the velocity of its Śīghrocca is the velocity of the planet

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[1] Before Āryabhaṭa (499 A.D.), the first scientific Hindu astronomer, whose work is extant.

itself, and the point called Śīghrocca is an imaginary point moving round the earth with the same angular velocity as that of the planet round the sun. In the case of a superior planet, the velocity of the planet is its true velocity and its Śīghrocca has the same velocity as that of the mean sun. Now the ancient idea was that a planet was attached to these invisible deities at its Mandocca, Śīghrocca and Pāta by cords of air. The deities at the Mandocca and the Śīghrocca drew the planet forward or backward towards their places alternately with the right and left hands. Thus irregularity in motion was caused. Again the deity at the Pāta drew the planet north or south of the ecliptic causing deviation in the latitude. This idea is found in the S.S., II. 1–8 and does not evidently include a knowledge of the epicyclic theory or the excentric theory.

The epicyclic and excentric theories are first met with in the Āryabhaṭīya of Āryabhaṭa. Varāhamihira in the description of the S.S. in his P.S., Brahmagupta in his B.S.S. and K.K., Lalla in his Ś.V., Śrīpati in his S. Śe. and Bhāskara in his S. Śi. have given detailed descriptions of these theories, the last astronomer being very clear and lucid in his statements.

HINDU TRIGONOMETRY

Before explaining these methods the Hindu idea of 'sine', 'cosine' and 'versed sine' must be explained.
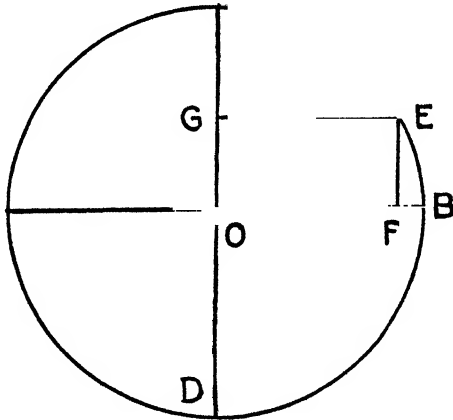
Let O be any circle and AOB and COD be two diameters at right angles to each other. Let BE be any arc. Let EF and EG be perpendiculars on AB and CD respectively.

Then EF is the sine of the arc EB or Jyā, EG is the cosine of the arc EB or Koṭijyā and FB is the versed sine of the arc EB or Utkramajyā.

Hindu Epicyclic Theory to find the Sun's Motion

The epicyclic theory is called Nīcoccavṛttabhaṅgī.

Let the circle ABP with E, the earth, as centre be the orbit of the sun or Kakṣāvṛtta. Let AEP be the apse line or Nīcoccarekhā. AE is the radius or Trijyā. With A as centre and the radius of the sun's epicycle or Mandāntyaphalajyā as radius describe a circle. This is the sun's epicycle or Nīcoccavṛtta. Let PEA produced cut it in U and N. Then U is the apogee or Mandocca in the epicycle and N is the perigee or Mandanīca.

Now the theory supposes that while A, the centre of the epicycle, moves in the direction of the signs about the orbit ABP, with a velocity equal to that of the sun's mean motion and always coinciding with its mean place, the sun itself moves along the epicycle with an equable motion but in a direction contrary to that of the signs. Further the time taken by the sun to complete one revolution along the circumference of the epicycle is the same as that taken by the centre of the epicycle to complete one revolution along the circumference of the orbit. Thus when the centre of the epicycle or the mean sun is at A, the true sun is at U.
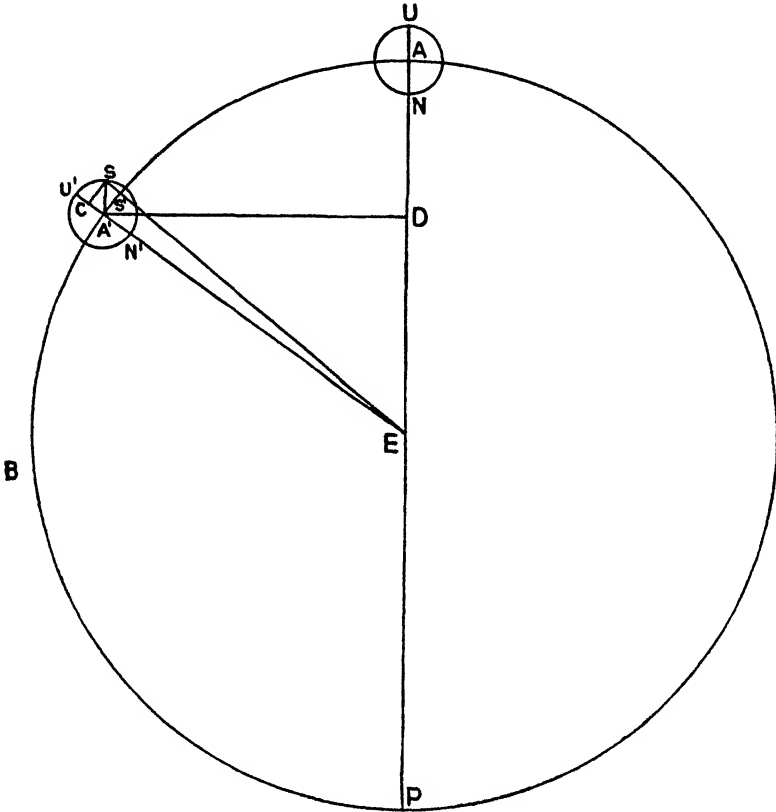
Now suppose A moves to A'. Let $A'E$ be joined cutting the epicycle in U' and N', which are the apogee and perigee respectively. Then the mean sun is at A' and the sun is at S, so that angle $U'A'S$ is equal to angle $U'EA$. Join ES cutting the orbit at S'. Then A' is the mean sun or Madhyama-sūrya and S' is the true sun or Sphuṭasūrya or Spaṣṭasūrya. The difference between the two positions is the arc $A'S'$, which is the equation of centre or Mandaphala.

It is required to find the value of the arc $A'S'$. Draw SC and $A'D$ perpendiculars to $U'N'E$ and UNE respectively.

$\angle AEA'$ = angle between the apogee and the mean sun
           = mean anomaly or Mandakendra
           = $\angle DEA'$
So $A'D$ = sine $\angle DEA'$ or Mandakendrajyā.

Now in the two similar right-angled triangles SCA' and $A'DE$,

$$\frac{SC}{SA'} = \frac{A'D}{A'E}.$$

So $SC \quad = \dfrac{A'D \times SA'}{A'E}$

Now since the radius of the epicycle : the circumference of the epicycle : : the radius of the orbit : the circumference of the orbit,

so $SC = \dfrac{A'D \times \text{circumference of the epicycle}}{\text{circumference of the orbit}}$

$$= \frac{\text{sine of mean anomaly} \times \text{circumference of the epicycle}}{360°}. \qquad .. \quad (1)$$

SC is approximately considered as the sine of the arc $A'S'$. So arc $A'S'$ is the arc corresponding to (1) as the sine.

Thus if the sun's mean longitude is known and that of its apogee is also known, then from the difference of the two longitudes, the sun's true longitude is calculated.

According to most of the Hindu astronomers, the sun's apogee has so very slight motion, that it is considered to be fixed for practical calculations. According to Āryabhaṭa and Lalla, it is 78°; according to S.S. as depicted in the P.S. it is 80°, and according to the modern S.S. it is 77° 14'. Brahmagupta and Bhāskara both say that it makes 480 revolutions in 4,320,000,000 years.

The measurement of the circumference of the sun's epicycle when that of the orbit is 360°, is 13° 30' according to Āryabhaṭa and Lalla and 14° according to the S.S. as depicted in the P.S. According to Brahmagupta and Bhāskara it is 13° 40'. According to the modern S.S., it is 13° 40' when described at the end of an odd quadrant of the concentric and 14° when described at the end of an even quadrant. The difference in the circumference of an epicycle between these two ends is equal to the product of the sine of the anomaly and the difference between the circumferences of the epicycles at the end of odd and even quadrants divided by the radius of the orbit.

Hindu Excentric Theory to find the Sun's Motion

The excentric theory is called Prativṛttabhaṅgī.

Let ABP be the sun's orbit, with E, the earth, as centre. Let AEP be the apse line. Let CE be equal to the radius of the sun's epicycle. Let $A'DP'$ be a circle with C as centre and equal to the circle ABP. Let AEP produced cut this circle in A' and P'. Then $A'DP'$ is the sun's excentric circle or Mandaprativṛtta and A' and P' are respectively the apogee and perigee in the excentric circle.

The theory supposes that the mean sun and the true sun move respectively along the concentric circle and the excentric circle with the same angular velocity in the direction of the signs.

So when the mean sun is at A, the true sun is at A'. When the mean sun has travelled up to M, the true sun has travelled up to S, so that arc AM is equal to arc $A'S$. Let ES be joined cutting the orbit at S'. Then S' is the place of the sun as observed from the earth. Then the arc MS' is the difference between the mean sun and the true sun and is the equation of centre.

It is required to find arc MS'.   Join EM, CS and SM.   Draw SF and MG perpendiculars to EM produced and $A'AE$ respectively.
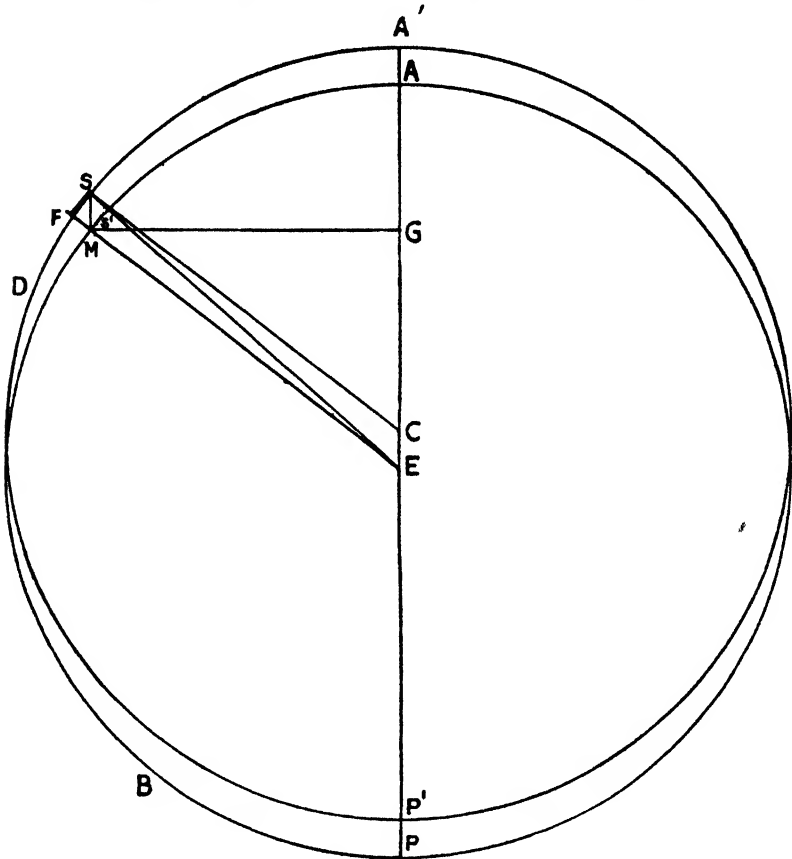
Since arc AM = arc $A'S$,
so $\angle AEM = \angle A'CS$.
So EM is parallel to CS.
But $EM = CS$,
so SM is equal to and parallel to CE.

Now $\angle AEM$ = angle between the apogee and the mean sun
$\qquad\qquad$ = mean anomaly
$\qquad\qquad$ = $\angle GEM$
$\qquad\qquad$ = $\angle SMF$.

Thus MG is the sine of the mean anomaly or Mandakendrajyā.
Now in the two similar right-angled triangles SFM and MGE,

$$\frac{SF}{SM} = \frac{MG}{ME}.$$

So SF $\quad \dfrac{MG \times SM}{ME}$

$\qquad\qquad$ sine of mean anomaly × circumference of the epicycle

SF is approximately considered as the sine of the arc MS'. Thus MS' is the arc corresponding to (1) as the sine.

This result is the same as that obtained by the epicyclic method.

The Hindu astronomers thus calculate the sun's equation of centre either by the epicyclic method or by the excentric method. Then applying this positively or negatively to the sun's mean longitude, according as the mean anomaly is greater than or less than 180°, they find the sun's true longitude.

Hindu Theory of the Moon

With regard to the calculation of the moon's true longitude, exactly the same methods as those for the sun are used. There is no mention of the moon's second inequality in Āryabhaṭa's, Varāhamihira's, Brahma-gupta's and Lalla's works. The failure of noticing this inequality may be due to the importance attached to the positions of the moon at syzygies only for the calculation of an eclipse and not at the quadratures.

Mañjula of the tenth century is the first Hindu astronomer to give the moon's second inequality. The form given by him is much more accurate than that given by Ptolemy. Śrīpati has also discussed the second inequality of the moon in his S. Se.[1] These works show that the moon's second inequality was not completely unnoticed by the Hindu astronomers.

According to all the Hindu astronomers, the moon's apogee has a significant motion, which has to be taken into account.

According to Āryabhaṭa and Lalla, the circumference of the moon's epicycle is 31° 30′, when that of the concentric is 360°; according to the S.S. as depicted in Varāhamihira's P.S., it is 31°; according to Brahmagupta and Bhāskara, it is 31° 36′; according to the modern S.S., it is 31° 40′ when described on the diameter of the concentric perpendicular to the line of apse and 32° when described on the line of apse.

Hindu Planetary Theory

The Hindu astronomers knew the two-fold inequalities of the planets—(1) the inequality of apsis or Mandocca and (2) the inequality of the apex of quick motion or Śīghrocca. The first is equivalent to the zodiacal inequality and the second to the solar inequality as described by Ptolemy. The Hindu name for the first inequality is Mandaphala and that for the second is Śīghraphala. The latter roughly represents the elongation in the case of an inferior planet and the annual parallax in the case of a superior planet.

The Hindu astronomers calculate both these inequalities either by the epicyclic method or by the excentric method.

Hindu Epicyclic Method to detect a Planet's Motion

Let ABM be the orbit of a planet, with centre E, the earth. Its radius is called Trijyā. Let AEM be the apse line and EC be the direction of the Śīghrocca. Let A' be the centre of the first epicycle of the planet and UDN be its epicycle or Mandanīcoccavṛtta, so that U is the apogee or Mandocca and N is the perigee or Mandanīca and UA' is its radius or Mandāntya-phalajyā.

Now according to the epicyclic theory, as in the case of the sun, when the position of the planet in the epicycle is at P, arc UP is equal to arc AA'. If EP is joined cutting the orbit in P', then P' is the position of the planet

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[1] See S.G.T., pp. 159–171.

after the correction due to the apsis. The amount of correction to be given
to the mean longitude of the planet is the arc $A'P'$, the value of which can
be found exactly in the same manner as in the case of the sun.
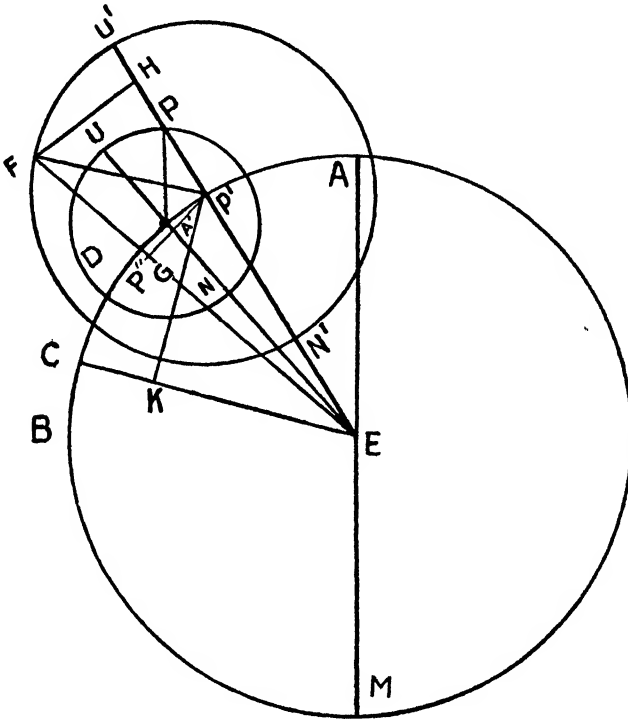
Now with P' as the centre and the radius of the planet's second epicycle
or Śīghrāntyaphalajyā as the radius describe a circle. Produce $EP'P$ to
cut it in U' and N', which are respectively the Śīghrocca and Śīghranīca
or the planet's apogee and perigee in the epicycle. Now if $P'F$ is drawn
parallel to EC, F is the position of the planet in the epicycle. If EF is
joined cutting the orbit in P'', then P'' is the true place of the planet. Thus
a further correction to be given to the corrected mean longitude of the
planet is the value of the arc $P'P''$, which is called Śīghraphala. This
process is called Śīghrakarman.

It is required to find the value of the arc $P'P''$. Draw $P'G$, $P'K$ and
FH perpendiculars respectively to EF, EC and EU'.

$\angle P'EC$ = angle between the Śīghrocca and the corrected planet
= Śīghrakendra.

So $P'K$, its sine, is Śīghrakendrajyā and EK, its cosine, is Śīghrakendra-
koṭijyā.

Now in the two similar right-angled triangles $EP'H$ and $P'EK$,

$$FH \text{ or Dohphala} = \frac{P'K \times FP'}{P'E}$$

$$= \frac{\text{sine angle } P'EK \times \text{radius of second epicycle}}{\text{radius of orbit}}$$

$$= \frac{\text{sine angle } P'EK \times \text{circumference of second epicycle}}{360°}.$$

From the same triangles,

$$HP' \text{ or Koṭiphala} = \frac{EK \times FP'}{P'E}$$

$$= \frac{\text{cosine angle } P'EK \times \text{circumference of second epicycle}}{360°}.$$

So HE or Sphuṭakoṭi $= P'E + HP' = $ Trijyā$+$Koṭiphala.
In the second and third quadrants, Sphuṭakoṭi $= $ Trijyā$-$Koṭiphala.

So FE or Karṇa $= \sqrt{FH^2 + HE^2} = \sqrt{\text{Doḥphala}^2 + \text{Sphuṭakoṭi}^2}$.

Now from the similar right-angled triangles $P'GE$ and FHE,

$$P'G = \frac{FH \times P'E}{FE}$$

or sine $\widehat{P'P''} = \frac{FH \times P'E}{FE}$ or Śighraphalajyā $= \frac{\text{Doḥphala} \times \text{Trijyā}}{\text{Karṇa}}$ .. (1).

So arc $P'P''$ or Śighraphala is the arc corresponding to (1) as the sine.

When the value of this arc is applied to the longitude of the planet corrected by the inequality due to apsis, the result is the planet's true longitude.

Hindu Excentric Method to detect a Planet's Motion
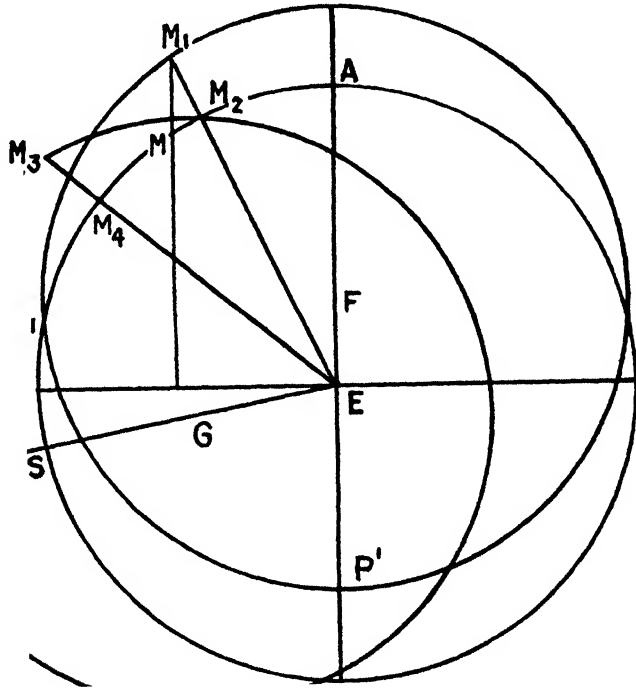
Let ABP with E, the earth, as centre be the orbit of the planet. Let AEP be the apse line. Let ES be the direction of the Śighrocca. Let EF

be equal to the radius of the first epicycle of the planet. Let $A'B'P'$ with F as centre, be equal to the circle ABP. Then $A'B'P'$ is the first excentric circle or Mandaprativṛtta of the planet. Let A' be the apogee or Mandocca and P' be the perigee or Mandanīca on the excentric. Then as in the case of the sun, when the mean planet is at M, the position of the planet on the excentric is at M_1, so that arc AM is equal to arc $A'M_1$. Let EM_1 be joined cutting the concentric in M_2. Then M_2 is the position of the planet corrected by the inequality due to the apsis. The correction to be applied to the mean longitude of the planet is the value of the arc MM_2, which can be found exactly in the same way as in the case of the sun.

Now from ES, cut off EG equal to the radius of the second epicycle of the planet or Śīghrāntyaphalajyā. With G as centre describe a circle equal to the concentric. This is the second excentric or Śīghraprativṛtta. Produce ES to meet it in S'. Then S' is the Śīghrocca in the excentric. Then M_3 is the position of the planet in the second excentric, such that arc $S'M_3$ is equal to arc SM_2. Let EM_3 be joined cutting the concentric in M_4. Then M_4 is the true place of the planet. The correction to be given to the once corrected planet is the value of the arc M_2M_4.

It is required to find the arc M_2M_4.*

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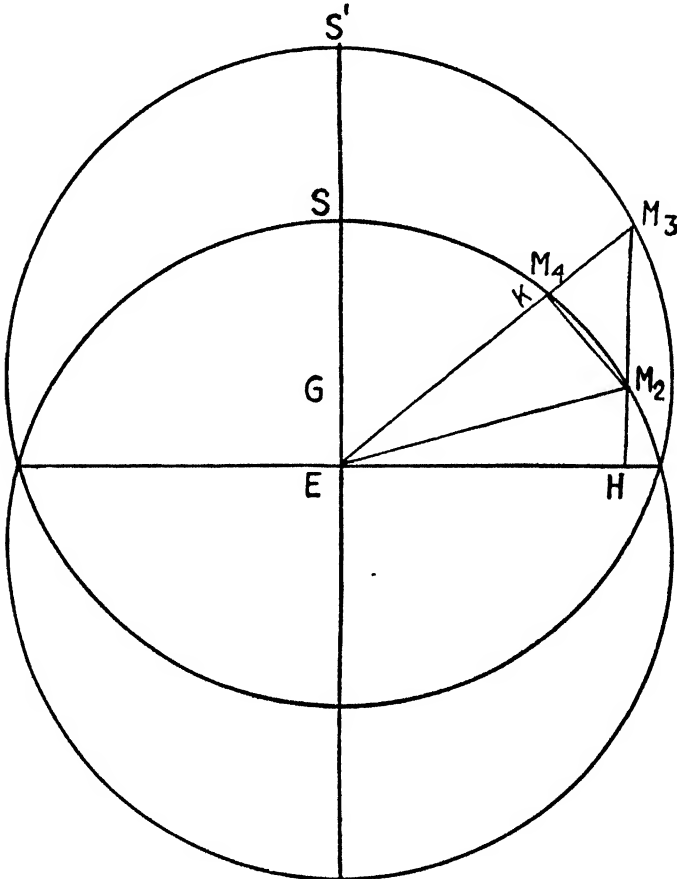
* For the sake of simplicity this part of the diagram is drawn separately.

Join EM_2.　Join M_3M_2 and produce it to meet the line at right angles to ES at H.　Draw M_2K perpendicular to EM_3.

Now $M_3M_2 = GE = $ Śīghrāntyaphalajyā.

$\angle SEM_2 = $ angle between the Śīghrocca and the once corrected planet $= $ Śīghrakendra.

So EH, its sine, is the Śīghrakendrajyā and M_2H, its cosine, is the Śīghrakendrakoṭijyā.

So M_3H or Sphuṭakoṭi

$= M_3M_2 + M_2H$

$= $ Śīghrāntyaphalajyā $+$ Śīghrakendrakoṭijyā.

When the Śīghrakendra is greater than 3 and less than 9 signs, Sphuṭa-koṭi $= $ Śīghrāntyaphalajyā $-$ Śīghrakendrakoṭijyā

So M_3E or Karṇa

$= \sqrt{M_3H^2 + EH^2}$

$= \sqrt{\text{Śīghrakendrajyā}^2 + \text{Sphuṭakoṭi}^2}.$

Now from the similar right-angled triangles M_3EH and M_3M_2K,

$$M_2K = \frac{EH \times M_3M_2}{M_3E},$$

or sine arc M_2M_4 or Śīghraphalajyā

$$= \frac{\text{Trijyā}}{\text{Trijyā}} \times \frac{\text{Śīghrāntyaphalajyā} \times \text{Śīghrakendrajyā}}{\text{Karṇa}}$$

$$= \frac{\text{Dohphala} \times \text{Trijyā}}{\text{Karṇa}} \quad \text{(see p. 64)} \quad .. \quad .. \quad .. \quad .. \quad .. \quad .. \quad (1)$$

So arc M_2M_4 or Śīghraphala is the arc corresponding to (1) as the sine, which is the same as that obtained by the epicyclic method (see p. 65).

Hindu Values of the Apogees and the Circumferences of the First and Second Epicycles

The longitudes of the Mandoccas of Mars, Mercury, Jupiter, Venus, and Saturn, according to Āryabhaṭa and Lalla, are respectively 118°, 210°, 180°, 90° and 236°; according to the S.S. as depicted in the P.S. they are 110°, 220°, 160°, 80° and 240°; according to the modern S.S. they are 130°, 220° 36′, 171° 16′, 79° 49′ and 236° 37′.　Both Brahmagupta and Bhāskara ascribe to them slow motions, which are 292, 332, 855, 653 and 41 revolutions respectively in 4,320,000,000 years.[1]

As regards the circumferences of the first epicycles of the planets in the above order, according to Āryabhaṭa and Lalla, they are respectively 63°, $31\frac{1}{2}$°, $31\frac{1}{2}$°, 18° and $40\frac{1}{2}$°, when the epicycles are described at the end of an odd quadrant of the concentric and are respectively 81°, $22\frac{1}{2}$°, 36°, 9° and $58\frac{1}{2}$°, when the epicycles are described at the end of an even quadrant of

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[1] In this connection Bhāskara says,

　　　'So 'pi pradeśaścalatīti tasmāt
　　　　prakalpitā tuṅgagatirgatijñaiḥ'

or, 'The Ucca moves, so the ancient astronomers have ascribed motion to it.'
(See S. Śi., Golādhyāya, V. 20 cd.)

the concentric; according to the S.S. as depicted in the P.S., the circumferences are respectively 70°, 28°, 32°, 14° and 60°; according to the modern S.S. they are respectively 72°, 28°, 32°, 11° and 48°, when the epicycles are described at the end of an odd quadrant of the concentric and are respectively 75°, 30°, 33°, 12° and 49°, when the epicycles are described at the end of an even quadrant of the concentric. According to Brahmagupta and Bhāskara, the circumferences of the first epicycles of Mars, Mercury and Jupiter are 70°, 38° and 33° respectively; and that of Venus is 9° at the end of an odd quadrant of the concentric and 11° at the end of an even quadrant. For Saturn, Brahmagupta gives 30° and Bhāskara gives 50°.

As regards the circumferences of the second epicycles of the planets in the above order, according to Āryabhaṭa and Lalla, they are respectively 238½°, 139½°, 72°, 265½° and 40½°, when the epicycles are described at the end of an odd quadrant of the concentric and are respectively 229½°, 130½°, 67½°, 256½° and 36°, when they are described at the end of an even quadrant of the concentric; according to the S.S. as depicted in the P.S., they are 234°, 132°, 72°, 260° and 40° respectively; according to the modern S.S., they are respectively 232°, 132°, 72°, 260° and 40°, when the epicycles are described at the end of an odd quadrant of the concentric and are respectively 235°, 133°, 70°, 262° and 39°, when they are described at the end of an even quadrant of the concentric. According to Brahmagupta and Bhāskara the circumferences of the epicycles of Mercury and Jupiter are respectively 132° and 68°; that of Venus is 263°, when the epicycle is described at the end of an odd quadrant and 258°, when it is described at the end of an even quadrant. For Saturn, Brahmagupta gives 35° and Bhāskara gives 40°. Both Brahmagupta and Bhāskara give the following rule to find the circumference of the second epicycle of Mars at any time:—'Find the quadrant in which the Śīghrakendra is. Take the smaller of the two arcs, passed or to be passed, of the quadrant. Find its sine. Multiply it by 6° 40′ and divide by the sine of 45°. Subtract the quotient from 243° 40′. The remainder is the circumference of the second epicycle.'

Hindu Methods of Application of the Correction

The methods to calculate the two inequalities of a planet according to the Hindu astronomers are given above. As regards their application to the mean longitude of a planet, the first operation should be to apply the amount of the first inequality to the mean longitude, getting thereby, in the case of a superior planet, its heliocentric longitude and in the case of an inferior planet, the centre of its circular orbit; the second operation must be to apply the amount of the second inequality to the corrected mean longitude, which inequality is the annual parallax in the case of a superior planet and the elongation in the case of an inferior planet. This is the operation followed by Ptolemy, but the Hindu astronomers not only do not follow this mathematical operation, but they differ in their methods from one another. These methods are given below.

According to Āryabhaṭa.

1. Calculate the Mandaphala from the mean longitude of the planet. Apply half of it to the mean longitude, positively or negatively, as the case may be.
2. From the corrected longitude, calculate the Śīghraphala. Apply half of it to the once corrected longitude.

3.   From the twice corrected longitude calculate the Mandaphala. Apply whole of it to the mean longitude of the planet. The result is called Sphuṭamadhya.

4.   From the Sphuṭamadhya calculate the Śighraphala. Apply whole of it to the Sphuṭamadhya. The result is the true longitude of the planet.

This method is followed in the case of Mars, Jupiter and Saturn.

In the case of Mercury and Venus:

1.   Calculate the Śighraphala from the mean longitude. Apply half of it to the Mandocca of the planet in a manner reverse to that in which it would be applied to the planet itself.

2.   Using the corrected longitude of the Mandocca and that of the mean planet, calculate the Mandaphala. Apply whole of it to the mean longitude.

3.   From the corrected longitude, calculate the Śighraphala. Apply whole of it to the corrected longitude. The result is the true longitude of the planet.

According to S.S. in P.S.

In the case of Mars, Jupiter and Saturn:

1.   Calculate the Śighraphala from the mean planet. Apply half of it to the Mandocca negatively, if the Śighrakendra is in the half of the orbit beginning with Aries, but positively otherwise.

2.   From the corrected Mandocca and the mean planet, calculate the Mandaphala. Apply half of it positively to the Mandocca, if the Manda-kendra is in the half of the orbit beginning with Aries, but negatively otherwise.

3.   From the corrected Mandocca and the mean planet, calculate the Mandaphala. Apply it positively or negatively to the mean planet.

4.   From the corrected mean planet, calculate the Śighraphala. Apply it positively or negatively to the corrected mean planet. The result is the true planet.

In the case of Venus, after applying these methods again 67′ should be subtracted. The result then will be the true Venus.

In the case of Mercury a peculiar method is followed.

Subtract the Mandocca of the sun from the Śighrocca of Mercury. Multiply the sine of the remainder by the sun's epicycle and divide by 360°. Apply the quotient positively or negatively to the mean Mercury according as the remainder is in the half of the ecliptic beginning with Aries or Libra respectively.

According to Brahmagupta and Bhāskara.

1.   Calculate the Mandaphala from the mean planet and apply it to the mean longitude. The result is called Mandaspaṣṭa or Sphuṭamadhya.

2.   Calculate the Śighraphala from the Mandaspaṣṭa. Apply it to the Mandaspaṣṭa. The result is the true longitude after the first approximation.

Repeat these two operations till the true longitude is fixed.

This is the method to be followed for all the planets except Mars. In the case of Mars, the same method as that given by Āryabhaṭa for Mars is followed.

According to Lalla.

He gives the method followed by Āryabhaṭa in the case of Mars, etc., for all the planets. He also gives an alternative method, which is the same as

the above method, with the exception that the second operation becomes the first and the first becomes the second.

According to the modern S.S.

The alternative method given by Lalla is followed.   .

Similarities and Differences between the Hindu and Greek Planetary Systems.

The foregoing comprehensive account of the Hindu and Greek planetary systems establishes their similarities and differences, which throw considerable light on the main object of the present thesis.

The similarities are as follows:—

1.   Both believe that the celestial sphere is moving round the earth from east to west, but the apparent motions of the sun, moon and the five planets are towards the east.   Thus both confirm the geocentric theory.

2.   Both assign uniform and circular movements to the sun, moon and the five planets.

3.   Both accept the same order of the planets.

4.   Both conceive one inequality in the sun's apparent motion and two inequalities in the motion of each of the five planets.

5.   Both agree that this apparent irregularity can be explained away either by the epicyclic theory or by the excentric theory.   Thus both are ignorant of the true elliptic orbits of the planets and assume them to be excentric circles instead.   The main ideas underlying the epicyclic and excentric theories in both systems are identical.

6.   According to both Mercury and Venus have the same mean orbit and motion as those of the sun.   Thus the epicycle assigned to them is their heliocentric orbit with the mean sun as the centre.

7.   According to both the mean motion in anomaly of a superior planet is equal to the difference between the mean motion of the sun and that of the planet.

8.   According to both the centre of the orbit of a superior planet is the earth.   Thus in this case the epicycle is the earth's orbit in the form of a circle with the mean sun as the centre.

The divergences are as follows:—

1.   Ptolemy calculates from his theory the exact values of the first inequality in the case of the sun, moon and the five planets, whereas the Hindu value is only approximate.

2.   The methods of calculating the inequalities differ in the two systems, because the trigonometrical ratio 'sine' is unknown to Ptolemy, whereas the Hindus make constant use of it.

3.   Ptolemy calculates the second inequality of the moon known today as ovection.   This inequality is not met with in the ancient works of Āryabhaṭa, Varāhamihira and Brahmagupta.   It is first found in the work of Muñjāla and his value of this inequality is more accurate than that of Ptolemy.[1]

4.   For the actual calculation of the inequalities in the case of the five planets, Ptolemy combines the epicyclic and the excentric theories.   According to him the planet moves round an epicycle, the centre of which is not carried by that excentric, which has its centre at the point, where equal angles are described in equal times, but it is carried by another circle equal

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[1] See S.G.T., p. 163.

to the excentric and with its centre at the point bisecting the line joining the centre of the ecliptic and that of the excentric. In the case of Mercury this excentric carrying the epicycle is moveable. Thus Ptolemy admits that the centre of equal distance is not the same as the centre of equal motion.

These assumptions and complications of Ptolemy are absent in the works of Hindu astronomers. As has been pointed out above, they do not combine the epicyclic and excentric theories to calculate the inequalities. Each device is adequate to calculate both inequalities.

On one occasion, however, Bhāskara refers to a diagram in which the epicyclic and excentric methods are combined and he calls the construction, a mixed one or Miśrabhaṅgī (see S. Śi., Golādhyāya, V. 32).

5. The striking point of dissimilarity between the two systems is that whereas the circumference of the epicycle of a planet is constant in the Greek system, it is not so in the Hindu system. In the latter case it has one measurement at the end of even quadrants and another at the end of odd quadrants of the concentric and decreases or increases in the intermediate positions in proportion to the sine of the anomaly. This change in the circumference of the epicycle of a planet is stated by Āryabhaṭa, whose is the earliest extant scientific treatise on Hindu astronomy. His successors also make it variable, but the values assigned to each epicycle differ in different books, as has been stated above. In no commentary on these works is the reason for this variation given. All commentators unanimously say that these measurements are the results of observation. Even Bhāskara, while accepting the values of the circumferences as given by Brahmagupta, merely says that if Brahmagupta found these values giving results in accordance with his observations, then there is no reason why he (Bhāskara) should not accept them. Thus at present it is not possible to speculate with any degree of certainty why the Hindu astronomers made the circumference of the epicycle of a planet variable. Perhaps one may say that it was designed to make the calculated results agree, as far as possible, with the observed results.

6. Another point where the Hindu system differs from the Greek system is in the actual application of the two equations to the mean longitude of a planet to find its true longitude. This point has already been made clear.

Origin and Development of the Greek Epicyclic and Excentric Methods

Before proceeding to discuss to what extent the Hindu astronomers were indebted to the Greeks, if at all, for their system of planetary motion, it is essential to mention briefly the theories with regard to the origin and development of the epicyclic and excentric methods as used by the Greek astronomers, a subject which is still enveloped in uncertainty. The reason for this is that the works of most of the ancient Greek astronomers are completely lost and the texts containing references to these works are very few in number and not always reliable. Several theories in this connection have been propounded of course, but all are based more on conjecture than on textual evidence.

From Ptolemy's statement in the first chapter of the twelfth book of his Mathematical Syntaxis, it follows that in the time of Apollonius of Perga (230 B.C.), the epicyclic method was used to determine the first inequality of all the planets, namely, the inequality due to their conformations with the sun, but the excentric method was used only for the three

superior planets.[1]   That a generalized excentric method was not in practice, is clear from his statement, ' διὰ τῆς κατ' ἐκκεντρότητα ὑποθέσεως......τῆς τοιαύτης ἐπὶ μόνων τῶν πᾶσαν ἀπόστασιν ἀπὸ τοῦ ἡλίου ποιουμένων γ̄ ἀστέρων προχωρεῖν δυναμένης ', which means, 'according to the excentric hypothesis, ... the same being applicable only to the three planets, which can be at any angular distance from the sun, etc.'

When did these theories then originate ?   Schiaparelli maintains that the Pythagoreans were the first to whom the idea of excentrics and epicycles occurred.   But these methods must have been known to Heraclides of Pontus (c. 388 B.C.).   The epicyclic method led him to his great discovery of the revolutions of Mercury and Venus round the sun.   Schiaparelli further gives a very ingenious proof that either Heraclides or one of his contemporaries must have invented the theory of moveable excentrics to explain the motion of the three superior planets round the sun.   These theories, according to Schiaparelli, were essential for the formulation of the heliocentric system by Aristarchus (310–230 B.C.), who took the simplest case of these theories, namely, when the centres of the excentrics of the three superior planets coincided with the sun and also the centres of the epicycles of Mercury and Venus.[2]

Dreyer, though not agreeing with Schiaparelli that the Pythagoreans were the inventors of the excentrics and epicycles, is still of opinion that both these methods were well known to Aristarchus, whose system was probably based on these theories.[3]

Tannery, on the other hand, argues that the epicyclic method was well known to Apollonius (230 B.C.), who himself invented the excentric method for the motion of the superior planets.[4]

Heath holds the same view.[5]

But it must be noted here that there is nothing in the above statement of Ptolemy to suggest that Apollonius discovered the excentric method. Ptolemy simply states that all other mathematicians and especially Apollonius of Perga have previously proved a certain theorem both by epicyclic and excentric methods.

The object of this thesis is not to discuss the views of these scholars with regard to the origin of the excentrics and epicycles, but this point must be again emphasized that a detailed examination of these theories reveals the fact that these views are based on tentative arguments, perhaps sometimes biassed, and not on any definite reliable textual evidence.   If Ptolemy's statement is taken to be accurate, then this much can be said with certainty, that in the time of Apollonius, the generalized form of the epicyclic system was used, but the excentric system was used only for the three superior planets.   That by the time of Hipparchus (126 B.C.) both methods were available as equivalent alternatives, is hinted at by Ptolemy in his M.S.[6]

Theon of Smyrna (2nd century) also says in his 'Astronomy' that Hipparchus much admired both the hypotheses, because, though different, they yielded identical results and that he even remarked that the mathematicians should investigate the cause of that identity.[7]   Theon also says that of the two methods, Hipparchus preferred the epicyclic system.[8]

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[1] See Vol. II, pp. 450-451.
[2] See Aristarchus of Samos, Part I, ch. XVIII; Part II, ch. I.
[3] See Planetary Systems, ch. VI.
[4] See Recherches sur l'Histoire de l'Astronomie ancienne, ch. XIV.
[5] See Aristarchus of Samos, pp. 268-269.
[6] See Vol. II, p. 211.   The quotation will be given below.
[7] See Théon De Smyrne, pp. 268, 298.
[8] See Théon De Smyrne, p. 304.

Ptolemy's M.S. gives the epicyclic and excentric methods in finished forms. As has been described above, he uses both methods as alternatives in the case of the sun, which has only one inequality, but combines them for the moon and for the five planets, which have double inequalities. The following quotations from his work will show that Ptolemy has made it clear how much of the planetary system is due to Hipparchus and how much to himself.

Quotations from the M.S. and their English Translation

With regard to the eccentricity of the solar circle and the longitude of its apogee, Ptolemy says, ' δέδεικται μὲν ταῦτα καὶ τῷ Ἱππάρχῳ μετὰ σπουδῆς· ὑποθέμενος γὰρ τὸν μὲν ἀπὸ ἐαρινῆς ἰσημερίας μέχρι θερινῆς τροπῆς χρόνον ἡμερῶν $\overline{9\delta}$ L', τὸν δὲ ἀπὸ θερινῆς τροπῆς μέχρι μετοπωρινῆς ἰσημερίας ἡμερῶν $\overline{9\beta}$ L', διὰ μόνων τούτων τῶν φαινομένων ἀποδείκνυσι τὴν μὲν μεταξύ, τῶν προειρημένων κέντρων εὐθεῖαν εἰκοστοτέταρτον ἔγγιστα μέρος οὖσαν τῆς ἐκ τοῦ κέντρου τοῦ ἐκκέντρου, τὸ δ' ἀπόγειον αὐτοῦ προηγούμενον τῆς θερινῆς τροπῆς τμήμασιν $\overline{κδ}$ L' ἔγγιστα, οἵων ἐστὶν ὁ διὰ μέσων τῶν ζῳδίων κύκλος $\overline{τ\zeta}$. καὶ ἡμεῖς δὲ τοὺς μὲν τῶν προκειμένων τεταρτημορίων χρόνους καὶ τοὺς λόγους τοὺς προκειμένους τοὺς αὐτοὺς ἔγγιστα καὶ νῦν ὄντας εὑρίσκομεν,' [1] which mean, ' These things have been proved by Hipparchus also with care, after assuming that the period from the spring equinox to the summer solstice cover 94½ days, while that from the summer solstice to the autumn equinox covers 92½ days. By means of these phenomena only, he shows the length of the straight line between the centres mentioned before to be approximately $\frac{1}{24}$ of the radius of the excentric circle and the apogee of the excentric circle to be approximately 24½° west of the summer solstitial point, the ecliptic containing 360°. We too find the times corresponding to the quadrants as set forth and the ratios as stated to be practically the same even now.'

With regard to the ' ἐξελιγμός ',[2] Ptolemy says, ' ἤδη μέντοι πάλιν ὁ Ἵππαρχος ἤλεγξεν ἀπό τε τῶν χαλδαϊκῶν καὶ τῶν καθ' ἑαυτὸν τηρήσεων ἐπιλογιζόμενος μὴ ἔχοντα ταῦτα ἀκριβῶς. ἀποδείκνυσι γάρ, δι' ὧν ἐξέθετο τηρήσεων, ὅτι ὁ πρῶτος ἀριθμὸς τῶν ἡμερῶν, δι' ὅσων πάντοτε ὁ ἐκλειπτικὸς

$\overline{\iota\beta}$

χρόνος ἐν ἴσοις μησὶν καὶ ἐν ἴσοις κινήμασιν ἀνακυκλεῖται, $\overline{\mu}$ ἐστιν καὶ ἔτι $,\overline{\zeta\zeta}$ ἡμερῶν καὶ μιᾶς ὥρας ἰσημερινῆς, ἐν αἷς μῆνας μὲν ἀπαρτιζομένους εὑρίσκει $,\overline{\delta\sigma\xi\zeta}$, ὅλας δὲ ἀνωμαλίας ἀποκαταστάσεις $,\overline{\delta\phio\gamma}$, ζῳδιακοὺς δὲ κύκλους $,\overline{\delta\chi\iota\beta}$ λείποντας μοίρας $\overline{\zeta} L'$ ἔγγιστα, ὅσας καὶ ὁ ἥλιος εἰς τοὺς $\overline{\tau\mu\epsilon}$ κύκλους λείπει, πάλιν ὡς τῆς ἀποκαταστάσεως αὐτῶν πρὸς τοὺς ἀπλανεῖς ἀστέρας θεωρουμένης. ὅθεν εὑρίσκει καὶ τὸν μηνιαῖον μέσον χρόνον ἐπιμεριζομένου τοῦ προκειμένου τῶν ἡμερῶν πλήθους εἰς τοὺς $,\overline{\delta\sigma\xi\zeta}$ μῆνας ἡμερῶν συναγόμενον $\overline{κθ}$ $\overline{λα}$ $\overline{ν}$ $\overline{η}$ $\overline{κ}$ ἔγγιστα,' [3] which mean, ' Now Hipparchus, however, calculating with the observations of the Chaldeans and of his own, showed again that this period is not correct. For he proves by means of the observations he set forth that the smallest number of days after which the eclipse period is always repeated with the same number of lunations and the same motions, is 126007 together with

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[1] See Vol. I, p. 233.

[2] This consists of 19756 days as established by the ancient Greek astronomers, during which period there are 669 lunations, 717 restitutions of the moon's anomaly, 726 restitutions of the moon's latitude and 723 revolutions of the moon in longitude plus 32°.

[3] See Vol. I, pp. 270-271.

1 equinoctial hour, in which period he finds 4267 complete lunations, 4573 revolutions of the anomaly and 4612 less $7\frac{1}{2}°$ revolutions of the ecliptic approximately and by which ($7\frac{1}{2}°$) the sun falls short of 345 complete revolutions, the conjunctions of the sun and moon being again considered with regard to the fixed stars. Hence dividing the above number of days over 4267 lunations, he obtains the mean length of a lunar month as $29^d \ 31^I \ 50^{II} \ 8^{III} \ 20^{IV}$ approximately.'

From these numbers Ptolemy concludes that during a period of 251 lunations there will be 269 restitutions of the moon's anomaly.[1]

Ptolemy continues, 'ἤδη μέντοι προκατειλημμένου τοῦ τῆς ἀνωμαλίας ἀποκαταστατικοῦ χρόνου παραθέμενος πάλιν ὁ Ἵππαρχος διαστάσεις μηνῶν ὁμοίας κατὰ πάντα τὰς ἄκρας ἐκλείψεις ἐχόντων καὶ τοῖς μεγέθεσι καὶ τοῖς χρόνοις τῶν ἐπισκοτήσεων, ἐν αἷς οὐδὲν ἐγίγνετο διάφορον παρὰ τὴν ἀνωμαλίαν, ὡς διὰ τοῦτο καὶ τὴν κατὰ πλάτος πάροδον ἀποκαθισταμένην φαίνεσθαι, δείκνυσιν καὶ τὴν τοιαύτην περίοδον ἀπαρτιζομένην ἐν μησὶν μὲν ͵ευνη, περιόδοις δὲ πλατικαῖς ͵ε ͢λκγ,'[2] which mean, 'Again while mentioning the intervals in lunar months between two extreme lunar eclipses similar in every respect, viz. in magnitude and in duration of the period of obscuration, in which intervals there was no difference due to the anomaly, so that because of this the period of motion in latitude appears to be included, Hipparchus proves that such period consisted of 5458 lunations and 5923 revolutions in latitude.'

With regard to these lunar periods as calculated by Hipparchus, Ptolemy says, 'τῶν γοῦν ἐκτεθειμένων περιοδικῶν ἀποκαταστάσεων κατὰ τοὺς ὑπὸ τοῦ Ἱππάρχου γεγενημένους ἐπιλογισμοὺς ἡ μὲν τῶν μηνῶν, ὡς ἔφαμεν, ὑγιῶς, ὡς μάλιστα ἐνῆν, ἐπιλελογισμένη . . . ., ἡ δὲ τῆς ἀνωμαλίας καὶ τοῦ πλάτους ἀξιολόγῳ τινὶ διημαρτημένη,'[3] which mean, 'At any rate, of the periodic restitutions established here according to the calculations of Hipparchus, the length of the mean lunar month was, as we have said, calculated soundly, as far as was possible . . . but that of the anomalistic month and the period of motion in latitude had a margin of error.'

Then in the beginning of the theory of the moon's motion Ptolemy says, ''Επομένου δὲ τούτοις τοῦ δεῖξαι τόν τε τρόπον καὶ τὴν πηλικότητα τῆς σεληνιακῆς ἀνωμαλίας νῦν μὲν ποιησόμεθα τὸν περὶ τούτου λόγον ὡς μιᾶς ταύτης ὑπαρχούσης, ᾗ μόνῃ καὶ πάντες σχεδὸν οἱ πρὸ ἡμῶν ἐπιβεβληκότες φαίνονται, λέγω δὲ τῇ κατὰ τὸν ἐκκείμενον ἀποκαταστατικὸν χρόνον ἀπαρτιζομένῃ, μετὰ δὲ ταῦτα δείξομεν, ὅτι ποιεῖταί τινα καὶ δευτέραν ἀνωμαλίαν ἡ σελήνη παρὰ τὰς πρὸς τὸν ἥλιον ἀποστάσεις μεγίστην μὲν γινομένην περὶ τὰς διχοτόμους ἀμφοτέρας, ἀποκαθισταμένην δὲ δὶς ἐν τῷ μηνιαίῳ χρόνῳ περὶ αὐτάς τε τὰς συνόδους καὶ τὰς πανσελήνους,'[4] which mean, 'The proving of the method and value of the lunar anomaly coming next to these, we shall now proceed to the argument with regard to this on the assumption that this anomaly is one, to which alone practically all the mathematicians, who came before us, seem to have given attention. I refer to that anomaly, which is completed in the period mentioned before. After that, however, we shall show that the moon has a second anomaly with regard to its distance from the sun, this anomaly becoming maximum at both quadratures and vanishing twice in one lunar month, once at new moon and once at full moon.'

Ptolemy continues, 'ἐπὶ δὲ τῆς προηγουμένης ἀποδείξεως ἀκολουθήσομεν ταῖς τοῦ θεωρήματος ἐφόδοις, αἷς καὶ τὸν Ἵππαρχον ὁρῶμεν συγκεχρημένον,'[5]

[1] See Vol. I, p. 272.   [2] See Vol. I, p. 272.   [3] See Vol. I, p. 277.
[4] See Vol. I, p. 294.   [5] See Vol. I, p. 294.

3B

which mean, 'On the preceding argument we shall follow the theoretical methods, which we see Hipparchus also has used.'

In this connection Ptolemy points out that though he followed the same method as that of Hipparchus to calculate the first lunar inequality, his value of the maximum inequality differs from that of Hipparchus, his being 5° and that of Hipparchus being 4° 34' by the epicyclic method and 5° 49' by the excentric method, and the difference is due to calculation and not to hypothesis.[1]

In the beginning of the fifth book of the M.S. Ptolemy again states that there is a second inequality of the moon, which he will now investigate.[2]

He continues, ' κατηνέχθημεν δὲ εἰς τὴν τοιαύτην ἐπίστασίν τε καὶ πίστιν ἀπό τε τῶν ὑπὸ τοῦ Ἱππάρχου τετηρημένων καὶ ἀναγεγραμμένων τῆς σελήνης παρόδων καὶ ἀπὸ τῶν ἡμῖν αὐτοῖς εἰλημμένων διὰ τοῦ πρὸς τὰ τοιαῦτα ἡμῖν κατασκευασθέντος ὀργάνου,' [3] which mean, 'I have arrived at this knowledge and belief from the lunar periods observed and written down by Hipparchus and also from those taken by myself by means of the instrument constructed by me for that purpose.'

With regard to the motion of the five planets Ptolemy says, ' προκειμένου δ' ἡμῖν τοῦ καὶ ἐπὶ τῶν ε̄ πλανωμένων ἀστέρων ὥσπερ ἐφ' ἡλίου καὶ σελήνης τὰς φαινομένας αὐτῶν ἀνωμαλίας πάσας ἀποδεῖξαι δι' ὁμαλῶν καὶ ἐγκυκλίων κινήσεων ἀποτελουμένας, τούτων μὲν οἰκείων ὄντων τῇ φύσει τῶν θείων, ἀταξίας δὲ καὶ ἀνομοιότητος ἀλλοτρίων, μέγα μὲν ἡγεῖσθαι προσήκει τὸ κατὰ τὴν τοιαύτην πρόθεσιν κατόρθωμα καὶ τέλος ὡς ἀληθῶς τῆς ἐν φιλοσοφίᾳ μαθηματικῆς θεωρίας, δύσκολον δὲ διὰ πολλὰ καὶ εἰκότως ὑπὸ μηδενός πω πρότερον κατωρθωμένον,' [4] which mean, 'Our present task is to prove all the apparent inequalities of all the five planets, as in the case of the sun and moon, which are completed by means of uniform and circular motions, these being in keeping with the nature of the divine, whereas disorder and irregularity are different. It is right to consider of great importance success in such an undertaking and to consider it the real end of the philosophical mathematical investigation, but difficult because of many reasons and rightly so, since it has been systematized by nobody ever before.'

Ptolemy continues, ' ὅθεν καὶ τὸν Ἵππαρχον ἡγοῦμαι φιλαληθέστατον γενόμενον διά τε ταῦτα πάντα καὶ μάλιστα διὰ τὸ μήπω τοσαύτας ἄνωθεν ἀφορμὰς ἀκριβῶν τηρήσεων εἰληφέναι, ὅσας αὐτὸς ἡμῖν παρέσχεν, τὰς μὲν τοῦ ἡλίου καὶ τῆς σελήνης ὑποθέσεις καὶ ζητῆσαι καὶ, ὡς ἐνῆν γε, ἀποδεῖξαι πάσῃ μηχανῇ δι' ὁμαλῶν καὶ ἐγκυκλίων κινήσεων ἀποτελουμένας, ταῖς δὲ τῶν ε̄ πλανωμένων διά γε τῶν εἰς ἡμᾶς ἐληλυθότων ὑπομνημάτων μηδὲ τὴν ἀρχὴν ἐπιβάλλειν, μόνον δὲ τὰς τηρήσεις αὐτῶν ἐπὶ τὸ χρησιμώτερον συντάξαι καὶ δεῖξαι δι' αὐτῶν ἀνομόλογα τὰ φαινόμενα ταῖς τῶν τότε μαθηματικῶν ὑποθέσεσιν. οὐ γὰρ μόνον ᾤετο δεῖν, ὡς ἔοικεν, ἀποφήνασθαι, διότι διπλῆν ἕκαστος αὐτῶν ποιεῖται τὴν ἀνωμαλίαν, ἢ ὅτι καθ' ἕκαστον ἄνισοι καὶ τηλικαῦται γίνονται προηγήσεις, τῶν γε ἄλλων μαθηματικῶν ὡς περὶ μιᾶς καὶ τῆς αὐτῆς ἀνωμαλίας τε καὶ προηγήσεως τὰς διὰ τῶν γραμμῶν ἀποδείξεις ποιησαμένων, οὐδ' ὅτι ταύτας ἤτοι δι' ἐκκέντρων κύκλων ἢ δι' ὁμοκέντρων μὲν τῷ ζῳδιακῷ, ἐπικύκλους δὲ περιφερόντων, ἢ καὶ νὴ Δία κατὰ τὸ συναμφότερον ἀποτελεῖσθαι συμβέβηκεν τῆς μὲν ζῳδιακῆς ἀνωμαλίας οὔσης τηλικαύτης, τῆς δὲ πρὸς τὸν ἥλιον τοσαύτης· τούτοις γὰρ ἐπιβεβλήκασι μὲν σχεδόν, ὅσοι διὰ τῆς καλουμένης αἰωνίου κανονοποιίας τὴν ὁμαλὴν καὶ ἐγκύκλιον κίνησιν ἠθέλησαν ἐνδείξασθαι, διεψευσμένως δ' ἅμα καὶ ἀναποδείκτως, οἱ μὲν μηδ' ὅλως, οἱ δ' ἐπὶ ποσὸν

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[1] See Vol. I, pp. 338-339.
[3] See Vol. I, p. 351.
[2] See Vol. I, pp. 350-351.
[4] See Vol. II, p. 208.

ἀκολουθήσαντες τῷ προκειμένῳ· ἐλογίσατο δέ, ὅτι τῷ μέχρι τοσαύτης ἀκριβαίας
τε καὶ φιλαληθείας προελθόντι δι᾽ ὅλων τῶν μαθημάτον οὐκ ἀπαρκέσει μέχρι
τῶν τοσούτων στῆναι, καθάπερ τοῖς ἄλλους οὐ διήνεγκεν, ἀλλ᾽ ἀναγκαῖον ἂν εἴη
τῷ μέλλοντι πείσειν ἑαυτόν τε καὶ τοὺς ἐντευξομένους ἑκατέρας τε τῶν ἀνωμα-
λιῶν τὴν πηλικότητα καὶ τὰς περιόδους διὰ φαινομένων ἐναργῶν καὶ ὁμολογου-
μένων ἀποδεῖξαι καὶ μίξαντι πάλιν ἀμφοτέρας τήν τε θέσιν καὶ τὴν τάξιν τῶν
κύκλων, δι᾽ ὧν αὗται γίνονται, καὶ τὸν τρόπον τῆς κινήσεως αὐτῶν ἀνευρεῖν
σχεδόν τε πάντα λοιπὸν ἐφαρμόσαι τὰ φαινόμενα τῇ τῆς ὑποθέσεως τῶν κύκλων
ἰδιοτροπίᾳ· τοῦτο δ᾽ οἶμαι καὶ αὐτῷ δύσκολον κατεφαίνετο,᾽ [1] which mean,
'Hence I consider that Hipparchus also showed himself a very great
lover of truth in all these matters, particularly in having investigated
the hypotheses of the sun and moon without having inherited so many
resources for accurate observations from his predecessors, as he himself
handed down to us, and as far as was possible in having proved that they
were based on uniform and circular motions, in all their mechanism; but
he did not attempt to deal with the hypotheses of the five planets, at any
rate, as far as we can tell from the memoranda come down to us. He
arranged the observations of them so that they will be more useful and
showed by means of them that the phenomena disagreed with the hypotheses
of the mathematicians of that time. For as it seems, he not only thought
it necessary for it to be proved that each of the planets has a double inequality
or that each has unequal retrogradations, each of such and such a value,
whereas the other mathematicians made their proofs by means of construc-
tions on the assumption of one and the same inequality and retrogradation;
or even that these (inequalities) were based on either excentric circles or
circles concentric with the zodiac carrying epicycles or as well, by Zeus,
on both, the zodiacal inequality being of this extent and the inequality
with regard to the sun being of that extent; for they have more or less given
their attention to these matters—those, who wished to prove by means of
so-called permanent tables, the uniform and circular motions, but at the
same time mistakenly and without sufficient proof, some of them failing
completely while others following the problem in hand to a certain extent;
but Hipparchus argued that it will not be sufficient for someone proceeding
to this point of accuracy and truth by means of all the mathematical sciences
to stop at such a point, where he did not differ from the others, but that
it would be necessary for someone intending to convince himself and his
future readers, to prove the value of each of the inequalities and their
periods by means of clear and accepted phenomena and by mixing both
again the position and the order of the circles, by means of which the
motions take place, and to discover the method of their motion and more
or less to fit the phenomena to the special nature of the hypothesis of the
circles. This I think seemed difficult even to him.'

Conclusions from the Above Quotations

The following conclusions are drawn from the above quotations:—

1. Hipparchus derived geometrically the value of the eccentricity of
the solar circle and the position of its apogee. These agree with the results
of Ptolemy.

2. Hipparchus found the different lunar periods based on the observa-
tions of the Chaldeans and his own.

It must be noted here that Kügler in his Babylonische Mondrechnung
has shown that these lunar periods agree with those calculated from the

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[1] See Vol. II, pp. 210-211.

cuniform tablets of the Babylonians and he rightly attributes the credit of invention to the Babylonians, from whom Hipparchus may have borrowed.

3. Ptolemy supplied corrections for the moon's motions in anomaly and latitude, as established by Hipparchus.

4. Hipparchus determined geometrically the maximum value of the moon's first inequality. Ptolemy's value differs from his.

5. Hipparchus could not establish geometrically any theory about the motion of the five planets. But he realized that his predecessors were mistaken in thinking that a planet had only one inequality, viz., the annual irregularity, which takes place when the planet is nearly in opposition to the sun. He pointed out that the planet had another inequality, due to its passage round the zodiac and the values of each inequality and the arc of retrogradation could be geometrically determined by the excentric method or by the epicyclic method or perhaps by a combination of the two. He made a very valuable contribution by systematizing all the planetary observations recorded by him as well as by his predecessors.

6. Ptolemy discovered the second inequality of the moon now known as evection and by combining the excentric and the epicyclic methods, he geometrically determined the moon's motion.

7. Again combining both methods, Ptolemy derived a theory of planetary motion and calculated the values of inequalities and retrogradations of the planets.

It must be noted here that Ptolemy does not make any statement regarding what Hipparchus directly owed to Apollonius of Perga, who was also a great mathematician and astronomer.

Careful examination of the Mathematical Syntaxis of Ptolemy reveals that he maintains an attitude of respect and admiration towards Hipparchus, whom he repeatedly calls ' φιλαλήθης ' or 'lover of truth '. There is no reason to believe that he has claimed the achievements of Hipparchus as his own thus depriving the latter of his well-deserved credit in the field of astronomy. At the same time, however, it gives absolutely no grounds for supposing that Ptolemy himself was not the originator of the theory of the moon's second inequality and of the planetary law, though they were based on all the observations collected by Hipparchus in addition to his own. The fact that Tannery does not do full justice to Ptolemy, may have its explanation in his wish to establish the position of Apollonius of Perga as the true founder of Greek thought on Astronomy, thereby assigning a greater antiquity to the Greek planetary system. The whole trend of Tannery's argument is oriented on these lines without sufficient evidence. In this connection it is worth noting Halma's comment, ' Ptolémée le reçut, cet héritage, et fit pour l'astronomie ce qu'Euclide avait fait pour la géométrie.'[1]

This disposes of the main position of the epicyclic and excentric methods in Greek astronomy. The question now arises whether the Hindu planetary system as represented by these methods, were borrowed from the Greeks.

Pauliśa Siddhānta

The earliest Hindu works, in which it has hitherto been the fashion of orientalists to suspect Greek influence, are the Pauliśa Siddhānta and the Romaka Siddhānta [2], both of which were composed between the first and

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[1] See M.S. translated by Halma, Preface, p. 14.

[2] Both these names are foreign. Pauliśa may be identified with the Greek name Paulaus. Romaka is identical with Rome. The authors of these works are not known. They gave foreign names to their works, probably because they borrowed

fifth centuries of this era. The original books are lost, but summaries of these are given by Varāhamihira in his P.S. It is not certain whether Varāha obtained them in their original forms nor even whether he introduced any change in the systems while summarizing them. Their contents, however, have to be judged from what is given in the P.S. The length of the sidereal year according to the Pa.S. is $365^d 6^h 12^m$. The sun's apogee is perhaps 80° as suggested by Thibaut and its equations of the centre for the mean anomalies of 10°, 40°, 70°, 100°, 130° and 160°, are respectively 21′, 96′, 139′, 140′, 108′ and 50′. Hence the circumference of the sun's epicycle is 15° 8′ as calculated by Sen Gupta.[1] No general rule to find the true longitude of the sun is given. The moon's true longitude is not calculated by the epicyclic method but by a numerical method. Tables of elongations of the five planets are given, but no attempt is made to find their true longitudes by means of epicyclic or excentric methods. From these tables Sen Gupta has calculated the circumferences of the second epicycles of these planets.[2]

Romaka Siddhānta

According to the R.S., the length of the year is 365^d, 14′ 48″, expressed in sexagesimal fractions, agreeing with that determined by Hipparchus. The length of the synodic month is 29·5305816 days or $29^d 31^I 50^{II} 5^{III} 37^{IV}$ expressed in sexagesimal fractions and that of the anomalistic month is $27^d 13^h 18′ 32·7″$. The longitude of the sun's apogee is 75° and its equations of the centre for mean anomalies of 15°, 30°, 45°, 60°, 75° and 90° are 34′ 42″, 68′ 37″, 98′ 39″, 122′ 49″, 137′ 5″ and 143′ 23″, which nearly agree with those given by Ptolemy (see M.S., Vol. I, p. 253). No general method to calculate the true longitude of the sun is given. The moon's equations of the centre for mean anomalies of 15°, 30°, 45°, 60°, 75°, and 90° are respectively 1° 14′, 2° 25′, 3° 27′, 4° 15′, 4° 44′ and 4° 56′, which, it should be noted, do not closely agree with those of Ptolemy (see M.S., Vol. I, p. 337). In the case of the moon also no general method is given to calculate its true longitude. There is no mention of the planetary motion.

Sūryasiddhānta in Pañcasiddhāntikā

The S.S. as depicted by Varāhamihira in the P.S. gives a complete epicyclic theory for the sun, moon and the five planets. One S.S. undoubtedly existed before Āryabhaṭa, but the question is whether it existed in the same form as that given in the P.S. by Varāha. In point of fact it could not have so existed, because all the astronomical elements in the S.S. of the P.S. agree [3] with those given in the K.K. of Brahmagupta based on a lost work of Āryabhaṭa,[4] who by Brahmagupta and Varāha is acknowledged to be the founder of that system. Thus it appears that Varāha recast the older

some of the Greek astronomical constants as the following account will show. Henceforth the Pauliśa Siddhānta and the Romaka Siddhānta will be referred to as Pa.S. and R.S.

[1] See J.D.L., Vol. XVIII, 'Āryabhaṭa, etc.', p. 20.
[2] See J.D.L., Vol. XVIII, 'Āryabhaṭa, etc.', pp. 23–25.
[3] See the following tables.
[4] This work of Āryabhaṭa is lost, but it is mentioned both by Varāha in his P.S., XV. 20 and by Brahmagupta in his B.S.S., XI. 5 and 13 and in K.K. (B.M.J.'s ed.), I, 1-2. Thus Āryabhaṭa was the originator of two systems of astronomy—one, as found in his extant work Ā.B., and the other as found in Brahmagupta's K.K. and Varāha's S.S. in the P.S.

form of the S.S. by introducing into it a complete epicyclic method following Āryabhaṭa and also using his astronomical constants.[1]

The above statements show that out of the three astronomical treatises, which can come under the category of scientific works, only two, viz. the Pa.S. and the R.S., existed before Āryabhaṭa and perhaps in their present forms, but the third, viz. the S.S., was remodelled by Varāha with Āryabhaṭa's constants.

It follows, therefore, that the earliest extant work on Hindu astronomy dealing comprehensively with the planetary motion is the Āryabhaṭīya by Āryabhaṭa.[2]   How much he is indebted to the Greeks for his theories will be judged by comparing his work with the Pa.S., R.S. and Ptolemy's M.S.

To facilitate this comparison, the following tables are added.   They give the astronomical elements in the M.S., R.S., Pa.S., Ā.B., Ś.V., K.K., S.S. in the P.S., B.S.S. and the modern S.S.

Conclusions drawn from an Examination of the Tables

A study of the tables (see following pages) shows the following:—

1.   The tropical year used by Hipparchus and then by Ptolemy is also used by the author of the R.S.   Though the discovery of this year is attributed to Hipparchus, this point is not yet definitely settled.   Moreover, even if the final discovery of the precession of equinoxes in Greece is attributed to Hipparchus, it must be remembered that he made use of the observations of the Chaldeans over a long period for this purpose.

2.   There is agreement to a certain extent among the lunar periods used by Ptolemy, Āryabhaṭa and the authors of the R.S. and the Pa.S., but the credit of the discovery of these periods does not belong to the Greek astronomers, but to the Babylonians, as has been so efficiently proved by Kügler in his Babylonische Mondrechnung.

3.   As regards the sidereal periods of the planets, Ptolemy's and Āryabhaṭa's elements do differ.[3]   Here again it must be remembered that the Babylonians discovered the periods of the planets in much earlier times.

4.   The circumference of the sun's epicycle used by Āryabhaṭa is different from that used either in the R.S. or Pa.S. or by Ptolemy.   All the four are more or less in agreement in the case of the moon's epicycle.

5.   With regard to the dimensions of the first and second epicycles of the planets, it is noticed that Āryabhaṭa could not possibly have borrowed the measurements calculated by Ptolemy.   His values are not only different, but they vary in odd and even quadrants, whereas Ptolemy's values are constant.

6.   Again the positions of the apses of the sun, Mercury, Jupiter and Venus as given by Āryabhaṭa, could not be deduced from those given by Ptolemy even after making an allowance for a movement of 1° in 100 years.[4]

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[1] Thibaut and others hold the opinion that the S.S. as given in the P.S. is anterior to Āryabhaṭīya.   Because of the discovery of Mahābhāskarīya, this view is no longer tenable.   See S.G.T., Intro., pp. xiii–xviii; B.C.M.S., vol. XXII, 'Āryabhaṭa's Lost Work.'

[2] That it was Āryabhaṭa, who developed the Hindu epicyclic theory is corroborated by Brahmagupta, when he says that the Romaka Siddhānta and the Vaśiṣṭha Siddhānta were rewritten by Śrīṣeṇa and Viṣṇucandra respectively, who borrowed the longitudes of the apogees and the nodes, the circumferences of the epicycles and the methods of finding the true longitude of a planet from Āryabhaṭa; see B.S.S., XI, 48–50.

[3] The R.S. does not deal with planets at all.

[4] The rate of precession according to Ptolemy is 1° in 100 years.

TABLE A

Sidereal Periods

	M.S.	R.S.	Pa.S.	Ā.B.	K.K.	S.S. in P.S.	Ś.V.	B.S.S.	Modern S.S.
Sun ..	365·246 (I, p. 208)	365·246 (P.S., I. 15)	365·2583 (P.S., III. 1)	365·2568005	365·2587000 (B.M.J.'s ed., I. 6)	365·25875 (I. 14)	365·25868005	365·25843750	365·25875648
Moon ..	27·32167588 (I, p. 271)	27·32160105 (P.S., I. 15)	27·321687 *	27·32166852	27·321673678 (I. 10)	27·321673678 (I. 14)	27·32166852	27·3216733	27·3216416
Mars ..	686·94462 (II, p. 218)	....	....	686·99974	686·99987 (II. 3)	686·99987 (XVI. 2, 4, 6)	686·99974	686·99793	686·9949
Mercury ..	87·96935 (II, p. 216)	....	....	87·96988	87·96999 (II. 4)	87·96999 (XVI. 7, 9)	87·96988	87·96992	87·969702
Jupiter ..	4330·96064 (II, p. 218)	....	....	4332·27216	4332·32058 (II. 5)	4332·32058 (XVI. 2, 4, 6)	4332·27216	4332·24009	4332·32065
Venus ..	224·69890 (II, p. 216)	....	....	224·69814	224·698180 (II. 6)	224·698180 (XVI. 8, 9)	224·69814	224·69794	224·69857
Saturn ..	10749·94640 (II, p. 218)	....	....	10765·92819	10766·06670 (II. 7)	10766·06670 (XVI. 3, 4, 6)	10765·92819	10765·81524	10765·77307
Moon's Apogee ..	3231·61655 (I, pp. 278-79)	....	....	3231·98708	3231·987694 (I, 11)	3231·987694 (IX. 3, 4)	3231·98708	3232·73500	3232·09367
Moon's Node ..	6796·45587 (I, pp. 278-79)	....	....	6794·74951 (Daśagītikā, 1-2).	6794·75080 (II. 1)	6794·75080 (IX. 5)	6794·74951 (I. 3-8)	6792·25396 (I. 15-23)	6794·39983 (I. 29-33)

* Calculated from the data derived by Sen Gupta from P.S., I. 11–13 and III. 1 (see J.D.L., XVIII, p. 19).

TABLE B
Lengths of Months

	M.S.	R.S.	Pa.S.	Ā.B.	Ś.V.	K.K.	S.S. in P.S.	B.S.S.	Modern S.S.
Anomalistic	27·555063 (I, p. 279)	27·554 (P.S., VIII. 5)	....	27·554602	27·554602	27·554607 (B.M.J.'s ed., I. 10-11)	27·554607 (IX. 2-4)	27·554455	27·554600
Synodic	29·530594 (I, p. 271)	29·5305816 (P.S., I. 15)	29·530558 *	29·530582 (Daśagītikā, 1-2)	29·530582 (I. 3-8)	29·530587 (I. 3-5)	29·530587 (I. 14)	29·530582 (I. 15-23)	29·530587 (I. 29-33)

* This is calculated by Sen Gupta from P.S., I. 11-13 and III. 1 (see J.D.L., Vol. XVIII, 'Āryabhaṭa', etc., p. 20).

TABLE C
Positions of Apses

	M.S.	R.S.	Pa.S.	Ā.B.	Ś.V.	K.K.	S.S. in P.S.	B.S.S.	Modern S.S.
Sun	65° 30' (I, p. 237)	75° (P.S., VIII. 2)	80° (P.S., III. 2-3)	78°	78° (II. 9)	80° (B.M.J.'s ed., I. 11)	80° (IX. 7)	77°	77° 14'
Mars	115° 30'	....	....	118°	118°	110°	110°	127°	130° 0'
Mercury	190°	....	....	210°	210°	220°	220°	227°	220° 36'
Jupiter	160° 59'	....	....	180°	180°	160°	160°	170°	171° 16'
Venus	55°	....	....	90°	90°	80°	80°	90°	79° 49'
Saturn	233° (Tables, II, pp. 436-45)	....	....	236° (Daśagītikā, 7)	236° (II. 28)	240° (B.M.J.'s ed., II. 9)	240° (XVII. 1-3)	252° (I. 19-20)	236° 37' (I. 41-42)

TABLE D

Dimensions of the First Epicycles

	M.S.	R.S.	Pa.S.	A.B.	Ś.V.	K.K.	S.S. in P.S.	B.S.S.	Modern S.S.
Sun	15° (I, p. 236)	15° (P.S., VIII. 3)	15° 8' *	13° 30'	13° 30'	14° (B.M.J.'s ed., I. 14)	14° (IX. 8)	13° 40'	odd even 13° 40'—14°
Moon	31½° (I, p. 322)	31° (P.S., VIII. 6)	....	31° 30'	31° 30' (II. 14)	31° (I. 15)	31° (IX. 8)	31° 36" (II. 20-21)	31° 40'—32°
Mars	72° (II, p. 340)	....	....	odd even 63°—81°	odd even 63°—81°	70°	70°	70°	72°—75°
Mercury	....	....	....	31¼°—22½°	31¼°—22½°	28°	28°	38°	28°—30°
Jupiter	33° (II, p. 375)	....	....	31¾°—36°	31¾°—36°	32°	32°	33°	32°—33°
Venus	15° (II, p. 306)	....	....	18°—9°	18°—9°	14°	14°	odd even 9°—11°	11°—12°
Saturn	41° (II, p. 419)	....	....	40¾°—58¾° (II, 28-29)	40¾°—58¾° (Daśagītikā, 8-9)	60° (II. 11-12)	60° (XVII. 1-3)	30° (II. 34-39)	48°—49° (II. 34-35)

* This is calculated by Sen Gupta from P.S., III. 2-3 (see J.D.L., Vol. XVIII, 'Āryabhaṭa, etc.', p. 20).

TABLE E

Dimensions of the Second Epicycles

	M.S.	R.S.	Pa.S.	A.B.	Ś.V.	K.K.	S.S. in P.S.	B.S.S.	Modern S.S.
Mars	237° (II, p. 351)	....	249° 15'*	odd even 238½°—229½°	odd even 238½°—229½°	234° (B.M.J.'s ed., II. 13-14)	234°	See previous p. 68	odd even 232°—235°
Mercury	135° (II, p. 279)	....	139° 20'*	139½°—130½°	139½°—130½°	132° (II. 17-18)	132°	132°	132°—133°
Jupiter	69° (II, p. 386)	....	76° 18'*	72°—67½°	72°—67½°	72° (II. 19-20)	72°	68°	72°—70°
Venus	259° (II, p. 306)	....	265° 45'*	265½°—256½°	265½°—256½°	260° (II. 21-22)	260°	odd even 263°—258°	260°—262°
Saturn	39° (II, p. 419)	....	36° 51'*	40½°—36° (Daśagītikā, 8-9)	40½°—36° (II. 28-29)	40° (II. 23-24)	40° (XVII. 1-3)	35° (II. 34-39)	40°—39° (II. 36-37)

* These are calculated by Sen Gupta from P.S., XVIII (see J.D.L., Vol. XVIII, 'Āryabhaṭa, etc.', pp. 23-25).

7. It must also be noted that the position of the apsis of the sun as given in the Pa.S. and R.S. agrees more with that used by Āryabhaṭa than that of Ptolemy, whose result agrees with that of Hipparchus.

This shows that as far as the elements of the Hindu epicyclic theory are concerned, Āryabhaṭa does not appear to have borrowed them or deduced them from the Greek elements as given in the M.S. of Ptolemy. Assuming that the theoretical conception was borrowed by him from the Greeks, there is nothing to show that he himself was not the discoverer of the elements. In fact the evidence available is in favour of his claims.

Firstly, Āryabhaṭa was an observer. This fact is completely over-looked by those scholars, who say that Hindu astronomers were not observers. In his work Āryabhaṭa says,

Kṣitiraviyogāddinakṛd ravīnduyogāt prasādhitaścenduḥ ǀ
Śaśitārāgrahayogāttathaiva tārāgrahāḥ sarve ǁ [1]

or, 'In this work the sun's motion is determined from the conjunction of the earth and the sun, and that of the moon is determined from the conjunction of the sun and moon. The motion of all the five planets is determined from the conjunction of each with the moon.'[2]

Moreover, as Āryabhaṭa himself acknowledges, he made use of some more ancient records of observations. Āryabhaṭa states,

Sadasajjñānasamudrāt samuddhataṁ devatāprasādena ǀ
Sajjñānottamaratnaṁ mayā nimagnaṁ svamatināvā ǁ

Or, 'By God's grace I have raised the best jewel of true knowledge, sunk in the ocean of knowledge, true and false, by using the best of my intelligence.'[3]

This clearly is a reference to some astronomical treatises, now lost, containing important and unimportant observations and probably theories, which were made full use of by Āryabhaṭa.[4] Those scholars, who cannot find any trace of a record of observations in the Hindu astronomy, have ignored this statement of Āryabhaṭa.

In this connection another statement of Āryabhaṭa must not be dis-regarded. At the end of his work he says,

Āryabhaṭīyaṁ nāmnā pūrvaṁ svāyambhuvaṁ sadā sadyat ǀ

Or, 'This science, which was before known as the Svāyambhuva or science revealed by Brahman and was always true, is now described in the book called Āryabhaṭīya.[5]

It seems as if it would be too cautious to doubt that this is an acknow-ledgement of his indebtedness to some ancient Hindu observations.

Again Varāha refers to some planetary observations in his P.S. In a chapter on planets he comments

Pradyumnabhūmitanaye
Jīve saure'tha vijayanandikṛte ǀ
Budhe ca bhagnotsāhaḥ
Prasphuṭamidaṁ karaṇaṁ bhajatāt ǁ

Or, 'Let him enjoy this more correct treatise of mine, who is not satisfied with the theory of Mars as propounded by Pradyumna or theories of Mercury, Jupiter and Saturn as propounded by Vijayanandin.'[6]

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[1] See Ā.B., Golapāda, 48.
[2] The mathematical theory contained in this verse has been explained by Sen Gupta in the B.C.M.S., Vol. XII, No. 3.
[3] See Ā.B., Golapāda, 49.
[4] This has been pointed out by Sen Gupta as well. See J.D.L., Vol. XVIII, p. 6.
[5] See Ā.B., Golapāda, 50. ab.   [6] See P.S., XVIII, 62.

This statement clearly shows that some kind of planetary theories were propounded by Hindu astronomers before Āryabhaṭa. This same chapter of the P.S. contains tables of elongations of the planets with regard to the sun.

In face of all this evidence it is impossible to think, in the first place, that the ancient Hindu astronomers made no observations and, in the second place, that there were no records of such observations before the time of Āryabhaṭa. It was not, therefore, necessary for Āryabhaṭa to look to Greece for his astronomical elements.

It is interesting to note here what Bhāskarācarya remarks in the beginning of his chapter on the Chedyaka or geometrical interpretation of the planetary motion. He says,

Divyaṁ jñanamatīndriyaṁ yadṛṣibhirbrāhmaṁ vasiṣṭhādibhiḥ ǀ
Pārampāryavaśādrahasyamavaniṁ nītaṁ prakāśyaṁ tataḥ ǁ

Or, 'This knowledge is divine having originated from Brahman, the Creator. It was beyond the power of human understanding till this great secret was revealed to the peoples by the sages Vaśiṣṭha and his followers'.[1]

There is nothing to be surprised at if here Brahman is considered as the originator of the science of astronomy. He is connected with astronomy, because he is regarded as the Creator of the universe. But what is noteworthy is the reference to the ancient Hindu astronomers as observers of the planetary motion.

One favourite argument of the supporters of the theory that Hindu astronomy is an offshoot of Greek astronomy, is that the former uses so many Greek terms. The only two Greek terms, which have been frequently used by Āryabhaṭa and other Hindu astronomers are Kendra or κέντρον or centre of a circle and Liptā or λεπτόν or 1 minute or sixtieth part of a degree. Kendra in the Hindu astronomy is not only used for the centre of a circle but also for the anomaly of a planet. No other Sanskrit word appears to have been used for 'anomaly', though the Sanskrit word Madhya stands for centre. This has given to many scholars an opportunity for saying that since 'anomaly', the central idea of the epicyclic theory of the planetary motion, is expressed by a Greek term in Hindu astronomy, so the Hindu astronomers must have borrowed the theory from the Greeks. There is no validity in such an argument. Firstly, because κέντρον was never used for anomaly by the Greek astronomers and secondly, as appears from Bhāskara's statement, Kendra originally meant 'centre of a circle' in the Hindu astronomy and it came to mean 'anomaly' later on. Bhāskara says,

Vṛttasya madhyaṁ kila kendramuktaṁ
Kendraṁ grahoccāntaramucyate'taḥ ǀ
Yato'ntare tāvati tuṅgadeśāt
Nīcoccavṛttasya sadaiva kendram ǁ

Or, 'Kendra means the centre of a circle. Since the centre of the epicycle of a planet is always at a distance of the planet from its apogee, so the distance between the planet and its apogee is called Kendra.'[2]

As regards the word Liptā from λεπτόν for a minute, it must be pointed out that there is a pure Sanskrit word used frequently by the Hindus. It is kalā.[3]

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[1] See S.Śi., Golādhyāya, V. 9.   [2] See S.Śi., Golādhyāya, V. 41.
[3] The division of a circle into signs, degrees, minutes and seconds, is Babylonian in origin.

It must be pointed out here that the late Hindu mathematical works contain the words Koṇa from γωνια meaning angle and Trikoṇa from τριγωνον meaning triangle, but the more ancient works like the Śulva-sūtras use the Vedic Sanskrit word Prauga for a triangle. It is works on *Hindu astrology* and *not* on *astronomy*, which use many Greek words.

Again the verse, so often quoted by the Western scholars, in support of the theory of Greek origin, is in praise of Greek astrologers and not Greek astronomers. Varāhamihira in his Vṛhatsaṁhitā, a work on astrology, while praising an astrologer, gives the following quotation of Garga, a Hindu astrologer:—

Mlecchāḥ hi yavanāsteṣu samyak śāstramidaṁ sthitaṁ ।
Ṛṣivatte'pi pūjyante kiṁ punardaivaviddvijaḥ ॥

Or, 'The Greeks are Mlecchas. This science of astrology is well established among them. So even they are honoured as sages. Then how much more an astrologer, who is a Brahmin, should be honoured.'[1]

Varāha in his P.S. sometimes refers to the Greek astronomers, but nowhere states that the Hindu astronomers borrowed anything from them. Brahmagupta, while enumerating the Siddhāntas or astronomical works known to him, refers in a general manner to a certain Yavanasiddhānta.[2] This word may mean an astronomical treatise composed in Sanskrit by a certain Yavana or Greek or the astronomical works of the Greeks. There is certainly no hint at the superiority of the Greek astronomers or even at the indebtedness of the Hindu astronomers to the Greeks. Bhaṭṭotpala, in his commentary on the Vṛhatsaṁhitā, quotes frequently a certain Yavaneśvara,[3] who appears to have composed a work on astrology in Sanskrit. These various references to Greek works only show that the Hindu astronomers of the ancient days were acquainted with some of the Greek systems of astronomy and it does not necessarily follow that the Hindu system originated from the Greek system unless identity in the elements of the two astronomical systems is established.

Final conclusions

The above analysis leads to the following conclusions:—

1.   There is at present no textual evidence to support the view that the excentric and epicyclic methods to detect the planetary motion originated in Greece. The Greek astronomical works, however, are the earliest extant works on astronomy, which make use of these methods to formulate the planetary law.

2.   Valuable records of the Babylonian observations found their way to Greece.

3.   Hipparchus, as far as it is known at present, made profitable use of these observations, with the help of which, in addition to his own, he calculated the inequality of the sun and the first inequality of the moon by using the excentric and epicyclic methods. He also remarked that a planet has a double inequality.

4.   Ptolemy discovered the second inequality of the moon. Again by combining the epicyclic and excentric methods, he established the planetary theory.

5.   Hindu astronomers were not unacquainted with Greek astronomy or astrology. As has been pointed out above, the names of the two Hindu

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[1] See Vṛhatsaṁhitā, II. 14.
[2] See B.S.S., XXIV, 3.
[3] The literal meaning is 'King of the Yavanas'.

astronomical works, Romaka Siddhānta and Pauliśa Siddhānta are foreign and some of the astronomical elements used here are the same as those used by Hipparchus. Greek astronomy came to India perhaps some time after the first century of this era, as works like the Vedānga Jyotiṣa, Sūrya-prajñapti and Paitāmaha Siddhānta as depicted in the P.S. are completely unaffected by the Greek astronomy.[1] Perhaps Babylonian astronomy came to India directly.

6. Whilst the possibility that the idea of the excentric and epicyclic theory came to India from Greece cannot be ruled out, it must be emphatically noted that there is no textual evidence to support this view except for the facts that the extant Greek astronomical works containing these theories are earlier than the extant Hindu works and the elementary principles of these theories are the same both in the Greek and Hindu works. As far as the available evidence goes Āryabhaṭa was the first Hindu astronomer to make use of this possibly imported idea of the epicyclic theory, in any event correlating original data of his predecessors and his own for the independent determination of the motions of the sun, moon and five planets by the epicyclic and excentric methods. It has been made clear that his astronomical elements could neither be borrowed nor deduced from the Greek elements. His epicyclic and excentric methods are unaffected by Ptolemaic ideas. These facts cannot be over-emphasized. Here lies Āryabhaṭa's originality. Āryabhaṭa deserves the credit, of which he appears to be unjustly deprived by learned scholars like Whitney, Thibaut and by many others, who follow them blindly, being unacquainted with the Sanskrit texts of the Hindu astronomical and mathematical works.[2]

In spite of his great indebtedness to the Babylonians, Hipparchus is still honoured for his substantial contribution to the knowledge of astronomy; in spite of his indebtedness to Hipparchus, Ptolemy is eulogized for his achievements in the field of astronomy; yet, Āryabhaṭa, who at the most utilized a foreign hint—and again it must be pointed out that this conjecture rests on purely negative evidence—to develop an independent planetary system as depicted in the Hindu astronomical works, is given no credit for his originality and his valuable work is considered but ' an offshoot of Greek astronomy'. The scholarship on this subject at present ends with an unsatisfactory and possibly not convincing note of injustice to the Hindu contribution.

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[1] The dates of the first two works are not settled but they are surely pre-Christian. The Paitāmaha Siddhānta is of the first century of this era.

[2] For the opinions of the Western scholars with regard to the indebtedness of the Hindu Astronomy to the Greek Astronomy, see P.S. translated by Thibaut, Intro., pp. 49–55; Astronomie, Astrologie und Mathematik, pp. 43–50; S.S. translated by Burgess, pp. 380–386; *Hindu Astronomy*, pp. 39–41; *Journal Des Savants*, 1859, pp. 401–418; *Histoire de L'Astronomie Ancienne*, Vol. I, pp. 400–517.

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Brahmagupta   Khaṇḍakhādyaka, edited by Babua Misra, Calcutta, 1924; translated by P. C. Sen Gupta, Calcutta, 1934.

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ABBREVIATIONS

Ā.B.	=	Āryabhaṭīya (Āryabhaṭa).
B.M.J.'s ed.	=	Babua Misra Jyotishacarya's edition of the Khaṇḍakhādyaka.
B.S.S.	=	Brāhmasphuṭasiddhānta (Brahmagupta).
K.K.	=	Khaṇḍakhādyaka (Brahmagupta).
M.S.	=	Mathematical Syntaxis (Ptolemy).
Pa.S.	=	Pauliśa Siddhānta.
P.S.	=	Pañcasiddhāntikā (Varāhamihira).
R.S.	=	Romaka Siddhānta.
S.G.T.	=	Sen Gupta's Translation (of the K.K.)
S.S.	=	Sūryasiddhānta.
S.Śe.	=	Siddhāntaśekhara (Śrīpati).
S.Śi.	=	Siddhāntaśiromaṇi (Bhāskara).
Ś.V.	=	Śiṣyadhīvṛddhida (Lalla).

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CONTRIBUTIONS TO AFFINE DIFFERENTIAL GEOMETRY—I

By T. S. NANJUNDIAH

(Communicated by Prof. P. C. Mahalanobis)

§0. INTRODUCTION

Many properties relating to osculating conics and the aberrancy curve of a plane curve have been studied by S. Mukhopadhyaya in three papers published in the *J.A.S.B.*, New Series, Vol. IV, 1908. As is well known, the lines of aberrancy and the curve of aberrancy are nothing but the affine normals and the affine evolute of the given plane curve. It thus appears that the results obtained by Mukhopadhyaya can be interpreted in a natural and elegant manner by adopting the standpoint of affine differential geometry of plane curves. This is done in the present note. The adoption of the affine point of view has also made it possible to derive alternative methods of approach to some of the results, and to present others in a new light.

§1. THE OSCULATING CONICS

Let C be a given plane curve (free from turning points) defined by the equation

(1.1) .. .. $\mathbf{r} = \mathbf{r}(s)$,

s being the affine arc of C introduced by the requirement

(1.2) .. .. .. $(\mathbf{r}', \mathbf{r}'') = 1$.

The affine curvature of C at $\mathbf{r}$ is the affine invariant $k(s)$ of C defined by

(1.3) .. .. $\mathbf{r}''' + k\mathbf{r}' = 0$ or $k = (\mathbf{r}'', \mathbf{r}''')$,

$\mathbf{r}''$ being called the affine normal vector at $\mathbf{r}$.
We know that

(1.4) .. .. .. $k(s) = \text{const.}$

is the affine natural equation of any conic. Hence the osculating conic $\overline{C}$ of C at $\mathbf{r}$, say

(1.5) .. .. $\mathbf{R} = \mathbf{R}(\sigma)$

—σ being the affine arc of $\overline{C}$ measured from $\mathbf{r}$—is the solution of the differential equation

(1.6) .. .. .. $\mathbf{R}'''(\sigma) + k(s)\mathbf{R}'(\sigma) = 0$

subject to the conditions for osculation, namely,

(1.7) $\mathbf{R}(0) = \mathbf{r}, \ \mathbf{R}'(0) = \mathbf{r}', \ \mathbf{R}''(0) = \mathbf{r}'', \ \mathbf{R}'''(0) = \mathbf{r}''' ; \ \mathbf{R}^{(4)}(0) \neq \mathbf{r}^{(4)}$.

If $k = 0$, $\bar{C}$ is the parabola

$$(1.8) \quad \cdots \quad \cdots \quad \cdots \quad \mathbf{R} = \mathbf{r} + \sigma\mathbf{r}' + \frac{\sigma^2}{2!}\,\mathbf{r}'' :$$

if $k \neq 0$, this, however, satisfies the conditions for third order contact, namely,

$$(1.9) \quad \cdots \quad \mathbf{R}(0) = \mathbf{r}, \ \mathbf{R}'(0) = \mathbf{r}', \ \mathbf{R}''(0) = \mathbf{r}''; \ \mathbf{R}'''(0) \neq \mathbf{r}'''.$$

It is therefore the osculating parabola at $\mathbf{r}$.

If $k = \gamma^2 > 0$, $\bar{C}$ is the ellipse

$$(1.10) \quad \cdots \quad \cdots \quad \mathbf{R} = \mathbf{r} + \frac{\sin\gamma\sigma}{\gamma}\,\mathbf{r}' + \frac{1 - \cos\gamma\sigma}{\gamma^2}\,\mathbf{r}''.$$

If $k = -\gamma^2 < 0$, $\bar{C}$ is the hyperbola

$$(1.11) \quad \cdots \quad \cdots \quad \mathbf{R} = \mathbf{r} + \frac{sh\,\gamma\sigma}{\gamma}\,\mathbf{r}' + \frac{ch\,\gamma\sigma - 1}{\gamma^2}\,\mathbf{r}''.$$

The corresponding implicit equations are easily obtained by eliminating σ: thus, the osculating parabola is given by

$$(1.12) \quad \cdots \quad \cdots \quad (\mathbf{R} - \mathbf{r}, \ \mathbf{r}'')^2 + 2(\mathbf{R} - \mathbf{r}, \ \mathbf{r}') = 0,$$

and the osculating conic is given by

$$(1.13) \quad \cdots \quad (\mathbf{R} - \mathbf{r}, \ \mathbf{r}'')^2 + k(\mathbf{R} - \mathbf{r}, \ \mathbf{r}')^2 + 2(\mathbf{R} - \mathbf{r}, \ \mathbf{r}') = 0.$$

Also the differential equation of all parabolas is given by

$$(1.14) \quad\quad\quad\quad\quad\quad\quad k = 0,$$

and the differential equation of all conics is given by

$$(1.15) \quad\quad\quad\quad\quad\quad\quad k' = 0.$$

We shall now show how these results easily lead to the corresponding ones of Mukhopadhyaya.

Let C be given in terms of an arbitrary parameter t: thus

$$(1.16) \quad\quad\quad\quad\quad\quad\quad \mathbf{r} = \mathbf{r}(t).$$

Denoting derivatives w.r.t. t by dots, we have

$$(1.17) \quad \cdots \quad \cdots \quad \cdots \quad \frac{ds}{dt} = (\dot{\mathbf{r}}, \ \dot{\mathbf{r}})^{\frac{1}{2}}.$$

Writing

$$(1.18) \quad \cdots \quad \cdots \quad \tau = \frac{dt}{ds} \quad \text{and} \quad \Delta_{ij} =$$

we have

$$\mathbf{r}' = \tau\dot{\mathbf{r}},$$

$$\mathbf{r}'' = \tau^2\ddot{\mathbf{r}} + \dot{\tau}\mathbf{r}',$$

$$\mathbf{r}''' = \tau^3\dddot{\mathbf{r}} + (\dot{\tau^3})\ddot{\mathbf{r}} + \frac{1}{2}(\ddot{\tau^2})\mathbf{r}';$$

hence

$$(1.19) \quad \ldots \quad k = (\mathbf{r}'', \mathbf{r}''') = \tau^5(\ddot{\mathbf{r}}, \dddot{\mathbf{r}}) - \frac{1}{2}(\ddot{\tau^2}), \qquad k' = \tau k.$$

Simplifying, we have

$$\mathbf{r}' = \Delta_{12}^{-\frac{1}{3}}\dot{\mathbf{r}}, \quad \mathbf{r}'' = \Delta_{12}^{-\frac{2}{3}}\ddot{\mathbf{r}} - \frac{1}{3}\Delta_{12}^{-\frac{5}{3}}\Delta_{13}\dot{\mathbf{r}};$$

$$k = \Delta_{12}^{-\frac{5}{3}}\Delta_{23} - \frac{1}{2}\left(\Delta_{12}^{-\frac{2}{3}}\right)_{tt} = \Delta_{12}^{-\frac{5}{3}}\Delta_{23} + \frac{1}{3}\Delta_{12}^{-\frac{5}{3}}(\Delta_{14} + \Delta_{23}) - \frac{5}{9}\Delta_{12}^{-\frac{8}{3}}\Delta_{13}^2$$

$$= \frac{1}{3}\Delta_{12}^{-\frac{5}{3}}(\Delta_{14} + 4\Delta_{23}) - \frac{5}{9}\Delta_{12}^{-\frac{8}{3}}\Delta_{13}^2,$$

$$k' = \Delta_{12}^{-\frac{1}{3}}\dot{k} = \frac{1}{3}\Delta_{12}^{-2}(\Delta_{15} + 5\Delta_{24}) - \frac{5}{9}\Delta_{12}^{-3}\Delta_{13}(\Delta_{14} + 4\Delta_{23})$$

$$- \frac{10}{9}\Delta_{12}^{-3}\Delta_{13}(\Delta_{14} + \Delta_{23}) + \frac{40}{27}\Delta_{12}^{-4}\Delta_{13}^3$$

$$= \frac{1}{3}\Delta_{12}^{-2}(\Delta_{15} + 5\Delta_{24}) - \frac{5}{3}\Delta_{12}^{-3}\Delta_{13}(\Delta_{14} + 2\Delta_{23}) + \frac{40}{27}\Delta_{12}^{-4}\Delta_{13}^3.$$

Collecting these formulae together, we thus have

$$(1.20) \quad \ldots \quad \ldots \quad \ldots \quad \mathbf{r}' = \frac{\dot{\mathbf{r}}}{\Delta_{12}^{\frac{1}{3}}}, \quad \mathbf{r}'' = \frac{\mathbf{N}}{3\Delta_{12}^{\frac{5}{3}}}$$

and

$$(1.21) \quad \ldots \quad \ldots \quad \ldots \quad k = \frac{\Gamma}{9\Delta_{12}^{\frac{5}{3}}}, \quad k' = \frac{M}{27\Delta_{12}^4},$$

where we have introduced, for brevity, the vector

$$(1.20') \quad \ldots \quad \ldots \quad \ldots \quad \mathbf{N} = 3\Delta_{12}\ddot{\mathbf{r}} - \Delta_{13}\dot{\mathbf{r}}$$

and the expressions

$$(1.21') \quad \begin{cases} \Gamma = 3\Delta_{12}(\Delta_{14} + 4\Delta_{23}) - 5\Delta_{13}^2, \\ M = 9\Delta_{12}^2(\Delta_{15} + 5\Delta_{24}) - 45\Delta_{12}\Delta_{13}(\Delta_{14} + 2\Delta_{23}) + 40\Delta_{13}^3. \end{cases}$$

Substituting for $\mathbf{r}'$, $\mathbf{r}''$ and k, the equation (1.12) of the osculating parabola takes the general form,

$$(1.22) \quad \ldots \quad \ldots \quad (\mathbf{R} - \mathbf{r}, \mathbf{N})^2 + 18\Delta_{12}^3(\mathbf{R} - \mathbf{r}, \dot{\mathbf{r}}) = 0,$$

and the equation (1.13) of the osculating conic $\bar{C}$ takes the general form

$$(1.23) \quad \ldots \quad (\mathbf{R} - \mathbf{r}, \mathbf{N})^2 + \Gamma(\mathbf{R} - \mathbf{r}, \dot{\mathbf{r}})^2 + 18\Delta_{12}^3(\mathbf{R} - \mathbf{r}, \dot{\mathbf{r}}) = 0.$$

$\bar{C}$ is an ellipse, parabola or hyperbola according as

$$\Gamma \gtreqless 0.$$

The differential equation of all parabolas is now expressed in its general form

$$(1.24) \qquad \qquad \Gamma = 0,$$

while that of all conics is expressed in its general form

(1.25) $$M = 0.$$

We shall consider two special cases:

First, we take $t = x$ where $\mathbf{r} = \{x, y\}$. Denoting by y_1, y_2, y_3, y_4, y_5 the first five derivatives of y w.r.t. x, we have

$$\dot{\mathbf{r}} = \{1, y_1\}, \quad \ddot{\mathbf{r}} = \{0, y_2\}, \quad \dddot{\mathbf{r}} = \{0, y_3\} :$$

$$\Delta_{12} = y_2, \quad \Delta_{13} = y_3, \quad \Delta_{14} = y_4, \quad \Delta_{15} = y_5; \quad \Delta_{23} = 0, \quad \Delta_{24} = 0.$$

Hence the osculating parabola and the osculating conic at $\{x, y\}$ are respectively given by the equations

(1.26) $$\{y_3(Y-y)-(y_1y_3-3y_2^2)(X-x)\}^2 = 18y_2^3\{(Y-y)-y_1(X-x)\},$$

and

(1.27) $\quad$ .. $\quad$ .. $\quad \{y_3(Y-y)-(y_1y_3-3y_2^2)(X-x)\}^2$

$$+(3y_2y_4-5y_3^2)\{(Y-y)-y_1(X-x)\}^2 = 18y_2^3\{(Y-y)-y_1(X-x)\}.$$

Also the differential equation of all parabolas is given by

(1.28) $\quad$ .. $\quad$ .. $\quad$ .. $\quad 3y_2y_4-5y_3^2 = 0,$

and that of all conics is given by

(1.29) $\quad$ .. $\quad$ .. $\quad 9y_2^2y_5-45y_2y_3y_4+40y_3^3 = 0$

—the well-known Mongian equation.

Next let us take $t = \sigma$—the ordinary arc of C—and consider the $(\varkappa; \sigma)$ differential equation of all conics, $\varkappa$ being the ordinary curvature of C at $\mathbf{r}$.

We have, if $\mathbf{t}, \mathbf{n}$ be the unit tangent and unit normal vectors at $\mathbf{r}$,

$$(\mathbf{t}, \mathbf{n}) = 1,$$

$$\dot{\mathbf{t}} = \varkappa\mathbf{n}, \quad \dot{\mathbf{n}} = -\varkappa\mathbf{t}.$$

So we have

$$\dot{\mathbf{r}} = \mathbf{t}, \quad \ddot{\mathbf{r}} = \varkappa\mathbf{n}, \quad \dddot{\mathbf{r}} = -\varkappa^2\mathbf{t}+\dot{\varkappa}\mathbf{n} :$$

$$\Delta_{12} = \varkappa, \qquad \Delta_{23} = \varkappa^3 ;$$

$$\Delta_{13} = \dot{\varkappa}, \qquad \Delta_{24} = 3\varkappa^2\dot{\varkappa} ;$$

$$\Delta_{14}+\Delta_{23} = \ddot{\varkappa} ;$$

$$\Delta_{15}+2\Delta_{24} = \dddot{\varkappa}.$$

Hence we have

(1.30) $\quad$ .. $\quad$ .. $\quad 9\varkappa^3 \cdot k = 3\varkappa(\ddot{\varkappa}+3\varkappa^3)-5\dot{\varkappa}^2,$

and

(1.31) $\quad$ .. $\quad 27\varkappa^4 \cdot k' = 9\varkappa^2(\dddot{\varkappa}+9\varkappa^2\dot{\varkappa})-45\varkappa\dot{\varkappa}(\ddot{\varkappa}+\varkappa^3)+40\dot{\varkappa}^3.$

Thus the $(\varkappa;\ \sigma)$ differential equation of all parabolas is given by

$$(1.32) \qquad 3\varkappa\frac{d^2\varkappa}{d\sigma^2}-5\left(\frac{d\varkappa}{d\sigma}\right)^2+9\varkappa^4=0,$$

while that of all conics is given by

$$(1.33) \quad 9\varkappa^2\frac{d^3\varkappa}{d\sigma^3}-45\varkappa\frac{d\varkappa}{d\sigma}\frac{d^2\varkappa}{d\sigma^2}+40\left(\frac{d\varkappa}{d\sigma}\right)^3+36\varkappa^4\frac{d\varkappa}{d\sigma}=0.$$

The equation (1.33) has been given by Mukhopadhyaya in the $(\varrho;\ \sigma)$ form, ϱ being the radius of curvature of C at $\mathbf{r}$.

There is an interesting alternative method of getting k, k' in terms of ϱ, σ giving Mukhopadhyaya's expressions for Γ, M in terms of ϱ, σ when σ is the independent variable. Thus, if p be the perpendicular on the tangent to the 'Affinebild' $\mathbf{r}_2=\mathbf{r}''(s)$, and τ the angle made by the tangent with a fixed direction, we have Böhmer's relation

$$(1.34) \qquad\qquad\qquad\qquad p=\varkappa^{\frac13}$$

and the formula

$$(1.35) \qquad\qquad\qquad k=p^3\left(p+\frac{d^2p}{d\tau^2}\right).$$

Also, $\qquad\qquad\dfrac{d\sigma}{d\tau}=\varrho,\quad \dfrac{d\sigma}{ds}=|\,\mathbf{r}'\,|=\varrho^{\frac13}.$

So we have (dots denoting derivatives w.r.t. σ)

$$p=\varrho^{-\frac13},$$

$$\frac{dp}{d\tau}=\varrho\dot p=-\frac13\varrho^{-\frac13}\dot\varrho,$$

$$\frac{d^2p}{d\tau^2}=\varrho\left(\frac19\varrho^{-\frac43}\dot\varrho^2-\frac13\varrho^{-\frac13}\ddot\varrho\right);$$

hence

$$(1.36) \qquad\qquad k=\varrho^{-\frac43}+\frac19\varrho^{\prime\frac13}\dot\varrho-\frac13\varrho^{-\frac23}\ddot\varrho,$$

or

$$(1.36') \quad\qquad 9\varrho^{-\frac83}k=\Gamma_\sigma=-\frac{1}{\varrho^4}(3\varrho\ddot\varrho-\dot\varrho^2-9).$$

Again

$$(1.37) \quad k'=\varrho^{\frac43}k=-\frac43\varrho^{-2}\dot\varrho-\frac{4}{27}\varrho^{-2}\dot\varrho^3+\frac13\varrho^{-1}\dot\varrho\ddot\varrho-\frac13\dddot\varrho,$$

or

$$(1.37') \quad\quad 27\varrho^{-4}k'=M_\sigma=-\frac{1}{\varrho^6}(9\varrho^2\dddot\varrho-9\varrho\dot\varrho\ddot\varrho+4\dot\varrho^3+36\dot\varrho).$$

Hence the $(\varrho;\ \sigma)$ differential equation of all conics given by Mukhopadhyaya.

§2. The System of Conics C_λ

We shall now consider the system of conics C_λ (of affine curvature λ) given by

$$(2.1) \quad .. \quad .. \quad \mathbf{R} = \mathbf{r} + \frac{\sin (\lambda^{\frac{1}{2}}\sigma)}{\lambda^{\frac{1}{2}}}\,\mathbf{r}' + \frac{1 - \cos (\lambda^{\frac{1}{2}}\sigma)}{\lambda}\,\mathbf{r}'',$$

σ being the affine arc of C_λ measured from $\mathbf{r}$. Insomuch that C_k is the osculating conic $\overline{C}$, and C_0 is the osculating parabola given by (1.8). Since $C_\lambda(\lambda \neq k)$ satisfies the conditions (1.9) for third order contact with C at $\mathbf{r}$, the system $C_\lambda(\lambda \neq k)$ consists of all conics having third order contact with C at $\mathbf{r}$. (2.1) may also be written in the implicit form

$$(2.2) \quad .. \quad (\mathbf{R}-\mathbf{r},\ \mathbf{r}'')^2 + \lambda(\mathbf{R}-\mathbf{r},\ \mathbf{r}')^2 + 2(\mathbf{R}-\mathbf{r},\ \mathbf{r}') = 0.$$

Hence the osculating rectangular hyperbola at $\mathbf{r}$ is the conic C_γ for which

$$(2.3) \quad .. \quad .. \quad |\mathbf{r}''|^2 + \gamma\,|\mathbf{r}'|^2 = 0 \quad \text{or} \quad \gamma = -\frac{|\mathbf{r}''|^2}{|\mathbf{r}'|^2}.$$

Introducing the point

$$(2.4) \quad .. \quad .. \quad .. \quad \bar{\mathbf{r}}_\lambda = \mathbf{r} + \lambda^{-1}\mathbf{r}'',$$

we may write (2.1) in the form

$$(2.5) \quad .. \quad \mathbf{R} = \bar{\mathbf{r}}_\lambda + \lambda^{-\frac{1}{2}}\sin (\lambda^{\frac{1}{2}}\sigma) \cdot \mathbf{r}' - \lambda^{-1}\cos (\lambda^{\frac{1}{2}}\sigma) \cdot \mathbf{r}'',$$

of which the implicit equation equivalent to (2.2) is given by

$$(2.6) \quad .. \quad .. \quad (\mathbf{R}-\bar{\mathbf{r}}_\lambda,\ \mathbf{r}'')^2 + \lambda(\mathbf{R}-\bar{\mathbf{r}}_\lambda,\ \mathbf{r}')^2 = \lambda^{-1}.$$

Now (2.6) shows that $\bar{\mathbf{r}}_\lambda$ is the centre of C_λ, and (2.4) then shows that the line of aberrancy at $\mathbf{r}$, defined as the locus of $\bar{\mathbf{r}}_\lambda$, is the affine normal at $\mathbf{r}$.

Again the affine evolute $\tilde{C}$ of C, defined as the envelope of the affine normals of C, is easily seen to have the parametric representation

$$(2.7) \quad .. \quad .. \quad .. \quad .. \quad \tilde{\mathbf{r}} = \bar{\mathbf{r}}_k.$$

But $\bar{\mathbf{r}}_k$ is the centre $\tilde{\mathbf{r}}$ of the osculating conic $\overline{C}$ at $\mathbf{r}$. Hence the aberrancy curve of C, defined as the locus of $\tilde{\mathbf{r}}$ as $\mathbf{r}$ describes C, is $\tilde{C}$ itself.

Next, the angle of aberrancy at $\mathbf{r}$ is defined as the angle δ made by the aberrancy line with the normal at $\mathbf{r}$. Insomuch that

$$\stackrel{\wedge}{\mathbf{r}'\mathbf{r}''} = \frac{\pi}{2} - \delta;$$

so we have

$$\frac{\cos \delta}{(\mathbf{r}',\ \mathbf{r}'')} = \frac{\sin \delta}{(\mathbf{r}' \cdot \mathbf{r}'')} = \frac{1}{\sqrt{(\mathbf{r}',\ \mathbf{r}'')^2 + (\mathbf{r}' \cdot \mathbf{r}'')^2}},$$

giving

$$(2.8) \quad .. \quad .. \quad \cos \delta = \frac{1}{|\mathbf{r}'| \cdot |\mathbf{r}''|}, \quad \sin \delta = \frac{(\mathbf{r}' \cdot \mathbf{r}'')}{|\mathbf{r}'| \cdot |\mathbf{r}''|}.$$

Let us consider the semi-axes α, β of the conic C_λ. α, β and λ are connected by the well-known relation

(2.9)   ..   .. $\alpha^2\beta^2 = \lambda^{-3}$.

Thus, if c be the semi-axis of the osculating rectangular hyperbola C_γ, (2.9) gives

$$c^2(-c^2) = \gamma^{-3} \quad \text{or} \quad .c^2 = (-\gamma)^{-\frac{3}{2}},$$

whence, on substitution from (2.3), we have

(2.10)   ..   .. $c^2 = \dfrac{|\mathbf{r}'|^3}{|\mathbf{r}''|^3}$.

Now (2.6) shows that the affine normal at $\mathbf{r}$, namely,

(2.11)   ..   .. $\mathbf{R} = \bar{\mathbf{r}}_\lambda + u\mathbf{r}''$,

and the line through the centre $\bar{\mathbf{r}}_\lambda$ parallel to the tangent at $\mathbf{r}$, namely,

(2.12)   ..   .. $\mathbf{R} = \bar{\mathbf{r}}_\lambda + v\mathbf{r}'$,

are along two conjugate diameters of C_λ. We can find the corresponding semi-diameters r, n : thus,
where (2.11) meets (2.5),

$$\lambda^{\frac{1}{2}}\sigma = 0 \text{ or } \pi,$$

$$u = \mp\lambda^{-1},$$

giving

(2.13)   ..   ..   .. $r^2 = \lambda^{-2}|\mathbf{r}''|^2$;

and, where (2.12) meets (2.5),

$$\lambda^{\frac{1}{2}}\sigma = \frac{\pi}{2} \text{ or } \frac{3\pi}{2},$$

$$r = \pm\lambda^{-\frac{1}{2}},$$

giving

(2.14)   ..   ..   .. $n^2 = \lambda^{-1}|\mathbf{r}'|^2$.

But we have $\alpha^2 + \beta^2 = r^2 + n^2$.

Hence α^2, β^2 are given by (2.9) and

(2.15)   ..   .. $\alpha^2 + \beta^2 = \lambda^{-2}(|\mathbf{r}''|^2 + \lambda|\mathbf{r}'|^2)$.

The equation to the director circle of C_λ is now given by

$$|\mathbf{R} - \bar{\mathbf{r}}_\lambda|^2 = \alpha^2 + \beta^2,$$

which at once reduces to

(2.16)   ..   .. $\lambda|\mathbf{R} - \mathbf{r}|^2 - 2(\mathbf{R} - \mathbf{r}.\mathbf{r}'') - |\mathbf{r}'|^2 = 0$.

This constitutes a coaxial system of circles whose radical axis is given by

(2.17)   ..   ..   .. $(\mathbf{R} - \mathbf{r}.\mathbf{r}'') + \frac{1}{2}|\mathbf{r}'|^2 = 0$.

This is therefore the directrix of the osculating parabola C_0.

It is at once verified that it bisects $\overline{\bar{\mathbf{r}}_\gamma \mathbf{r}}$ at right angles.

Further, the coaxial system (2.16) has real limiting points, namely, $\mathbf{r}$ and $\bar{\mathbf{r}}_\gamma$: for, it is easily verified that

$$\overline{\mathbf{r}\bar{\mathbf{r}}} \cdot \overline{\bar{\mathbf{r}}_\gamma \bar{\mathbf{r}}_\lambda} = \alpha^2 + \beta^2 .$$

Next, the tangent vector $\mathbf{R}'(\sigma)$ at any point $\mathbf{R}(\sigma)$ upon the osculating parabola (1.8) is given by

(2.18)   ..   ..   .. $\mathbf{R}'(\sigma) = \mathbf{r}' + \sigma \mathbf{r}''.$

The axis has the direction of the affine normal at $\mathbf{r}$ which is a diameter. Hence if $\mathbf{R}_0 \equiv \mathbf{R}(\sigma_0)$ is the vertex, we have

$$\left(\mathbf{r}'' . \mathbf{R}'(\sigma_0)\right) = 0.$$

giving

(2.19)   ..   ..   .. $\sigma_0 = - \dfrac{(\mathbf{r}' . \mathbf{r}'')}{|\mathbf{r}''|^2} .$

Thus the vertex is given by

(2.20)   ..   .. $\mathbf{R}_0 = \mathbf{r} - \dfrac{(\mathbf{r}' . \mathbf{r}'')}{|\mathbf{r}''|^2} \mathbf{r}' + \dfrac{1}{2} \dfrac{(\mathbf{r}' . \mathbf{r}'')^2}{|\mathbf{r}''|^4} \mathbf{r}'' .$

Accordingly the axis is

$$(\mathbf{R} - \mathbf{R}_0 . \mathbf{r}'') = 0,$$

which reduces to

(2.21)   ..   .. $(\mathbf{R} - \mathbf{r}, \mathbf{r}'') + \dfrac{(\mathbf{r}' . \mathbf{r}'')}{|\mathbf{r}''|^2} = 0;$

and the tangent at the vertex is

$$(\mathbf{R} - \mathbf{R}_0 . \mathbf{r}'') = 0,$$

which reduces to

(2.22)   ..   ..   .. $(\mathbf{R} - \mathbf{r} . \mathbf{r}'') + \dfrac{1}{2} \dfrac{(\mathbf{r}' . \mathbf{r}'')^2}{|\mathbf{r}''|^2} = 0.$

If l be the semi-latus rectum, then the point

(2.23)   ..   ..   .. $\mathbf{R}_+ = \mathbf{R}_0 + \dfrac{l}{2} \dfrac{\mathbf{r}''}{|\mathbf{r}''|}$

is the focus, and the point

(2.24)   ..   ..   .. $\mathbf{R}_- = \mathbf{R}_0 - \dfrac{l}{2} \dfrac{\mathbf{r}''}{|\mathbf{r}''|}$

lies on the directrix.   So, substituting (2.24) in (2.17), we have

(2.25)   ..   ..   .. $\dfrac{\sigma_0^2}{2} + \dfrac{l}{2|\mathbf{r}''|} = \dfrac{1}{2} \dfrac{|\mathbf{r}'|^2}{|\mathbf{r}''|^2} ,$

whence (2.23) gives

(2.26)   ..   .. $\mathbf{R}_+ = \mathbf{r} - \dfrac{(\mathbf{r}' . \mathbf{r}'')}{|\mathbf{r}''|^2} \mathbf{r}' + \dfrac{1}{2} \dfrac{|\mathbf{r}'|^2}{|\mathbf{r}''|^2} \mathbf{r}'' .$

Further (2.25) gives

so that we have

$$(2.27) \qquad \qquad \qquad l = \frac{1}{|\mathbf{r}''|^3}.$$

Now if ϱ be the radius of curvature of C at $\mathbf{r}$, we have

$$(2.28) \qquad \qquad \qquad \varrho = |\mathbf{r}'|^3.$$

From (2.10), (2.27) and (2.28) we have the neat relation given by Mukhopadhyaya, namely,

$$(2.29) \qquad \qquad \qquad c^2 = \varrho l.$$

Also, using (2.8), we can express $\cos \delta$ in terms of any two of the magnitudes ϱ, c, l: thus,

$$(2.30) \qquad \qquad \cos \delta = \left(\frac{c}{\varrho}\right)^{\frac{2}{3}} = \left(\frac{l}{\varrho}\right)^{\frac{1}{3}} = \left(\frac{l}{c}\right)^{\frac{2}{3}}.$$

Let us consider any ellipse $C_\lambda (\lambda > 0)$ of the system (2.1). We have, from (2.15) and (2.9),

$$(2.31) \qquad \qquad \qquad \begin{cases} \alpha^2 + \beta^2 = \lambda^{-1} |\mathbf{r}'|^2 + \lambda^{-2} |\mathbf{r}''|^2, \\ \alpha^2 \beta^2 = \lambda^{-3}; \end{cases}$$

giving

$$(2.32) \qquad \qquad \frac{\alpha}{\beta} + \frac{\beta}{\alpha} = \lambda^{\frac{1}{2}} |\mathbf{r}'|^2 + \lambda^{-\frac{1}{2}} |\mathbf{r}''|^2,$$

which may also be written in the form

$$(2.32') \qquad \frac{\alpha}{\beta} + \frac{\beta}{\alpha} = (\lambda^{\frac{1}{4}} |\mathbf{r}'| - \lambda^{-\frac{1}{4}} |\mathbf{r}''|)^2 + 2 |\mathbf{r}'| \cdot |\mathbf{r}''|.$$

Now $\dfrac{\alpha}{\beta} + \dfrac{\beta}{\alpha}$ is a minimum when the eccentricity e is a minimum. Hence, in view of (2.32'), the ellipse C_{λ_0} of minimum eccentricity is determined by

$$(2.33) \qquad \qquad \qquad \lambda_0 = \frac{|\mathbf{r}''|^2}{|\mathbf{r}'|^2},$$

and then we have, remembering (2.8),

$$(2.34) \qquad \qquad \qquad \frac{\alpha}{\beta} + \frac{\beta}{\alpha} = \frac{2}{\cos \delta}.$$

Here we have, from (2.13) and (2.14),

$$r_0 = n_0 = \frac{|\mathbf{r}'|^2}{|\mathbf{r}''|} = \varrho \cos \delta.$$

Comparing (2.33) with (2.3), we have

$$(2.35) \qquad \qquad \qquad \qquad \lambda_0 = -\gamma.$$

Hence $\bar{\mathbf{r}}_{\lambda_0}$ is the image of $\bar{\mathbf{r}}_\gamma$ with respect to $\mathbf{r}$; further, (2.10) gives

$$(2.36) \quad .. \quad .. \quad .. \quad .. \quad c^2 = \lambda_0^{-\frac{3}{2}}.$$

Again if λ_1, λ_2 correspond to equal values of e, and so to equal values of $\alpha : \beta$, then (2.32), as a quadratic in λ, gives, on using (2.33),

$$(2.37) \quad .. \quad .. \quad \lambda_1^{\frac{1}{2}} \cdot \lambda_2^{\frac{1}{2}} = \lambda_0 \quad \text{or} \quad \lambda_1 \lambda_2 = \lambda_0^2;$$

whence, from (2.13), we have

$$(2.38) \quad .. \quad .. \quad .. \quad .. \quad r_1 r_2 = r_0^2.$$

Also, we have

$$\alpha_1 \beta_1 = \lambda_1^{-\frac{3}{2}}, \quad \alpha_2 \beta_2 = \lambda_2^{-\frac{3}{2}};$$

whence (2.37) and (2.36) give

$$(2.39) \quad .. \quad .. \quad .. \quad \alpha_1 \beta_1 \cdot \alpha_2 \beta_2 = \lambda_0^{-3} = c^4.$$

§3. The Affine Invariants

We shall recall the formulae (1.20) and (1.21) giving $\mathbf{r}'$, $\mathbf{r}''$ and k, k' when C is specified in terms of an arbitrary parameter t. Thus, we have

$$(3.1) \quad .. \quad .. \quad .. \quad \mathbf{r}' = \frac{\dot{\mathbf{r}}}{\Delta_{12}^{\frac{1}{3}}}, \quad \mathbf{r}'' = \frac{\mathbf{N}}{3\Delta_{12}^{\frac{5}{3}}}$$

and

$$(3.2) \quad .. \quad .. \quad .. \quad k = \frac{\Gamma}{9\Delta_{12}^{\frac{5}{3}}}, \quad k' = \frac{M}{27\Delta_{12}^{4}}$$

where the vector $\mathbf{N}$ and the expressions Γ, M are defined by $(1.20')$ and $(1.21')$.

At the outset, we shall establish Abel Transon's formula for $\tan \delta$, δ being the angle of aberrancy at $\mathbf{r}$. Let ϱ be the radius of curvature of C at $\mathbf{r}$, and σ be the ordinary arc of C. We have

$$(3.3) \quad .. \quad .. \quad .. \quad \varrho = \frac{|\mathbf{r}'|^3}{(\mathbf{r}', \mathbf{r}'')} = |\mathbf{r}'|^3.$$

Differentiating w.r.t. s, we have

$$(3.4) \quad .. \quad .. \quad .. \quad \frac{1}{3}\frac{d\varrho}{ds} = |\mathbf{r}'|(\mathbf{r}' . \mathbf{r}'').$$

Now we have

$$(3.5) \quad .. \quad .. \quad .. \quad .. \quad |\mathbf{r}'| = \frac{d\sigma}{ds};$$

and

$$\frac{(\mathbf{r}' . \mathbf{r}'')}{(\mathbf{r}', \mathbf{r}'')} = \cot \overset{\wedge}{\mathbf{r}'\mathbf{r}''},$$

i.e.

$$(3.6) \quad .. \quad .. \quad .. \quad (\mathbf{r}' . \mathbf{r}'') = \tan \delta.$$

Hence (3.4) gives, on substitution from (3.5) and (3.6), the formula

$$(3.7) \qquad \tan \delta = \frac{1}{3} \frac{d\varrho}{d\sigma} .$$

We now consider certain affine invariants of our curve C. Thus, from (3.1), we find that

$$(3.8) \qquad \frac{|\dot{\mathbf{r}}|}{\varDelta_{12}^{\frac{1}{4}}} \text{ and } \frac{|\mathbf{N}|}{\varDelta_{12}^{\frac{5}{3}}}$$

are affine invariants.

Similarly, from (3.2), we see that

$$(3.9) \qquad \frac{\varGamma}{\varDelta_{12}^{\frac{5}{3}}} \text{ and } \frac{M}{\varDelta_{12}^{\frac{4}{3}}}$$

are affine invariants.

Again (3.6), on substitution from (3.1), shows that

$$(3.10) \qquad \frac{(\dot{\mathbf{r}} \cdot \mathbf{N})}{\varDelta_{12}^{2}}$$

is also an affine invariant.

If a, b be the semi-axes of the osculating conic $\overline{C}$, we have, since k is the affine curvature of $\overline{C}$,

$$(3.11) \qquad ab = k^{-\frac{3}{2}} .$$

Substituting for k from (3.2), this gives

$$(3.11') \qquad 27 \left(\frac{\varGamma}{\varDelta_{12}^{\frac{5}{3}}} \right)^{-\frac{3}{2}} = ab .$$

Mukhopadhyaya uses (3.11') to establish that

$$\frac{\varGamma}{\varDelta_{12}^{\frac{5}{3}}}$$

is an affine invariant.

Again, from (3.11), we have

$$(3.11'') \qquad -\frac{3}{2} k^{-\frac{5}{2}} k' = (ab)' = \frac{D_t(ab)}{\varDelta_{12}^{\frac{1}{2}}}$$

showing that

$$(3.12) \qquad \frac{D_t(ab)}{\varDelta_{12}^{\frac{1}{2}}}$$

is also an affine invariant.

As we have already seen in §2, the centre $\tilde{\mathbf{r}}$ of the osculating conic $\overline{C}$ at $\mathbf{r}$ is given by

$$(3.13) \qquad \tilde{\mathbf{r}} = \mathbf{r} + \frac{1}{k} \mathbf{r}'' ,$$

and the locus of $\tilde{\mathbf{r}}$ is the affine evolute $\tilde{C}$.

We have

$$\tilde{\mathbf{r}}' = \mathbf{r}' + \frac{1}{k}\,\mathbf{r}''' + \left(\frac{1}{k}\right)'\mathbf{r}'',$$

giving, by virtue of (1.3),

(3.14) .. .. .. $\tilde{\mathbf{r}}' = -\dfrac{k'}{k^2}\,\mathbf{r}''.$

Substituting from (3.1) and (3.2), (3.14) becomes

(3.14') .. .. .. $\dot{\tilde{\mathbf{r}}} = -\dfrac{M}{\Gamma^2}\,\mathbf{N}.$

If $\tilde{\sigma}$ be the ordinary arc of the affine evolute $\tilde{C}$, we have

(3.15) .. .. .. $\dfrac{d\tilde{\sigma}}{ds} = |\,\tilde{\mathbf{r}}'\,| = \dfrac{k'}{k^2}|\,\mathbf{r}''\,|,$

which is also equivalent to

(3.15') .. .. .. $\dfrac{d\tilde{\sigma}}{dt} = |\,\dot{\tilde{\mathbf{r}}}\,| = \dfrac{M}{\Gamma^2}|\,\mathbf{N}\,|.$

The relations (3.14') and (3.15') have also been given by Mukhopadhyaya.

Again by differentiating (3.14) and using (1.3), we have

(3.16) .. .. .. $\tilde{\mathbf{r}}'' = \dfrac{k'}{k}\,\mathbf{r}' + \left(\dfrac{1}{k}\right)''\mathbf{r}''.$

From (3.14) and (3.16), we have

(3.17) .. .. .. $(\tilde{\mathbf{r}}', \tilde{\mathbf{r}}'') = \dfrac{k'^2}{k^3}.$

Now if $\tilde{\varrho}$ be the radius of curvature of the affine evolute $\tilde{C}$, we have

(3.18) .. .. $\tilde{\varrho} = \dfrac{|\,\tilde{\mathbf{r}}'\,|^3}{(\tilde{\mathbf{r}}', \tilde{\mathbf{r}}'')}.$

Substitution from (3.15) and (3.17) gives

(3.19) .. .. $\tilde{\varrho} = \dfrac{k'}{k^3}|\,\mathbf{r}''\,|^3.$

Substituting from (3.1) and (3.2), this is seen to be equivalent to

(3.19') .. .. .. $\tilde{\varrho} = \dfrac{M}{\Gamma^3}\cdot\dfrac{|\,\mathbf{N}\,|^3}{\Delta_{12}}.$

In particular, with $t = x$, where $\mathbf{r} = \{x, y\}$, this gives

(3.19'') .. .. $\tilde{\varrho} = \dfrac{T\cdot\left\{y_3^2 + (y_1y_3 - 3y_2^2)^2\right\}^{\frac{3}{2}}}{y_2\left(3y_2y_4 - 5y_3^2\right)^3}$

in terms of the first five derivatives y_i of y w.r.t. x, T denoting the usual $\{x, y\}$-Mongian function.

Let us consider the semi-axes a, b of the osculating conic $\overline{C}$. We have, from (2.15) and (2.9),

(3.20)   ..   .. $\begin{cases} a^2+b^2 = k^{-1}\,|\,\mathbf{r}'\,|^2 + k^{-2}\,|\,\mathbf{r}''\,|^2, \\ a^2 b^2 = k^{-3}\,; \end{cases}$

giving

(3.21)   ..   .. $\dfrac{a}{b} + \dfrac{b}{a} = k^{\frac{1}{2}}\,|\,\mathbf{r}'\,|^2 + k^{-\frac{1}{2}}\,|\,\mathbf{r}''\,|^2.$

Differentiating, we have

(3.21′)   ..   .. $\left(\dfrac{a}{b} + \dfrac{b}{a}\right)' = 2\{k^{\frac{1}{2}}(\mathbf{r}'\,.\,\mathbf{r}'') + k^{-\frac{1}{2}}(\mathbf{r}''\,.\,\mathbf{r}''')\}$

$$+ \frac{1}{2}k^{-1}k'\{k^{\frac{1}{2}}\,|\,\mathbf{r}'\,|^2 - k^{-\frac{1}{2}}\,|\,\mathbf{r}''\,|^2\}$$

But we have, identically,

(3.21″)   ..   .. $\mathbf{r}''' + k\mathbf{r}' = 0$ and $|\,\mathbf{r}''\,|^2 - k\,|\,\mathbf{r}'\,|^2 = (\mathbf{r}'\,.\,\mathbf{r}'')'.$

Hence (3.21′) gives

(3.22)   ..   .. $\left(\dfrac{a}{b} + \dfrac{b}{a}\right)' = -\dfrac{1}{2}k^{-2}k'(\mathbf{r}'\,.\,\mathbf{r}'')'.$

Let ϑ be the angle which an axis of the osculating conic $\overline{C}$ makes with the x-axis. Denoting $\mathbf{r}$ by $\{x,\,y\}$ and referring to the equation (1.13) of $\overline{C}$, it is seen that ϑ is given by

(3.23)   ..   ..   .. $2\vartheta = \tan^{-1}\dfrac{2H}{A-B},$

where we have introduced

(3.23′)   .. $A = x''^2 + kx'^2, \quad H = x''y'' + kx'y', \quad B = y''^2 + ky'^2.$

We have, in virtue of the first of the relations (3.21″) above,

(3.23″)   ..   .. $A' = k'x'^2, \quad H' = k'x'y', \quad B' = k'y'^2.$

Hence, differentiating (3.23) and substituting from (3.23′) and (3.23″), we have

$$\vartheta' = \frac{(A-B)H' - H(A'-B')}{(A-B)^2 + 4H^2}$$

$$-\frac{\begin{vmatrix} A & H \\ A' & H' \end{vmatrix} + \begin{vmatrix} H & B \\ H' & B' \end{vmatrix}}{(A+B)^2 - 4(AB - H^2)} = \frac{-k'(\mathbf{r}'\,.\,\mathbf{r}'')(\mathbf{r}',\,\mathbf{r}'')}{\{|\,\mathbf{r}''\,|^2 + k\,|\,\mathbf{r}'\,|^2\}^2 - 4k(\mathbf{r}',\,\mathbf{r}'')^2}$$

$$= \frac{-k'(\mathbf{r}'\,.\,\mathbf{r}'')}{\{|\,\mathbf{r}''\,|^2 - k\,|\,\mathbf{r}'\,|^2\}^2 + 4k(\mathbf{r}'\,.\,\mathbf{r}'')^2}$$

giving, in virtue of the second of the relations (3.21″),

(3.24)   ..   .. $\vartheta' = \dfrac{-k'(\mathbf{r}'\,.\,\mathbf{r}'')}{\{(\mathbf{r}'\,.\,\mathbf{r}'')'\}^2 + 4k(\mathbf{r}'\,.\,\mathbf{r}'')^2}.$

Now ϑ' becomes indeterminate, if

$$(3.25) \qquad \qquad (\mathbf{r}'.\mathbf{r}'') = 0 \text{ and } also \ (\mathbf{r}'.\mathbf{r}'')' = 0,$$

which are the conditions that $\bar{C}$ may be a circle. For, in the first place, (3.6) shows that

$$(3.25a) \qquad \qquad \qquad \qquad (\mathbf{r}'.\mathbf{r}'') = 0$$

is the condition that the aberrancy angle δ vanishes; and, in the second place, (3.22) shows that

$$(3.25b) \qquad \qquad \qquad \qquad (\mathbf{r}'.\mathbf{r}'')' = 0$$

is the condition that $\dfrac{a}{b}+\dfrac{b}{a}$ has a minimum, which occurs when $\bar{C}$ has a minimum eccentricity. Hence the conditions (3.25) that the osculating conic may be a circle.

In view of (3.6) and (3.7), we may write (3.25) in the alternative forms:

$$(3.25') \qquad \qquad \qquad \delta = 0 \text{ and } d\delta = 0,$$

or

$$(3.25'') \qquad \qquad \qquad \frac{d\varrho}{d\sigma} = 0 \text{ and } \frac{d^2\varrho}{d\sigma^2} = 0.$$

Also, (3.24) may be written in the alternative forms:

$$(3.24') \qquad \qquad \qquad \vartheta' = -\frac{k'(\mathbf{r}'.\mathbf{r}'')}{\left(\dfrac{a}{b}-\dfrac{b}{a}\right)^2},$$

or

$$(3.24'') \qquad \qquad \qquad \vartheta' = -\frac{k'}{k}\frac{1-e^2}{e^4}\tan\delta,$$

e being the eccentricity of $\bar{C}$.

To conclude, I am grateful to Prof. B. S. Madhava Rao for the suggestion of the problem and for kind guidance.

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SOIL FERTILITY AND BALANCED MANURING

By A. R. Foster, B.Sc., A.R.I.C., A.I.C.T.A.

I am taking as the subject of my talk this evening 'Soil Fertility and Balanced Manuring', as this is a matter of vital importance to India today. In 1945, in their 'Food Plan for India', the Royal Institute of International Affairs [1] expressed the view that the production of foodgrains in India, as it then was, estimated to be 60 million tons per annum, would need to be increased by at least 14 million tons by 1953, if the country was to be self-supporting in food and a reasonable diet provided for everyone. The production of such a vast amount of food was a problem of the first magnitude then, and is even more so for India as it now is after partition. We must allow no shibboleths or fanciful theories to deflect us from finding a solution to it.

In the title of my talk, I have referred to 'Balanced Manuring', and the emphasis is on 'Balanced'. We should see that balance is maintained in the soil and in the manure we apply to it; and equally we must maintain a balanced outlook on the problem as a whole.

Before I discuss manuring, I must attempt to define soil fertility, and I think possibly this has been done best by Richardson in his excellent series of papers on this subject in the 'Empire Journal of Experimental Agriculture' [2] in 1946. He has taken it to mean the fruitfulness or productivity of the soil. There are many factors bearing on this, the chief of which are water-supply, nutrient supply, soil reaction, organic matter content and the physical condition of the soil. Other factors bearing on productivity, although not so intimately concerned with the soil are temperature, length of day and season, crop variety and pest and disease attack.

Possibly the best way of arriving at an understanding of the significance of these factors is to give a brief outline of the way soils are formed, and the properties they have as a result.

I ask your indulgence for going over again ground which may be already familiar to you, but I feel that a proper understanding of soil processes is necessary to an appreciation of our subject.

Soils are essentially the products of the geological material underlying them, from which they have been formed by weathering *in situ*. This geological material may be igneous rock from the earth's original crust, metamorphic rock formed by geological changes since the original igneous rock was formed, or may be alluvium brought down by vast rivers from hills and mountains many hundreds of miles away. In Bengal, we are primarily concerned with the latter category, and owe a debt to the tracts of India higher up the valleys of the Ganges and the Brahmaputra whence most of their best soil has been washed down to be deposited in the delta on which we live and have our being.

The earth's crust is not uniform in composition, as well we know. It might be a blessing if it were. Gold, however, is found in certain favoured localities and coal, iron, mica, manganese, phosphate rock, etc. in others. Given this diversity in its components, it seems unreasonable to assume that at any one point we can be certain of finding all the elements required for healthy crop growth present in sufficient quantity. This we find to be so in practice, and many areas are deficient in one or other of the important plant nutrients. One such area, which is well known to you, is the

phosphate-deficient tract in North Bihar. Lack of the essential plant food, phosphate, is the limiting factor to the growth of large crops in that area. There are other areas in the world where deficiencies of one element or another have limited the growth of crops and this is a subject to which I shall return later in my talk.

I referred earlier to the formation of soils by weathering of geological material. How does this process take place? Weathering is a chemical decomposition of parent material caused by climatic conditions of temperature and moisture, by the vegetation growing on the soil, by the action of micro-organisms in the soil and by human and other interference. The most important original factor in soil formation is the climate, as this governs the type of vegetation which occurs, and so it is possible for similar geological material to produce different soils according to whether the climate is hot or cold, humid or dry. But human interference, since man started cultivating the soil for his food, has had an increasingly important influence on soil formation.

If we examine the physical composition of the mineral matter in the soil, we find that by mechanical means it can be separated into various fractions of sand, silt and clay, and according to whether sand predominates or clay, the soil may be described as a light sand or a heavy clay. There are, of course, a number of intermediate types of soil, such as light, medium or heavy loams, between these extremes. The distinction between sand and clay is one of particle size, and this is of major importance in considering the properties of the soil since, as you are aware, the effective surface area of a solid is frequently a measure of its physical and chemical activity. It is estimated that in a sandy soil, the surface area of the particles is of the order of 12,000 sq. centimetres per grm. of soil, whereas the surface area of clay may be 200,000 sq. centimetres per grm. or more.[3]

Clay consists of secondary minerals, such as Kaolinite, Beidellite, Montmorillonite, etc., complex alumino-silicates formed by decomposition of the original minerals in the parent rock. Its particles fall within the colloidal range and have very great surface activity. As a result, a clay soil is far more active physically and chemically than a sandy one. It retains much more moisture than a sandy soil, and so is not so susceptible to drought. It expands and contracts on wetting and drying to a remarkable degree, and any of you who have seen the deep cracks which appear in the Black Cotton soils of Central India during the dry season will appreciate the extent to which a clay can contract on drying.

The rôle of colloids in life is an important one, and in soils it is this active colloidal material that forms the framework to which plant nutrients are attached. It has what is known as a buffer action in the soil, which evens up local inequalities and prevents deleterious effects that might result from them. In a thin soil deficient in colloidal matter such inequalities may react quickly to the detriment of the plant. In such a soil a heavy-handed cultivator may damage his plants by uneven distribution of fertilizers. But in a soil containing adequate colloidal material, there is a safety margin which ensures that, even if the distribution of the fertilizer is not perfect, no harm will be done. It is the absence of colloidal material in the growing medium used in soil-less cultivation which makes the even distribution of plant nutrients, usually in solution, so essential.

The colloidal complex of the soil is closely associated with the colloids of the fine root hairs of the plant, and it is believed that it is through this association that plant nutrients enter the roots from the soil. That such an association is not absolutely essential, however, is shown by the fact that plant roots can absorb nutrients direct, as they do in soil-less cultures.

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Clays vary according to the base which is attached to the colloidal complex and, if hydrogen, calcium; sodium, etc., predominate, different physical properties result. The soil which farmers prefer is one in which lime predominates. Such a soil is usually a good, friable loam, easy to cultivate. Where, due to excessive leaching such as occurs in areas of heavy rainfall, the bases are removed in solution in the drainage water, we are left with a clay in which hydrogen has taken the place of lime, and the soil is sour and acid as a result. Liming is then essential to restore the soil to good physical texture. Where sodium replaces lime, either in arid areas due to sodium salts being brought to the surface by rising sub-soil water, or in areas near the sea where the soil is flooded with salt water, sodium clays may be formed. Good examples of these occur close to Calcutta on the edges of the Salt Lakes, where characteristic sodium clays, which are excessively sticky when wet and extremely hard when dry, may be seen.

While discussing the colloidal properties of the soil, we come naturally to a consideration of humus, an important component of soil which is also colloidal and forms a complex in association with the clay fraction. It is particularly important in those soils which are deficient in clay, as it then provides the colloidal material that is otherwise lacking, and so improves their physical and chemical properties. It is also beneficial to very heavy clays by opening them up and improving their structure.

Humus is a dark coloured, amorphous substance formed when plant residues in the soil are broken down by the action of bacteria and fungi. It is richer in nitrogen than undecomposed organic matter, its ratio of carbon to nitrogen being approximately 10 as compared with 40 in the undecomposed material. The breakdown of organic matter to humus is principally due to the action of bacteria, but in acid soils fungi play a more prominent part.

It is important to note that the function of earthworms in this connection is to break up and distribute plant remains through the top layers of the soil. They contribute little, however, to the decomposition of the organic matter. They are absent from very acid soils such as those occurring under heath and coniferous forests, with the result that the organic litter does not get incorporated in the soil. It has been contended by followers of the late Sir Albert Howard that fertilizers reduce the earthworm population of the soil, but this has not been borne out by recent work. At Rothamsted, plots which received heavy dressings of sulphate of ammonia were compared with unmanured plots and the former contained as many earthworms as the latter, but the weight of worms on the nitrogenous plots was much greater, due presumably to the greater amount of vegetation produced as a result of the extra nitrogen. At Cornell University in the States, four times the weight and number of worms were found on fertilized plots as on unfertilized. As long as any tendency to acidity in the soil is corrected, there seem to be no grounds for assuming that the use of sulphate of ammonia reduces the earthworm population.

The rôle of organic matter in the soil is undoubtedly important. Although Howard's writings may have concentrated attention on this problem, the discovery of the importance of humus and organic matter is not a recent one, nor was it made in response to the agitation started by Sir Albert and his followers. Its importance has been an accepted fact for very many years, and was recognized by practical farmers in Britain, such as Townshend of Norfolk, when, well over two hundred years ago, he introduced his soil-improving rotation, the famous Norfolk Four-Course, which not only included roots for feeding livestock, but also included a leguminous crop which helped to build up the general fertility and nitrogen content of

the soil. This rotation revolutionized British farming by enabling larger stocks of cattle to be maintained, with consequent increase in the production of farm yard manure for application to the soil. For over two centuries, this system has been the backbone of mixed farming in Britain.

There is, however, a limit to the economics of applying even farm yard manure, and with increased mechanization there has been a reduction in the amount of manure available. In India, the problem has been different in that the bulk of the cattle manure produced has been used as fuel. It is calculated that as much as 65 m. tons dry matter [1] (equivalent to 200 m. tons f.y.m.) is used for this purpose each year, and Parr [4] has estimated that the present output of cattle manure in India is only sufficient to manure one acre in every ten. Other means of returning organic matter to the soil must therefore be explored. In this connection, it should not be over-looked that any means of increasing crop production with consequent increase in crop residues, such as result from the judicious use of inorganic fertilizers, increases the amount of organic matter which can be added to the soil. These residues can either be ploughed in direct and allowed to decompose in the soil, in which case supplementary nitrogen may need to be added to balance the large proportion of carbonaceous material in the undecomposed organic matter, or they may be rotted first and then applied to the soil.

Working at Indore, Howard and Wad evolved an efficient process of making compost from plant residues and the urine of farm animals which, when returned to the soil, was of undoubted benefit. The essential feature of composting is to add nitrogen to carbonaceous organic matter to hasten its breakdown to humus. Urine is not essential for this purpose and sulphate of ammonia can be used in its place. Compost prepared by the Indore and other methods can undoubtedly play a useful rôle in Indian Agriculture, and the Government of India are at present actively engaged in promoting its use in Indian villages. It was well said some years ago, however, 'the full possibilities of humus will only appear when dressings of compost are supplemented by the addition of suitable artificials. The combination of the two, applied at the right moment and in the proper proportions, will open the door to intensive crop production of the future. Humus and artificials will supplement one another.' This was Howard in his original work, 'The Waste Products of Agriculture',[5] and the advice is still good. Unfortunately, he and his followers later took to advocating composting to the exclusion of everything else, presenting their case with an almost religious fervour and condemning the use of inorganic fertilizers in any form.

Composting has the drawback to the practical farmer that it involves a number of manual operations to keep the breakdown of organic matter under control, and this becomes important where man-hours have to be taken into consideration. It also assumes the availability of large supplies of organic matter, which is not always the case.

Dr. Acharya, who is now in charge of the Government of India's compost schemes, when previously working at the Indian Institute of Science at Bangalore,[1] estimated that it should be possible to prepare about 5 to 6 m. tons good quality compost every year from the waste from towns and cities of above 5,000 population. A further 5 to 6 m. tons might be made if towns of 2/5,000 population also participated. This, however, represents a mere fraction of the country's total requirements, when applied to a cultivated area of over 250 million acres. More recent plans [6] visualize increasing the output of compost by 100 m. tons if village wastes can be utilized and a further 200 m. tons if alternative fuel to cow manure can be provided.

These plans are conditioned by a number of 'ifs' and will need a very intensive educational drive in the villages before substantial results are produced, and in any case are only expected to produce a little over 1 ton compost per acre of cultivated land.

In addition to composts, there are many other good methods of increasing the organic matter content of the soil and the choice must be made, not on doctrinaire grounds, but on the basis of economics and of convenience under local conditions. Among these sources, apart from farm yard manure, may be mentioned leguminous green manuring, crop residues or green leaves ploughed under, sewage sludge, etc. Ley farming, which has been developed by Stapledon and involves including 2 or 3 years under grass which is eventually ploughed in, is proving increasingly popular in North-West Europe, as it undoubtedly produces a great improvement in the organic matter status of the soil. Work by Parr at the Indian Agricultural Research Institute, New Delhi, has shown that similar results may be obtained by including berseem manured with phosphate in the rotation. This provides ample fodder for cattle and at the same time improves the fertility status of the soil.

In the middle of the nineteenth century, Liebig evolved his theories regarding the mineral origin of plant foods in soils. His discoveries were important pioneer efforts and many of them are still valid. Some of his theories, however, particularly regarding the source of nitrogen in the soil, did not stand the test of time, as is the fate of many theories advanced during the course of scientific progress. It was not long before other scientists discovered the importance of biological activity in the soil for fixing nitrogen from the air. Rothamsted Experimental Station played a leading rôle in this work and as early as 1878 Warrington established the function of nitrifying micro-organisms in the soil. These were later isolated by Winogradsky in 1890.

While we are discussing Rothamsted, it would be as well to correct a number of misconceptions spread by Howard's followers. This experimental station was founded over a hundred years ago by an enterprising young land-owner, Lawes, who had discovered that he could make bones much more rapidly available to his crops by digesting them first with acid, thus making a product which he called Superphosphate. He commercialized his discovery and devoted part of the proceeds to setting up the first experimental station in Britain. As a result of its origin, Rothamsted is assumed by the Howard School to exist mainly for proving the value of fertilizers. In fact, if you study the writings of Rothamsted workers, you will find that, under the direction of such distinguished figures as Sir Daniel Hall and Sir John Russell, Rothamsted has, during its hundred years of activity, gained a place pre-eminent amongst agricultural research stations in the world, a position it could never have attained had it been devoted to sectional interests. A study of Russell's 'Soil Conditions and Plant Growth', for long the Bible of soil scientists, will reveal how much research has been devoted to micro-biological investigations, dating from Warrington's original work. Over 40% of this massive book is devoted to soil micro-biology and related matters. In fact, it is almost impossible to separate the biological from the non-biological in the book.

It was the work of Warrington and Winogradsky which led to the elucidation of the nitrogen cycle which is so closely bound up with the organic matter content of the soil and which has such a strong appeal to the mystic streak in advocates of 'Back to Nature'. I will not elaborate on this subject, as I feel you are already familiar with it. As you know, the nitrogenous constituents of plant residues in the soil are broken down by the

activity of micro-organisms and absorbed by the plant in the form of nitrates or ammonium salts.   To say where the cycle commences is as difficult as to decide whether to place the hen before the egg or *vice versa*.   Our main reservoir of nitrogen, however, is the air above us, and in tropical areas, where thunderstorms lead to the formation of large amounts of oxides of nitrogen in the air, as much as 50 lbs. of ammoniacal and nitrate nitrogen per acre, may be received by the soil each year dissolved in rain.   A more important method of deriving nitrogen from the air, however, is from fixation by bacteria, either in association with legumes or as free-living organisms. As a result, an acre of soil may contain several thousand pounds of nitrogen in organic combination.   Nevertheless, a dressing of nitrate of soda or sulphate of ammonia giving, say, 20 lbs. of nitrogen per acre often produces a remarkable increase in yield.   It is evident that the greater proportion of the soil nitrogen is not immediately available for the use of plants.

It has been stated by the Howard School, that the addition of inorganic salts to the soil results in decreased activity by micro-organisms.   No sound evidence of this has yet been produced.   In fact, experiments at Rothamsted have shown that the judicious addition of nitrogenous fertilizers results in increased micro-biological activity.   The solitary instance quoted by the Howard School is an experiment conducted by Rayner [7] on thin, acid soils of forestry nurseries at Wareham.   There the addition of sulphate of ammonia was found to be detrimental to the mycorrhiza essential to the establishment of young forestry seedlings.   Under these extreme conditions, however, a deleterious effect from an inorganic salt is not unexpected. You will recollect that, when describing the composition of soils earlier, emphasis was laid on the importance of their colloid content.   In a thin sandy soil, colloidal material is deficient and its buffering action, whereby the effects of local concentrations of inorganic salts are toned down, is absent.   To deduce from this particular case, therefore, that sulphate of ammonia is detrimental to soils which contain adequate colloidal material and in which any acidifying effect it may have is rectified where necessary by the addition of lime, is an example of the false logic, arguing from the particular to the general, only too prevalent amongst Sir Albert's followers.

We have seen that, in whatever form nitrogen is applied to the soil, it ultimately goes through the stage of ammoniacal and nitrate nitrogen before being absorbed by the plant.   On the face of it, therefore, it would appear beneficial to add nitrates or ammonium salts direct to the soil where additional nitrogen is desired.   This has, in fact, been found to be so, and inorganic nitrogen can be added to the soil without detriment, as long as it is done intelligently.   Throughout the world, several million tons of inorganic nitrogen are applied to the soil each year.

Of the three principal plant nutrients, Nitrogen, Phosphate and Potash, the Big Three of the soil, nitrogen is the chief need of Indian soils, and when applied in appropriate amounts it results in astonishing increases in yield. It produces its most obvious effect on the colour of the plant, rendering it a healthy green as compared with the sickly yellow of the nitrogen-starved plant.   It also promotes more vigorous growth, and the resultant larger area of leaf surface increases the plant's carbohydrate manufacturing capacity, with consequent benefit to the yield of grain, sugar, tubers, etc.

Under Indian conditions, it is often possible to obtain large increases in yield from nitrogen alone, the soil providing the other plant foods from its reserves.   After its continued use alone for some years, however, the response obtained may begin to fall off.   This has sometimes led to nitro-genous fertilizers being described as 'drawing the land'.   It is certainly true that bigger crops take more out of the land, but cultivators do not

object to good weather or good seeds because they give bigger crops, more exhausting to the soil. The remedy is to supply the plant food required to feed such heavy crops, and to supplement nitrogen with phosphate or potash, or whatever else is found to be required.

There are a number of nitrogenous fertilizers available for use by the cultivator, but by far the most important is Sulphate of Ammonia. This fertilizer has now been available for over a century, previously as a by-product from the distillation of coal, but now mainly made synthetically from nitrogen obtained from the air. A certain amount of care is needed in its application, as with any concentrated fertilizer, but this has not proved beyond the skill of the Indian cultivator who now uses it extensively without damage to his crops. It does increase the loss of lime from the soil to the extent of about one-third of the weight of sulphate of ammonia applied, but this may easily be rectified, if required, by regular liming. It has particular advantages in wet climates, as the ammonium ion attaches itself to the colloidal complex of the soil and is used by the plant when required; it is not leached out by heavy rain, as is the case with nitrates.

Nitrate of Soda, another extremely important source of nitrogen, very largely derived from natural deposits in Chile, has the advantage over sulphate of ammonia that it provides nitrogen in a form which can be rapidly taken up by the plant without further alteration, whereas ammonia has to be converted to nitrate before most plants can absorb it. It is therefore an extremely useful fertilizer as a quick-acting top-dressing. It has the serious disadvantage in this country however, that, if heavy rain follows quickly on its application, most of the nitrate is washed away in the drainage water; also it is not suitable for use on paddy.

Another nitrogenous fertilizer which has recently achieved prominence, one might almost say notoriety, is Ammonium Nitrate, which has the merit of containing nitrogen in both forms. It has, however, the grave dis-advantage, as far as we are concerned, that it takes up moisture readily from the atmosphere and under humid conditions is quickly rendered difficult to handle. It is also an ingredient of explosives and was involved in the serious explosions in Texas City and Brest. It is widely used in Britain in the form of Nitrochalk, in which the ammonium nitrate is mixed with calcium carbonate and the explosion hazard eliminated.

An important class of nitrogenous fertilizers comprises the so-called organics, of which oil-cakes, such as groundnut and castor cake, the residues remaining after the oils have been expressed from the seeds, are extensively used in this country. Animal wastes, such as blood, hoof and horn meals and guano, are popular amongst market gardeners in Europe. Their main merit is that they are slow-acting and need less skill for their application, but they are usually very much more expensive on a nitrogen basis than fertilizers such as sulphate of ammonia. As a source of organic matter they are negligible compared with bulky manures such as farm yard manure.

As we have observed, in the main, crops in India respond to nitrogen alone. But in some areas, or in fields where nitrogen has been used exclusively for some time, a need for phosphate may be experienced. Phosphate is also particularly useful for application to legumes. It does not produce the same outstanding visual effect that nitrogen does, but nevertheless it is important in its effect on the plant, as it promotes the development of grain and seed and also favours root growth, thus enabling the plant to draw more moisture and nourishment from the soil. It also promotes early ripening.

Although bones, either in the form of bonemeal or as bone super-phosphate, can be, and are, used as fertilizers, there is a limit to their avail-

ability, and their use for this purpose is often uneconomic, as they may be better used for the manufacture of valuable products such as bone feeding flours, gelatine, and glues.   In modern practice, therefore, the majority of phosphatic fertilizers are manufactured from mineral phosphates obtained from deposits such as occur in North Africa, Egypt or the Pacific Islands. The rock phosphate as mined, however, is not immediately available to plants, although under some conditions, if it is finely ground it can be used direct as a fertilizer.   More often, it is applied as superphosphate, which is produced by digesting the rock with sulphuric or phosphoric acid.   Other forms of phosphatic fertilizer almost as efficient as superphosphate can be prepared by the heat treatment of phosphate rock, either with or without sodium carbonate and silica.   Another most important source of phosphate used very widely in the U.K. is, of course, basic slag, obtained from iron and steel works.

The third main plant food, Potash, is needed less than phosphate in India, and this is not surprising when it is realized that one of its principal functions is to replace sunshine in promoting carbohydrate formation. Few crops in India want for sunshine and, in any case, the majority of Indian soils appear to contain adequate reserves of potash.   Nevertheless, it has important uses on crops such as potatoes and tobacco, and is beneficial on fruit.

The most important source of potash is the sulphate, although the chloride can also be used on crops other than tobacco and potatoes.   The main sources of supply pre-war were France and Germany, but during the war the Dead Sea deposits were exploited to an increasing extent.

Lime is another important material that must be present in adequate quantity in the soil, not only for its physical effects as described earlier, but also as a plant food.

In addition to these, there are a number of minor, or trace, elements, so called because, while they are essential to the health of the crop, or of the animal feeding on it, they need only be present in traces.   Examples of these trace elements are Boron, Magnesium, Manganese, Zinc, Copper, Cobalt and Molybdenum, deficiencies of which have all been recorded.   For example, striking results have been obtained from the use of cobalt in New Zealand against 'South Mains disease'.   Local manures cannot cure a deficiency of this sort already present in local soils, as they themselves will also be deficient in the nutrient in question.

As I mentioned earlier in this talk, the composition of the earth's crust is not uniform, and we do not find all the nutrients required for maximum crop production occurring adequately in all soils.

In many soils, particularly in the Tropics, the phosphate is present in an unavailable form, and such soils respond immediately to dressings of phosphatic fertilizer.   I have already mentioned the outstanding instance of the phosphate-deficient tract of North Bihar.   A similar tract occurs in Travancore.   There are other areas in the world also where most striking results have been obtained when the nutrient missing from the natural soil has been rectified.   The outstanding results obtained from superphosphate on New Zealand pastures is well known, and areas which previously were useless as cultural land have been converted into high class grazing and carrying a very large head of cattle.   In the Tennessee Valley Authority, phosphate has assumed such importance that it is known as the 'Magic Mineral'.

There is the further point that certain crops are more sensitive to deficiencies than others.   It is well known that phosphates give a marked response on legumes, even when they do not appear to be needed by other

crops.   The classic work at Cockle Park established the value of basic slag on white clover and Parr's work at New Pusa has shown how beneficial phosphate is to beseem.   Fruit trees, sugar-beet, potatoes and tobacco generally require potash fertilizers, while citrus is particularly sensitive to zinc.   Other instances occur of specific crops needing larger supplies of certain nutrients than do the normal run of crops.

It will be seen, therefore, that, if such crops are to be grown or if it is required to make use of soils deficient in a specific nutrient, this deficiency must be made good before successful results can be obtained.   A natural soil with its normal covering of vegetation is a closed cycle and cannot make good this deficiency from its own resources.   Sub-soiling may bring temporary relief in some instances, but not if the parent material is itself deficient.   Eventually, therefore, the addition of nutrients from outside is essential, particularly if, as occurs under modern conditions, a great deal of the produce of the land is sold off it for supply to the world's city dwellers, and there is a constant drain of plant nutrients from the land.

'Back to Nature' enthusiasts make much of the fertility of natural soils, as though there were something magic in the word 'natural'.   Many soils in the natural condition support a very poor vegetation, such as swamps, desert, steep hillsides, etc.   They are all natural, but they are anything but fertile, and subscribe little to the production of food although they occupy a very large portion of the earth's surface.   Fawcett [8] has estimated that of the 56 million square miles of the earth's land surface, 22 million are too cold or too dry to support crops, whilst of the remainder half consists of forest, marsh, poor grazing land, waste or mountains.   Thus in over two-thirds of the land surface of the world, natural conditions do not permit the cultivation of our food.   Why should we assume that Nature intends to be kind to us or fall in with our wishes ?   More often than not her ways are cruel, and the struggle for existence is hard and strictly competitive.   Why should we expect her to treat us differently ?   As soon as you cultivate a crop for food production, you go against Nature. Most of our lands would go back to jungle or forest if we did not interfere with her.   All the processes of cultivation are unnatural, but they are essential if we are to grow our food.   So why should we be afraid to go a step further, and supplement such plant food as Nature sees fit to provide by additional supplies of nitrogen, phosphate, potash, lime, or such trace elements as may be required ?

Perhaps at this stage, one may be permitted to ask the conundrum, when is a natural manure not a natural manure ?   We hear much of the distinction between artificial fertilizers and the so-called natural ones. But who can say that the deposits of nitrate of soda in Chile or of phosphate rock and potash salts found in various parts of the world are not natural ? Does Chilean Nitrate differ in any important manner from the synthetic product ?   One of the chief sources of nitrogen in urine is urea, always regarded as a natural organic compound until the chemist succeeded in synthesizing it.   Where then is the distinction between natural and unnatural manures ?

It is only by supplementing the plant food provided in the soil by nature that we shall be able to maintain the vastly increased populations of future ages, or for that matter, provide sufficient food to feed this generation adequately.   •

But before we examine how this can be done, let us study the various methods practised for maintaining the fertility of the soil.   A method, if it can be called such, still practised in this country, is that known as natural recuperation, in which fixation by living micro-organisms replaces the

nitrogen removed in crops and the natural losses that occur in the soil, while mineral nutrients slowly become available to plants as the result of weathering. Natural recuperation may increase the fertility of the soil if little is being removed from it, but if it is being continuously cropped it is sufficient only to produce very low yields.

Various systems have been evolved to maintain fertility and at the same time produce crops for human consumption. The most primitive of these is shifting cultivation, still practised in the Khasia hills and neighbouring areas. It consists of clearing jungle and burning it and growing a crop on the cleared area, after which it is allowed to revert to jungle. It is a wasteful system, often leading to erosion and to loss of fertility, and in any case is clearly not applicable to most conditions.

Advances on this system have been evolved in the traditional methods adopted in countries such as Egypt, China and parts of India. In the Nile Delta, soil fertility has been maintained for upwards of six thousand years, largely due to the continuous supply of plant food in silt deposited from the irrigation waters. Other early valley civilizations, including those of Mesopotamia and Mohenjo-Daro, followed this system, as did China. In China also, and in the Mediterranean, terracing techniques were evolved similar to those we see today in many parts of India.

The most striking feature of Chinese agriculture has been their use of night soil as the main source of plant food, and King in his 'Farmers of 40 Centuries'[9] has written so persuasively of this method that its disadvantages are often overlooked. It has indeed maintained the fertility of Chinese soils at a higher level than in India, but it is a closed cycle, and crop yields cannot be raised any further without the introduction of additional plant foods from outside. A much more serious disadvantage, however, is the high death and disease rate from soil and water pollution, as the result of which China has the highest death rate in the world. In Japan recently, the U.S. Army had to ban food grown on soils treated in this manner, on account of the serious health hazard from dysentery, typhoid, etc.

In modern times, other systems have been evolved, some of them improvements on traditional agriculture, and others not. To take the latter first, modern extensive agriculture as practised in North America has exploited the natural fertility of prairie soils while putting little back, and can only be described as mining the soil. The reserves of fertility were cashed in and the products, in the form of grain, exported to other countries, with the result that the soil structure deteriorated and man-made deserts and 'dust-bowls' were produced. These were caused by bad cultural methods and not, as is sometimes claimed by the Howard School, by the use of fertilizers. According to Crowther,[10] the average consumption of fertilizers in the three 'dust-bowl' States of Kansas, Colorado and Oklahoma was 1 cwt. sulphate of ammonia, 15 cwts. superphosphate and less than $\frac{1}{2}$ cwt. muriate of potash per thousand acres of crops. This infinitesimal application of fertilizers can hardly be blamed for the creation of the 'dust-bowl', and Crowther expresses the view that the remedy will probably be found in more cover crops, in the establishment of which more fertilizers will be needed.

Modern intensive agriculture, however, as practised in England, Germany and other countries of N.W. Europe, is characterized by the use of considerable amounts of inorganic fertilizers in addition to farm yard manure or other local manures, and by the deliberate use of grazing animals and of grassland as a means of maintaining soil fertility.

This system has resulted in a high level of soil fertility being built up and maintained, and Richardson[2] has drawn the interesting comparison between the three main methods of maintaining soil fertility by using their average yields of wheat, expressed in bushels per acre, as an index of the level of fertility achieved.   Under natural recuperation, the average yields are India 10, Russia 12, Australia 12, U.S.A. 13, Canada 13 and Argentina 13. For comparison the wheat yield in medieval England was 10, and that on the continuously unmanured plot of the Broadbalk experiment at Rothamsted 12.

Under natural recuperation plus local manures, average yields were China 16, France prior to 1880—16, Italy 21, Japan 25.   While under intensive agriculture (natural recuperation plus local manures plus inorganic fertilizers) yields were New Zealand 31, Germany 32, Great Britain 33, Belgium 38, Netherlands 45.

It would therefore appear that 12 bushels wheat per acre represents the level of soil fertility that can be maintained under the first method, 20 bushels under the second and 35 bushels under the third.   Here it is interesting to note that the consumption of fertilizers in cwts. per acre arable land in European countries in 1936 was: Holland 2·16, Belgium 1·17, Germany 0·86, Denmark 0·41, U.K. 0·38, whereas in the Middle West of U.S.A. it was 0·02,[10] and in India it had only reached 0·008 cwts. by 1939.

A comparison on the basis of paddy yields would be of more interest to India, but would not cover as wide an area and figures are difficult to obtain.   It is known, however, that the average yield of clean rice in India pre-war was 775 lbs. per acre, as compared with 4,500 lbs. in Italy and 3,000 lbs. in Japan.   It is also known that pre-war Japan used nearly 4 million tons of fertilizers,[1] mainly sulphate of ammonia and superphosphate, almost wholly on her 16 million acres of arable land and that, of this a large proportion was sulphate of ammonia used on rice.   Another country which showed an enormous increase in fertilizer consumption was Russia, where the tonnage used rose from practically nil to 4 million tons in the 10 years prior to the war.

The results obtained by modern intensive agriculture are no doubt good, but they do not represent the limits attainable.   Very high crop yields have been obtained under glass house conditions, and by soil-less cultivation of crops, as would appear from the reports received from the Hydroponics Centre at Kalimpong and elsewhere.   In the field, also, yields much higher than are obtained by the ordinary farmer are possible, and in an official survey in the U.S.A.[11] maximum yields in bushels per acre were obtained of wheat 117, barley 112·5, oats 183·7, maize 174.   In hydroponics even higher yields have been obtained, for example 2–300 tons tomatoes and 66 tons potatoes per acre.

What then is possible in India ?   In a competition organized in pre-war years by the Maharashtra Chamber of Commerce, a crop of sugarcane yielding 100 tons per acre was grown, as compared with an average for the country of 15–20 tons per acre, and for the Bombay-Deccan of 40–50 tons. Cane, of course, is very responsive to nitrogen, and carefully conducted experiments in India have shown that, on an average, 1 maund sulphate of ammonia will produce an increase in yield of·52 mds. cane, equivalent to 5 mds. sugar.   But cane is not the only crop which gives big responses to nitrogen.   Sir John Russell[12] deduced from the results of the many experiments conducted in India which he surveyed during his visit in 1937, that 1 md. sulphate of ammonia used in conjunction with a light dressing of f.y.m. or compost produces increases of 4½ mds. paddy, 3 mds. wheat or

15 mds. potatotes. It is worthy of note that the increase in yield of paddy is much the same as found in Japan.

These figures give an indication of the increases in yield that could be obtained from fertilizers on present day India's 55 m. acres rice and 24 m. acres wheat. The Institute of International Affairs' 'Food Plan' [1] estimated that by applying nitrogenous fertilizers at an average rate of 16 to 20 lbs. nitrogen per acre, in conjunction with organic manures and with phosphate where necessary, on the 40% of the arable acreage of India where a satisfactory water-supply could be assured, India's food grain supply could be increased by not less than 20%, say 12 to 15 m. tons per annum. Their figures, of course, referred to India before partition. Such a plan, they considered, would involve 600,000 tons of fertilizer nitrogen (equivalent to 3 million tons sulphate of ammonia) and later the necessary tonnage of phosphate. A considerable stepping up of fertilizer production in this country would therefore be necessary, as the Government of India's plans so far visualize the manufacture of only 400 to 450,000 tons sulphate of ammonia per annum.

So far, our discussion has confined itself to the effect of fertilizers on yield only, and we have not considered their effect on quality. So much has been said on this subject by the Howard School of thought that it is difficult not to be controversial. One important practical point must, however, be borne in mind. It is no use producing food of high quality if it is not available in sufficient quantity. The Pattern Dietary Scales for the Far East [1] lay down a ration of 2,800 calories as necessary for a man in moderate work and 1,700 calories as an emergency ration. Until we have produced the quantity of food to allow every one in India to have a full diet, it is pointless to argue on the finer aspects of quality.

Perhaps before we go any further we should attempt to define what we mean by quality. Quality means in the last issue, suited to its purpose, and in foodstuffs it is essential that there should be adequate quantities of carbohydrates, fats, proteins, mineral salts and vitamins. Some of these factors can be influenced beneficially by the use of fertilizers. For example, the protein content of fodder crops can be increased by nitrogenous top dressings, and the phosphate content can be improved by applying phosphatic fertilizers. Potash is often associated with quality in fruit.

But it is on the subject of vitamins that the Howard School make assertions that need contesting. Hitherto a certain amount of mystery attached to vitamins, but a great deal has been learned about them now, and it is accepted that they are best included in the diet in the so-called protective foods, milk, animal fats, eggs, grain germ, yeast, fruits and vegetables. If an ample and sufficiently varied diet including these protective foods is consumed, the supply of vitamins and minerals will usually look after themselves. In humid climates such as that of Bengal, however, the soils are heavily leached of minerals and crops tend to be low in them, and so of low nutrient value. It may be necessary, therefore, to combat this by either supplementing the diet of the plant, or of the animal or human being feeding on it, with additional minerals.

Compost enthusiasts argue that, on the analogy of the importance of vitamins in animal nutrition and hormones in plant and animal physiology, similar materials ought to be important in feeding plants. They may be, although soil-less cultivation would indicate that they are not essential. It is interesting to speculate on this problem, and it needs investigating but to go a stage further, as Howard has done, and argue that only crops grown on compost contain adequate vitamins is not permissible.

The assertion that plants grown on artificials are not as nutritious as those grown wholly on organic manures and cause the animals feeding on them to be more prone to disease, is based on no valid data. There is a lot of hearsay evidence, but no properly conducted comparisons have been carried out. A frequent error is to confuse the effect of an unbalanced diet and say that it is due to the crop having been grown on artificials. It is an accepted fact that a diet deficient in protective factors such as vitamins, minerals, protein, etc., is unsatisfactory and may lead to disease. There is no evidence that food grown on balanced manures is deficient in these factors. Wheat at Rothamsted grown on fields heavily fertilized for many years was examined at Cambridge for its content of vitamin B_1 and was found to be in no way inferior to wheat grown continuously on farm yard manure for the same period. Similar results were found for barley and potatoes, which showed no difference in vitamin C content, whether grown with dung or sulphate of ammonia.

Now let us consider the question of plant disease. It is well known that unbalanced manuring favours disease and that excess nitrogen, whether in the organic or in the inorganic form, predisposes a plant to disease. There is no sound evidence from proper experimental investigation, however, to show that plants grown with balanced fertilizers in the presence of organic matter are more susceptible to disease than those grown on compost alone. The confusion is again due to an illogical linking of supposed cause and effect.

The earth was subjected to many scourges due to plant disease, long before inorganic fertilizers became widely used. One that springs to the mind was that causing the potato famine in Ireland in 1845.[13] At the time it was called the Murrain, but was later identified as Late Blight of potatoes, phytopthera infestans. This disease was not caused by artificial fertilizers. Later it was found that it could be controlled by sprays containing copper, which is now standard practice wherever large crops of potatoes are grown. The world production of potatoes would be very small indeed if fungicides were not used against blight or insecticides against such serious pests as the colorado beetle. A more recent instance of plant disease was the damage caused in 1946 to wheat in Central India by rust. The use of inorganic fertilizers in this area was infinitesimal, even less than the 0·008 cwts./acre for the whole of India quoted earlier, and evidently not the reason for the attack.

Padwick has estimated that pests and diseases account for a loss of 4 million tons rice per annum in present-day India. The blame for this cannot be laid at the door of inorganic fertilizers, as their use on paddy is still extremely small in relation to the area.

One of the chief causes of diseases in plants, nowadays, is the modern custom of growing large areas of a single crop contiguously. This clearly favours the development of insect pests or fungus disease. Their spread was countered to a certain extent in earlier days, and still is in some areas, by the practice of mixed cropping, whereby more than one crop is grown at the same time on a single plot of land. This breaks the continuity and checks the spread of disease. It is a method possible, however, only where harvesting is carried out by hand and not by machine, and where conditions permit growing more than one crop at a time. It is not applicable to rice cultivation.

When considering the incidence of disease, there is the further point to be borne in mind that nowadays we know more about diseases, their symptoms and their causes, than our ancestors did. We can therefore recognize the reason for a plant's ill health, where previously it passed

unnoticed.   That specific diseases were not widely reported in earlier days
is not to say that they did not exist.   This applies to human beings and
animals, as well as to plants.   It is common to say we are not as healthy as
our forebears were.   But it is a fact that the average expectation of life
in many countries nowadays is far higher than it was; and as regards
stature, it is interesting to examine suits of armour of 6 or 700 years ago
and note how much smaller their occupants must have been than
modern man.

The lowest death rates and infant mortality rates were found pre-war in
countries such as New Zealand, Denmark and Holland, where the consump-
tion of fertilizers per head of population was highest.   When every one has
sufficient to eat and the general level of health is up to the standard of these
countries, we may concern ourselves with the finer points of different methods
of manuring.   Until then, let us make the fullest use of methods tried out
and tested in these countries, and bend all our efforts to producing the
maximum quantity of food that this country can grow.

I will now, if I may, summarize the points we have discussed in this
paper.   In the first place, we examined the way soils are formed, and
appreciated the effect of the lack of uniformity of the parent material on
the properties of the soil itself, leading to differential needs of different
soils.   We also recognized the importance of colloidal material in the soil,
and the contribution which organic matter makes to this.   Organic matter
is also important for its beneficial effect on the physical condition of the
soil and for the part it plays in the nitrogen cycle.   The value of
compost was recognized, but it was appreciated that this was only one
of many ways of returning organic matter to the soil.   The import-
ance of supplementing organic matter with additional plant nutrients,
according to the requirements of the soil and/or the plant, was made clear if
our land was to produce the additional supplies of food required to feed
every one adequately and to cater for the ever-increasing population of this
country.   Various systems of maintaining soil fertility were examined, and
it was found that the modern intensive method of utilizing as much organic
matter as is available, and supplementing this with inorganic fertilizers,
held the best promise of solving the world's food problem.   It was also
noted that the highest standards of health were maintained in those countries
using the largest quantities of fertilizers.

In conclusion, I would re-emphasize what I said at the beginning of
this talk of the importance of utilizing every means available to us for
increasing food production, while, at the same time, maintaining the fertility
of the soil.   The situation is far too urgent for effort to be dissipated in
chasing unproven theories.   Any reasonable theory must of course be
investigated but, in the meantime, we must not check food production by
desisting from methods which have been proved to be sound.

The value of these methods was endorsed by the Food Agricultural
Organization of the United Nations at Copenhagen in 1946, and as a last
word I can do no better than quote the President of the Agricultural section
of the British Association, who, in his Presidential Address in August 1947,[14]
said 'Probably more can be done for the improvement of health in the
world today by providing ample supplies of food than in any other way,
and the propagation of unfounded beliefs about the harmful effects of
fertilizers is detrimental to the interests of the whole community'.*

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* Paper read at the Society on 11th March, 1948.

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SOME NOVEL PROPERTIES OF CYCLIDES AND HYPER-CYCLIDES

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Abstract

The present paper consists of two sections, devoted respectively to an analysis of certain novel geometrical properties of a cyclide and a hyper-cyclide.

The prominent result on cyclides, proved in Sec. I, is that, for the average type of cyclide, the five centres of inversion, taken in combination with the feet of the five sets of normals that can be drawn from them to the *related* focal quadrics, are all situated on a certain twisted (unicursal) cubic, whose triad of ' points at infinity ' forms a triangle, self-conjugate with respect to the fixed (imaginary) ' *circle at infinity* '.

The corresponding proposition on hyper-cyclides, established in Sec. II, is that, for the general type of an n-cyclide of an $(n+1)$-space, the $(n+3)$ ' centres of inversion ', taken in conjunction with the feet of the $(n+3)$ sets of normals that can be drawn from them to the associated ' focal n-quadrics ', are all situated on a unicursal curve (of degree $n+1$), whose $(n+1)$ points at infinity determine on the n-flat at infinity a ' *simplex* ', self-conjugate with respect to the fixed ' $(n-1)$-*sphere at infinity* '.

Apropos of this, it may be remarked that, while on the one hand the ' n-cyclide ' of an $(n+1)$-space is the natural *analogue* of the ordinary cyclide of a 3-space, the corresponding two-dimensional analogue is a bi-circular quartic, including its degenerate variety, i.e. a circular cubic. In point of fact, the *two-dimensional* analogues of some of the results of this paper have been considered previously in my paper on *Circular Cubics and Bi-circular Quartics* (vide *Journal of the National Academy of Sciences, 1948*). (In the press.)

A very decent proportion of the investigations of this paper is believed to be original.

Introduction

This paper is divided into two sections, dealing respectively with the cyclides of a 3-space and the n-cyclides of an $(n+1)$-space.

Sec. I concerns itself with the relative geometrical configurations of the five centres of inversion of an ordinary cyclide, and the feet of the normals that can be drawn from them to the respective focal quadrics of the surface. Incidentally a certain unicursal cubic curve, intrinsically related to the cyclide, has been talked about, and some of its geometrical features have been scrutinized.

As for Sec. II, its subject-matter is a *natural* generalization of that of Sec. I to multi-dimensional geometry, for an ' n-cyclide ', lying in an $(n+1)$-space, is nothing but the *analogue* or *prototype* of the ordinary cyclide of a 3-space. As a matter of fact, for an n-cyclide of an $(n+1)$-space, the centres of inversion (numbering $n+3$) and the feet of the normals drawn from them to the respective focal n-quadrics have been taken into account, and their mutual relations examined. Finally a

certain unicursal curve (of degree $n+1$), covariantly related to an n-cyclide, has been introduced and commented upon from a projective standpoint.

SECTION I

(*Ordinary Cyclides (of a 3-space)*)

ART. 1. As is well known, a cyclide Γ—definable in the first instance as a quartic surface, having the imaginary ' circle at infinity ' for a double curve—possesses, in general, five ' spheres of inversion ' (say, Π, Π_1, Π_2, Π_3, Π_4) and five associated ' focal quadrics ' (say, Σ, Σ_1, Σ_2, Σ_3, Σ_4) related to one another in such a way that Γ can be generated as the envelope of the ∞^2 spheres, whose centres move on any of the five focal quadrics (say, Σ_p), and which intersect at right angles the *corresponding* sphere of inversion, viz. Π_p. If, as a matter of fact, one of the focal quadrics Σ and the associated sphere Π be represented in the respective Cartesian forms :

$$\frac{x^2}{a^2}+\frac{y^2}{b^2}+\frac{z^2}{c^2} = 1 \quad \text{and} \quad (x-\alpha)^2+(y-\beta)^2+(z-\gamma)^2 = k^2, \quad .. \quad (\text{I})$$

the equation of Γ is easily obtained in the form :

$$(x^2+y^2+z^2+k'^2)^2 = 4a^2(x-\alpha)^2+4b^2(y-\beta)^2+4c^2(z-\gamma)^2, \quad .. \quad (\text{II})$$

where $k'^2 = k^2-\alpha^2-\beta^2-\gamma^2$.

By elementary algebraic manipulations, (II) can be carried over into each of the four (equivalent) forms, viz.

$$(x^2+y^2+z^2+k'_p{}^2)^2 = 4a_p{}^2(x-\alpha_p)^2+4b_p{}^2(y-\beta_p)^2$$
$$+4c_p{}^2(z-\gamma_p)^2, \quad (p = 1, 2, 3, 4), \quad .. \quad (\text{III})$$

provided that the new tetrads of constants :

$$\{a_p\}, \{b_p\}, \{c_p\}, \{\alpha_p\}, \{\beta_p\}, \{\gamma_p\} \text{ and } \{k'_p\}$$

are defined by

$$\begin{aligned} a_p{}^2 = a^2+\lambda_p, \ b_p{}^2 = b^2+\lambda_p, \ c_p{}^2 = c^2+\lambda_p, \ k'_p{}^2 = k'^2+2\lambda_p, \\ \alpha_p = \frac{a^2\alpha}{a^2+\lambda_p}, \ \beta_p = \frac{b^2\beta}{b^2+\lambda_p}, \ \gamma_p = \frac{c^2\gamma}{c^2+\lambda_p}, \end{aligned} \right\} \quad .. \quad (\text{IV})$$

(for the values of p ranging from 1 to 4), and that λ_1, λ_2, λ_3, λ_4 are the four *non-zero* roots of the quintic equation in λ, viz.

$$\lambda^2+\lambda k'^2+a^2\alpha^2+b^2\beta^2+c^2\gamma^2 - \frac{a^4\alpha^2}{a^2+\lambda} - \frac{b^4\beta^2}{b^2+\lambda} - \frac{c^4\gamma^2}{c^2+\lambda} = 0. \quad .. \quad (\text{V})$$

Comparison of the two Cartesian forms (II) and (III) of Γ leads to the conclusion that the remaining focal quadrics (Σ_1, Σ_2, Σ_3, Σ_4) and their associated spheres of inversion (Π_1, Π_2, Π_3, Π_4) are given by

$$\frac{x^2}{a_p{}^2}+\frac{y^2}{b_p{}^2}+\frac{z^2}{c_p{}^2} = 1 \quad \text{and} \quad (x-\alpha_p)^2+(y-\beta_p)^2+(z-\gamma_p)^2 = k_p{}^2,$$

it being understood that

$$k_p{}^2 = k'^2+2\lambda_p+\frac{a^4\alpha^2}{(a^2+\lambda_p)^2}+\frac{b^4\beta^2}{(b^2+\lambda_p)^2}+\frac{c^4\gamma^2}{(c^2+\lambda_p)^2},$$

and that p ranges, as usual, from 1 to 4.

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Manifestly the first three relations of (IV) reveal the *confocal* character of the five focal quadrics Σ, Σ_1, Σ_2, Σ_3, Σ_4—a fact which could be otherwise foreseen from geometrical considerations. Furthermore, the cyclide Γ can be easily verified to invert into itself w.r.t. each of the spheres Π, Π_1, Π_2, Π_3, Π_4— a fact which justifies their appellation ' *spheres of inversion* '.

We record here, for future use, the subsidiary equalities:

$$a_p^2\alpha_p = a^2\alpha,\ b_p^2\beta_p = b^2\beta,\ c_p^2\gamma_p = c^2\gamma, \qquad .. \qquad .. \quad (\text{VI})$$

which follow automatically from (IV).

For brevity's sake, the five symbols A, A_1, A_2, A_3, A_4 will henceforth be used to denote respectively the five centres of inversion :

$$(\alpha, \beta, \gamma),\ (\alpha_1, \beta_1, \gamma_1),\ (\alpha_2, \beta_2, \gamma_2),\ (\alpha_3, \beta_3, \gamma_3) \text{ and } (\alpha_4, \beta_4, \gamma_4).$$

Our next task is to take account of the normals that can be drawn from the five centres of inversion $\{A_p\}$ to the five corresponding focal quadrics $\{\Sigma_p\}$.

ART. 2. We know from Solid Geometry that the feet of the six normals that can be drawn from the point A (α, β, γ) to the quadric Σ :

$$\frac{x^2}{a^2}+\frac{y^2}{b^2}+\frac{z^2}{c^2} = 1, \quad .. \qquad .. \qquad .. \qquad .. \quad (1)$$

lie on a unicursal cubic curve (Ξ), which admits of the parametric representation :

$$x = \frac{a^2\alpha}{a^2+t},\ y = \frac{b^2\beta}{b^2+t},\ z = \frac{c^2\gamma}{c^2+t}, \qquad .. \qquad .. \quad (2)$$

(t being the parameter). There is no difficulty in shewing that the curve Ξ possesses three perpendicular asymptotes, which are parallel respectively to the three axes of the quadric Σ. This relation, interpreted by aid of the commonplace lemmas of Projective Geometry, leads to the undermentioned property of the curve Ξ :—

The three points at infinity on the cubic curve Ξ determine (on the plane at infinity) a triangle, self-conjugate with respect to the ' circle at infinity ' as well as to the ' conic at infinity ', attaching to the quadric Σ. .. THEOREM A

Regard being now had to the relations (VI) of Art. 1, it is evident that the parametric equations (2) of (Ξ) can be alternatively put in the form

$$x = \frac{a_p^2\alpha_p}{a_p^2+t'},\ y = \frac{b_p^2\beta_p}{b_p^2+t'},\ z = \frac{c_p^2\gamma_p}{c_p^2+t'}, \quad (p = 1, 2, 3, 4), \quad .. \quad (3)$$

it being tacitly understood that t' ($\equiv t-\lambda_p$) is the *new* parameter. Inasmuch as the curve Ξ remains *essentially the same*, no matter t or t' is regarded as the parameter, we infer immediately that Ξ must pass also through the feet of the normals that can be drawn from each of the other four points A_1, A_2, A_3, A_4 to the corresponding focal quadric. Remarking that a unicursal twisted cubic (lying in a 3-space) can be made to pass through more than *seven* points only in *very special cases*, we can finalize our conclusions in the following form :—

For a cyclide Γ of the most general type, the 35 points consisting of the five centres of inversion A, A_1, A_2, A_3, A_4 and the feet of the five hexads of normals that can be drawn from them to the respective focal quadrics Σ, Σ_1, Σ_2, Σ_3, Σ_4 are all situated on one and the same twisted cubic Ξ. Furthermore, Ξ goes through the common centre of the said (confocal) quadrics, and

has its three asymptotes parallel respectively to their (common) principal axes.   ..   ..   THÉOREM B

SECTION II

(n-Cyclides in an (n+1)-space)

ART. 3. $(x_0, x_1, x_2, \ldots\ldots x_n)$ being the $(n+1)$ rectangular Cartesian co-ordinates of an arbitrary point in an $(n+1)$-space, it is well known—

   (a) that an *n-surface* Γ is the locus of the ∞^n points, whose co-ordinates conform to a *single* relation of the form :

$$f(x_0, x_1, x_2, \ldots\ldots x_n) = 0, \quad .. \qquad .. \qquad .. \qquad (1)$$

and that Γ reduces to an *n flat* or an *n-sphere*, according as (1) assumes one or the other of the *special* forms :

$$a_0 x_0 + a_1 x_1 + a_2 x_2 + \ldots\ldots + a_n x_n = \text{const.} .. \qquad .. \qquad (2)$$

or $$(x_0 - \alpha_0)^2 + (x_1 - \alpha_1)^2 + (x_2 - \alpha_2)^2 + \ldots + (x_n - \alpha_n)^2 = k^2 ; \quad .. \qquad (3)$$

   (b) that an $(n-1)$-*surface* Ω is the locus of the ∞^{n-1} points, whose co-ordinates fulfil *two* independent relations, e.g. (1) and

$$\phi(x_0, x_1, x_2, \ldots\ldots x_n) = 0 ; \quad .. \qquad .. \qquad .. \qquad (4)$$

and   (c) that, in particular, the $(n-1)$-surface Ω is called an '$(n-1)$-*sphere*', when the two defining equations (1) and (4) represent respectively an '*n-sphere*' and an '*n-flat*'.

As observed in my paper on *Extensions of Robert's theorems and analogous theorems in hyper spaces* (as yet unpublished), an arbitrary n-sphere intersects the n-flat at infinity (const. $= 0$) all along a fixed (imaginary) '$(n-1)$-*sphere at infinity*'. It is remarkable that, when $n = 2$, the result last mentioned reduces to the well-known result of Projective Geometry, viz. that all spheres of a 3-space cut the plane at infinity along a *fixed* circle, often called the '*circle at infinity*'.

Naturally, then, it is quite open to us to define an '*n-cyclide*' in an $(n+1)$-space as an *n-surface* (of the fourth degree), having every point of the fixed '$(n-1)$-*sphere at infinity*' as a double point. A little reflection shows that this definition of an *n-cyclide* leads to the following symbolic form of its Cartesian equation :

$$U^2 + U V_1 + W_2 + W_1 + W_0 = 0, \qquad .. \qquad .. \qquad (5)$$

it being implied that

$$U = \sum_{r=0} x_r^2,$$

and that W_2, W_1, W_0 and V_1 are homogeneous functions of the set of variables $(x_0, x_1, x_2, \ldots x_n)$ of degrees indicated by the corresponding suffixes. Certainly W_0 is a mere constant, and the aggregate number of *arbitrary* (and hence *disposable*) constants, that appear in the typical equation (5) of the '*n-cyclide*', is

$$= \frac{n^2 + 7n + 8}{2} . \quad .. \qquad .. \qquad .. \qquad .. \qquad (6)$$

In the next article we shall see directly how the *general* '*n-cyclide*', defined as above, can be generated by means of an *assigned* n-quadric and an *assigned* n-sphere.

ART. 4.   Let Π and Σ denote respectively the n-sphere and the n-quadric, viz.

$$\sum_{r=0}^{r=n} (x_r - \alpha_r)^2 = k^2 \text{ and } \sum_{r=0}^{r=n} \frac{x_r^2}{a_r^2} = 1. \quad .. \quad (1), (2)$$

Then the *general* equation of the system of ∞^n n-spheres, whose centres move on Σ and which cut Π orthogonally, can be brought to the form:

$$\sum_{r=0}^{r=n} (\xi_r - x_r)^2 = \sum_{r=0}^{r=n} (x_r - \alpha_r)^2 - k^2, \quad .. \quad .. \quad (3)$$

where $(\xi_0, \xi_1, \xi_2, \ldots \xi_n)$ are the *current* co-ordinates, and $(x_0, x_1, x_2, \ldots x_n)$ are $(n+1)$ variable parameters, subject to the *single* relation (2).

If we now introduce the notations, viz.

$$U = \sum_{r=0}^{r=n} \xi_r^2, \; k'^2 = k^2 - \sum_{r=0}^{r=n} \alpha_r^2 \text{ and } V = U + k'^2, \quad .. \quad (4)$$

so that, as a matter of course,

$$V = \sum_{r=0}^{r=n} \xi_r^2 + k'^2,$$

the *general* equation (3) to the variable n-sphere becomes

$$\sum_{r=0}^{r=n} x_r(\xi_r - \alpha_r) = \frac{V}{2}. \quad .. \quad .. \quad .. \quad (5)$$

Bearing in mind that (2) is the *only* condition to be satisfied by the otherwise arbitrary parameters $(x_0, x_1, x_2, \ldots x_n)$ we may apply Lagrange's method of *undetermined multiplier* to ascertain the envelope of (5), subject to the condition (2).   So differentiating (5) and (2) w.r.t. $\{x_r\}$ we come across $(n+1)$ equations of the type :

$$\xi_r - \alpha_r = \mu \cdot \frac{x_r}{a_r^2}, \quad (r = 0, 1, 2, \ldots, n) \quad .. \quad .. \quad (6)$$

where μ is an *undetermined* multiplier.

Manipulating (2), (5) and (6), we get

$$\frac{V}{2} = \sum_{r=0}^{r=n} x_r \left(\mu \frac{x_r}{a_r^2} \right) = \mu. \quad .. \quad .. \quad .. \quad (7)$$

Similarly coupling (6) with (2), we obtain

$$a_r(\xi_r - \alpha_r) = \mu \frac{x_r}{a_r} \text{ and } \therefore \sum_{r=0}^{r=n} a_r^2(\xi_r - \alpha_r)^2 = \mu^2. \quad .. \quad (8)$$

Elimination of μ from (7) and (8) gives rise to

$$\frac{V^2}{4} = \sum_{r=0}^{r=n} a_r^2(\xi_r - \alpha_r)^2,$$

i.e.

$$\left(\sum_{r=0}^{r=n} \xi_r^2 + k'^2 \right)^2 = 4 \sum_{r=0}^{r=n} a_r^2(\xi_r - \alpha_r)^2. \quad .. \quad .. \quad (9)$$

Summing up the above set of results, we arrive at the following proposition :—

When $(\xi_0, \xi_1, \xi_2, \ldots \xi_n)$ *are looked upon as the* $(n+1)$ *current co-ordinates of an* $(n+1)$*-space, the n-surface (say,* Γ*) represented by the Cartesian equation* (9) *is none other than the envelope of the* ∞^n *n-spheres, whose centres move freely on the given n-quadric* Σ*, viz.*

$$\sum_{r=0}^{r=n} \frac{x_r^2}{a_r^2} = 1, \qquad \qquad \qquad (2)$$

and which intersect orthogonally the given n-sphere Π*, viz.*

$$\sum_{r=0}^{r=n} (x_r - \alpha_r)^2 = k^2. \qquad \qquad \qquad (1)$$

Needless to say, the two constants k, k' are interrelated, the connecting link between them being the second of the relations (4).

ART. 5. If we now change symbols and restore the familiar notation $(x_0, x_1, x_2, \ldots x_n)$ for the *current* co-ordinates of a point, the Cartesian equation (9) (of the foregoing article), representing the envelope Γ, assumes the form :

$$\left(\sum_{r=0}^{r=n} x_r^2 + k'^2 \right)^2 = 4 \sum_{r=0}^{r=n} a_r^2 (x_r - \alpha_r)^2, \qquad (1)$$

which may be thrown into the abridged form :

$$V^2 = W, \qquad \qquad \qquad (2)$$

when V and W are respectively the expressions for an n-sphere and an n-quadric, as defined by

$$V = \sum_{r=0}^{r=n} x_r^2 + k'^2 \quad \text{and} \quad W = 4 \sum_{r=0}^{r=n} a_r^2 (x_r - \alpha_r)^2. \qquad (3)$$

As in Art. 4, the n-quadric Σ and the n-sphere Π are supposed to be given by

$$\sum_{r=0}^{r=n} \frac{x_r^2}{a_r^2} = 1 \quad \text{and} \quad \sum_{r=0}^{r=n} (x_r - \alpha_r)^2 = k^2 \qquad \qquad (4)$$

and the constants k and k' to abide by the relation :

$$k'^2 = k^2 - \sum_{r=0}^{r=n} \alpha_r^2. \qquad \qquad \qquad (5)$$

An obvious geometrical interpretation of the symbolic equation (2) is that *every* point on the section of the n-sphere $(V = 0)$, made by the n-flat at infinity (const. $= 0$) or, what is the same thing, every point on the fixed imaginary '$(n-1)$-*sphere at infinity*' is a *double point* on the enveloping surface Γ, defined by (2). So in accordance with the nomenclature adopted already in Art. 3, the n-surface Γ must be designated as an 'n-*cyclide*'. Due note being taken of the fact that the total numbers of constants, involved in the *arbitrary* selection of the initial n-sphere Π and n-quadric Σ, are respectively

$$n+2 \quad \text{and} \quad \frac{n^2 + 5n + 4}{2},$$

it is crystal-clear that the total number of *arbitrary* constants that enter in the structure of the envelope Γ, derived as above from Π and Σ, is

$$= (n+2)+\frac{n^2+5n+4}{2}=\frac{n^2+7n+8}{2}. \qquad \cdot \cdot \qquad \cdot \cdot \qquad (6)$$

Comparing this relation with (6) of Art. 3, we readily realize that the number of *arbitrary* constants occurring in the envelope Γ is precisely the same as that of the *arbitrary* constants, attaching to the *unrestricted* type of *n*-cyclide. The inevitable conclusion is that *every n-cyclide admits of generation as the envelope of the system of ∞^n n-spheres, whose centres move on a given n-quadric and which intersect a given n-sphere at right angles.*

The reader can easily verify that Γ inverts into itself w.r.t. the *n*-sphere Π, which must accordingly be called an '*n-sphere of inversion*'. Further defining (after the manner of Plücker) a focus of an *n*-surface Γ as an infinitesimal *n* sphere, having double contact with it, and attending to the geometrical mode of generation of an *n*-cyclide (considered as above), we promptly perceive that *every* point on the $(n-1)$-surface, formed by the intersection of Π and Σ, is a 'focus' of Γ. Accordingly, Γ must be spoken of as a 'focal *n*-quadric' of Γ.

In the succeeding article we shall investigate the other *n*-spheres of inversion and focal *n*-quadrics that belong to a given *n*-cyclide.

ART. 6. Starting with an *assigned n*-sphere of inversion Π and an *assigned* focal *n*-quadric Σ (related to it) in the respective Cartesian forms :

$$\sum_{r=0}^{n} (x_r-\alpha_r)^2 = k^2 \text{ and } \sum_{r=0}^{r=n} \frac{x_r^2}{a_r^2}=1, \qquad \cdot \cdot \qquad \cdot \cdot \qquad (1)$$

and proceeding as in Art. 4 or 5, we derive the Cartesian equation of the cyclide Γ in the form :

$$\left(\sum_{r=0}^{r=n} x_r^2+k'^2\right)^2 = 4 \sum_{r=0}^{r=n} a_r^2(x_r-\alpha_r)^2. \qquad \cdot \cdot \qquad \cdot \cdot \qquad (II)$$

where

$$k'^2 = k^2 - \sum_{r=0}^{r=n} \alpha_r^2. \qquad \cdot \cdot \qquad \cdot \cdot \qquad \cdot \cdot \qquad (1)$$

Plainly (II) is the same as

$$\left(\sum_{r=0}^{r=n} x_r^2+k'^2+2\lambda\right)^2 = 4 \sum_{r=0}^{r=n} a_r^2(x_r-\alpha_r)^2+4\lambda^2$$

$$+4\lambda \sum_{r=0}^{r=n} x_r^2+4\lambda k'^2. \qquad \cdot \cdot \qquad (2)$$

whatever be the parameter λ.

The R.S. being

$$= 4 \sum_{r=0}^{r=n} (a_r^2+\lambda)\left(x_r-\frac{a_r^2\alpha_r}{a_r^2+\lambda}\right)^2+4 \sum_{r=0}^{r=n} a_r^2\alpha_r^2-4 \sum_{r=0}^{r=n} \frac{a_r^4\alpha_r^2}{a_r^2+\lambda}+4\lambda^2+4k'^2\lambda.$$

it is manifest that, if λ be restricted to fulfil the relation :

$$\lambda^2+k'^2\lambda+\sum_{r=0}^{r=n} a_r^2\alpha_r^2-\sum_{r=0}^{r=n} \frac{a_r^4\alpha_r^2}{a_r^2+\lambda}=0, \qquad \cdot \cdot \qquad \cdot \cdot \qquad (III)$$

the equation (2) or (II) assumes the simplified form :

$$\left(\sum_{r=0}^{r=n} x_r^2 + k'^2 + 2\lambda \right)^2 = 4 \sum_{r=0}^{r=n} (a_r^2 + \lambda) \left(x_r - \frac{a_r^2 \alpha_r}{a_r^2 + \lambda} \right)^2. \quad \ldots \text{(IV)}$$

The *similarity* between the algebraic forms of (II) and (IV) at once suggests that, λ being conditioned as before to satisfy the relation (III), the original n-cyclide Γ, as represented by (II), will also have the new n-sphere and n-quadric, viz.

$$\sum_{r=0}^{r=n} \left(x_r - \frac{a_r^2 \alpha_r}{a_r^2 + \lambda} \right)^2 = k'^2 + 2\lambda + \sum_{r=0}^{r=n} \frac{a_r^4 \alpha_r^2}{(a_r^2 + \lambda)^2}, \quad \ldots \text{(V)}$$

and

$$\sum_{r=0}^{r=n} \frac{x_r^2}{a_r^2 + \lambda} = 1 \quad .. \qquad .. \qquad .. \qquad .. \text{(VI)}$$

respectively for an ' n-sphere of inversion ' and a ' *focal n-quadric* '.

It is clear on all hands that the algebraic equation (III) of degree $(n+3)$ in λ has $(n+3)$ roots, of which one is *zero*. The logical conclusion is that the n-cyclide Γ has altogether $(n+3)$ pairs of ' n-spheres of inversion ' and ' *focal n-quadrics* ', one of these pairs being (Π, Σ).

It is scarcely necessary to remark that the actual equations of the $(n+3)$ pairs of ' n-spheres of inversion ' and ' focal n-quadrics ' of the n-cyclide Γ, as represented by (II), are none else than (V) and (VI), provided that λ is put successively equal to the *different* roots (numbering $n+3$) of the equation (III).

ART. 7. Now we shall first make a short digression on the set of normals that can be drawn from a given point C $(\alpha_0, \alpha_1, \alpha_2, \ldots, \alpha_n)$ to a given n-quadric Σ, viz.

$$\sum_{r=0}^{r=n} \frac{x_r^2}{a_r^2} = 1. \quad .. \qquad .. \qquad .. \qquad .. \quad (1)$$

By a slight extension of the method, usually adopted in the case of the corresponding problem for an ellipsoid, it is easily seen that altogether $2(n+1)$ normals can be drawn to Σ from C and that their feet are designable simply as the intersections of the n-quadric (Σ) with the unicursal curve Ξ (of degree [*] $n+1$), definable by

$$\left(x_0 = \frac{a_0^2 \alpha_0}{a_0^2 + t}, \; x_1 = \frac{a_1^2 \alpha_1}{a_1^2 + t}, \; x_2 = \frac{a_2^2 \alpha_2}{a_2^2 + t}, \ldots, x_n = \frac{a_n^2 \alpha_n}{a_n^2 + t} \right), \quad .. \quad (2)$$

it being understood that t is a variable parameter.

Returning now to the topic of the previous article and retaining the notations and conventions used therein, we can assert that (1) is one of the ' focal n-quadrics ' of the n-cyclide Γ, given by

$$\left(\sum_{r=0}^{r=n} x_r^2 + k'^2 \right)^2 = 4 \sum_{r=0}^{r=n} a_r^2 (x_r - \alpha_r)^2 \quad .. \qquad . \quad (3)$$

---

[*] The *degree* of an algebraic curve, lying in an $(n+1)$-space is measured by the number of intersections (real or imaginary) of the curve with an arbitrary n-flat.

and that the *related* n-sphere of inversion Π is

$$\sum_{r=0}^{r=n} (x_r - \alpha_r)^2 = k^2, \qquad .. \qquad .. \qquad .. \qquad (4)$$

the two constants k, k' being correlated by

$$k'^2 = k^2 - \sum_{r=0}^{r=n} \alpha_r^2 . \qquad .. \qquad .. \qquad .. \qquad (5)$$

Moreover, if the $(n+3)$ roots of the algebraic equation of degree $(n+3)$ in λ, viz.

$$\lambda^2 + k'^2\lambda + \sum^{r=n} a_r^2\alpha_r^2 - \sum^{r=n} \frac{a_r^4\alpha_r^2}{a_r^2+\lambda} = 0 \quad .. \qquad .. \qquad (6)$$

be $(0, \lambda_1, \lambda_2, \ldots, \lambda_{n+2})$ the $(n+2)$ focal n-quadrics of Γ—other than (Σ), i.e. (1)—are represented respectively by the $(n+2)$ Cartesian equations of the type :

$$\sum_{r=0}^{r=n} \frac{x_r^2}{a_r^2+\lambda_p} = 1, \qquad .. \qquad .. \qquad .. \qquad (7)$$

where the suffix p, attaching to λ, is to take on the series of values 1, 2, 3, ... $n+2$ (in succession), and, for each of these values of p, the summation for r extends from $r = 0$ to $r = n$.

It goes without saying that the $(n+2)$ ' n-spheres of inversion ' (of Γ), that answer respectively to the $(n+2)$ ' focal n-quadrics ' (7), have their respective Cartesian equations of the form :

$$\sum_{r=0}^{r=n} \left(x_r - \frac{a_r^2\alpha_r}{a_r^2+\lambda_p}\right)^2 = k_p^2, \quad .. \qquad .. \qquad .. \qquad (8)$$

where

$$k_p^2 = k'^2 + 2\lambda_p + \sum_{r=0}^{r=n} \frac{a_r^4\alpha_r^2}{(a_r^2+\lambda_p)^2}, \qquad .. \qquad .. \qquad (9)$$

it being postulated that, as in the case of (7), the suffix p (attaching to λ) is to assume successively the set of values 1, 2, ..., $n+2$ and that, for each of these values of p, the summation for r ranges from $r = 0$ to $r = n$.

We shall now find it convenient to introduce the double-suffix notations $a_{r,\,p}$ and $\alpha_{r,\,p}$ in the following manner :—

$$a_{r,\,p}^2 = a_r^2 + \lambda_p \quad \text{and} \quad \alpha_{r,\,p} = \frac{a_r^2\alpha_r}{a_r^2+\lambda_p} . \qquad .. \qquad .. \qquad (10)$$

As a matter of course the relation

$$a_{r,\,p}^2 . \alpha_{r,\,p} = a_r^2 . \alpha_p \qquad .. \qquad .. \qquad .. \qquad (11)$$

holds independently of r and p.

The $(n+2)$ focal n-quadrics and the $(n+2)$ associated n-spheres of inversion, as defined by (7) and (8), may now be thrown into the respective compact forms :

$$\sum_{r=0}^{r=n} \frac{x_r^2}{a_{r,\,p}^2} = 1 \quad \text{and} \quad \sum_{r=0}^{r=n} (x_r - \alpha_{r,\,p})^2 = k_p^2. \quad .. \qquad (12), (13)$$

An immediate inference from (13) is that the $(n+2)$ centres of inversion C_1, C_2, C_3, ... , C_{n+2}—other than the point C, viz.

$$(\alpha_0,\ \alpha_1,\ \alpha_2, \ldots ,\ \alpha_n) \qquad .. \qquad .. \qquad .. \quad (14)$$

have for their sets of $(n+1)$ Cartesian co-ordinates

$$(\alpha_{0,\,p},\ \alpha_{1,\,p},\ \alpha_{2,\,p}, \ldots ,\ \alpha_{n,\,p}), \qquad .. \qquad .. \quad (15)$$

where, of course, the numerical values $1, 2, 3, \ldots n+2$ are to be ascribed in succession to p.

If we now attribute a particular value to p so as to single out a centre of inversion C_p, then, by (2), the feet of the $2(n+1)$ normals, that can be drawn from C_p to the corresponding focal n-quadric Σ_p, lie on a unicursal curve (say, Ξ') whose representation (in terms of a parameter t') is

$$\left(\therefore x_0 = \frac{a_{0,\,p}{}^2 \cdot \alpha_{0,\,p}}{a_{0,\,p}{}^2 + t'},\ x_1 = \frac{a_{1,\,p}{}^2 \cdot \alpha_{1,\,p}}{a_{1,\,p}{}^2 + t'} \right.$$

$$\left. x_2 = \frac{a_{2,\,p}{}^2 \cdot \alpha_{2,\,p}}{a_{2,\,p}{}^2 + t'},\ \ldots ,\ x_n = \frac{a_{n,\,p}{}^2 \cdot \alpha_{n,\,p}}{a_{n,\,p}{}^2 + t'} \right). \qquad (16)$$

This curve Ξ' can be readily identified with the curve Ξ from the consideration that, by virtue of (11), the two sets of equations (2) and (16) become exactly alike if one sets

$$t = t' + \lambda_p.$$

Inasmuch as a parametric transformation does not materially affect a curve, the identity of Ξ and Ξ' becomes manifest.

Putting this and that together, we may summarize our conclusions in the undermentioned form :

For the most general type of an n-cyclide—lying in an $(n+1)$ space—the $(n+3)(2n+3)$ points, consisting of the $(n+3)$ centres of inversion and the feet of the $(n+3)$ sets of normals—each such set consisting of $2(n+1)$ lines— that can be drawn from the $(n+3)$ centres of inversion to their respective focal n-quadrics, are all situated on one and the same unicursal curve (Ξ) of degree $n+1$. .. .. THEOREM C

ART. 8. We shall now give a finishing touch to the subject by a passing reference to an interesting projective relation that binds the curve Ξ with the n-flat at infinity (say, Λ).

If we now look back upon the parametric equations (2) of Art. 7, that define Ξ, the fact stands out that the $(n+1)$ points at infinity on Ξ—which are no other than the points of intersection of Ξ and Λ—have their parameters respectively equal to

$$(-a_0{}^2,\ -a_1{}^2,\ -a_2{}^2, \ldots ,\ -a_n{}^2).$$

Necessarily, the tangents to Ξ at these points (at infinity)—which are simply the $(n+1)$ asymptotes (of Ξ)—are parallel respectively to the $(n+1)$ co-ordinate axes $(OX_0,\ OX_1,\ OX_2, \ldots ,\ OX_n)$, i.e. to the $(n+1)$ principal axes of any of the confocal n-quadrics $\{\Sigma_p\}$. Expressed in the current phraseology of multi-dimensional Projective Geometry, the property last substantiated assumes the following form :—

· *The 'simplex', formed upon the n-flat at infinity (Λ) by the $(n+1)$ points (at infinity) of the unicursal curve Ξ, is self-conjugate with regard to the $(n-1)$-sphere at infinity (situated obviously upon Λ).* .. THEOREM D

It is superfluous to remark that Theorems C and D bearing on an n-cyclide of an $(n+1)$-space are respectively the *analogues* of Theorems B and A, bearing on the ordinary cyclide (of a 3-space).

NOTE ON THE SEXTACTIC POINTS OF A CUBIC
AND ITS HESSIAN

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(Communicated by Dr. B. Mukherji)

Abstract

As is well known, a (bicursal) cubic Γ and its Hessian Γ' have all the nine harmonic polars in common. The main business of the present paper is to investigate the relative geometrical configurations of the two triads of sextactic points, say, (α, β, γ) and $(\alpha', \beta', \gamma')$ of Γ, Γ', which lie upon *any* of the nine (common) harmonic polars (say, L) and which will, for brevity's sake, be termed 'cognate' in this paper. It has been proved as a matter of fact that, if O be the point of inflexion appertaining to L, one of the points of the second triad (say, α') will be the conjugate pole of O (on Γ'), whereas the other two points β', γ' will be mutually conjugate (of course, w.r.t. Γ'). Among other noteworthy results established in this paper, we may mention—

(a) that each of the two tetrads of points $(\alpha, \beta, \gamma, \beta')$ and $(\alpha, \beta, \gamma, \gamma')$ is an 'equi-anharmonic' range; and

(b) that β', γ' are a pair of 'corresponding' points of the involution system, determined on the line L by its intersections with the three associated ('cognate') sextactic conics of the original cubic Γ.

Incidentally pointed attention has been paid to certain novel properties of Hessians of a family of cubics, having three 'cognate' sextactic points *in common*.

It may be remarked in passing that certain results, obtained in the author's *Note on Conics of double osculation*,* have been re-stated and discussed here in a *new* light and in a *new* context.

Introduction

The main object of the present paper is to trace the geometrical relations that subsist between the two triads of ('cognate') sextactic points, belonging respectively to a (bicursal) cubic and its Hessian and lying on one of the nine (common) harmonic polars. There are incidental references to an 'equi-anharmonic' range of four (collinear) points and to a 'cognate' triad of sextactic points of a (bicursal) cubic. Certain novel results, discussed at some length in my *Note on Conics of double osculation of a cubic*, have been re-stated here for the sake of clearness and ready reference. A major part of what appears in this paper is believed to be original.

* See the next issue of the *Journal of the National Academy of Sciences* (Allahabad). (In the press.)

<p style="text-align:center">SECTION I</p>

ART. 1.   From the Theory of Higher Plane Curves, we know—

- (i) that a bicursal cubic has nine points of inflexion $\{I_r\}$ and nine corresponding harmonic polars $\{L_r\}$, (r ranging from 1 to 9);
- (ii) that Γ has 27 sextactic points, lying three by three, on the nine harmonic polars $\{L_r\}$;
- (iii) that the three sextactic points (say, α_r, β_r, γ_r) which lie on any particular harmonic polar L_r,—and which will be termed *cognate* in this paper—have I_r for their common tangential;
- (iv) that the Hessian Γ' of Γ has the *same* nine points of inflexion $\{I_r\}$ and the *same* nine harmonic polars $\{L_r\}$; and
- (v) that the three sextactic points $(\alpha'_r,\ \beta'_r,\ \gamma'_r)$ of Γ', which lie on L_r,—and which will be called *cognate* in this paper—have I_r for their common tangential.

The main purpose of the present paper is to study the geometrical configurations of the two triads of *cognate* sextactic points, viz. $(\alpha_r,\ \beta_r,\ \gamma_r)$ and $(\alpha'_r,\ \beta'_r,\ \gamma'_r)$ that belong respectively to the two cubics Γ and Γ' and are, besides, situated on the *same* harmonic polar L_r.   Considerations of symmetry point to the conclusion that any special geometrical relations, found to connect the two correlated triads of 'cognate' sextactic points of Γ, Γ', that lie on any particular harmonic polar L_r, must, as a matter of course, hold in respect of similar triads of sextactic points that lie on each of the remaining eight harmonic polars.   So it will suffice if we confine our attention to the two triads of sextactic points (of Γ and Γ') that lie on an arbitrary harmonic polar L_r.   To that end Cartesian analysis will be adopted in the following articles.

ART. 2.   Suppose that one of the nine points of inflexion of a bicursal cubic Γ is taken as the origin O of Cartesian co-ordinates, and that the tangent to Γ at O is taken as the axis ($y = 0$).   Suppose further that the harmonic polar (L) of O cuts Γ at the three *cognate* sextactic points α, β, γ, so that $O\alpha$, $O\beta$, $O\gamma$ are necessarily the three tangents that can be drawn to Γ from O.   If one of these tangents (say, $O\alpha$) be taken as the axis ($x = 0$), the Cartesian equation to Γ can evidently be thrown into the form:

$$S \cdot y = x^3, \qquad \cdots \qquad \cdots \qquad \cdots \quad (\mathrm{I})$$

where $S \equiv ax^2 + 2hxy + by^2 + 2gx + 2fy + c = 0,$ $(A \equiv bc - f^2 = 0),$

is the osculating (i.e. six-pointic) conic of Γ at the sextactic point α.

For obvious reasons, the co-ordinate axes, chosen as above, will, in general, be oblique and the co-ordinates of the sextactic point are

$$\left(0,\ -\frac{f}{b}\right). \tag{1}$$

In order to determine the other two sextactic points, *cognate* with α, we may rewrite (I) in the form

$$(S + 3\lambda x^2 + 3\lambda^2 xy + \lambda^3 y^2)y = (x + \lambda y)^3,$$

and impose the condition that the line

$$x + \lambda y = 0$$

may touch the conic:

$$S+3\lambda x^2+3\lambda^2 xy+\lambda^3 y^2 = 0,$$

.e. $$(a+3\lambda)x^2+2(h+\tfrac{3}{2}\lambda^2)xy+(b+\lambda^3)y^2+2gx+2fy+c = 0.$$

Fig.1

$(0,-\frac{f}{c})$

$S=0$

$(L)...$ *Harmonic polar*
$(gx+fy+c=0)$

$\left(\dfrac{\lambda_1}{f-\lambda_1 g}, -\dfrac{1}{f-\lambda_1 g}\right)$

$\left(\dfrac{\lambda_2}{f-\lambda_2 g}, -\dfrac{1}{f-\lambda_2 g}\right)$

$x=0$

$y=0$
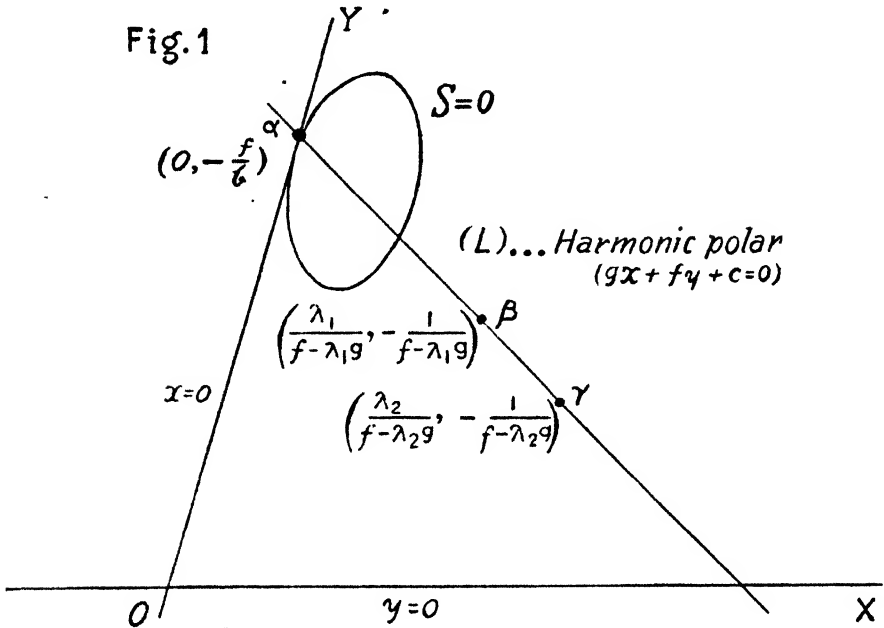
In this way we readily realize that the 'cognate' sextactic points β and γ have for their co-ordinates:

$$\left(\frac{\lambda_1}{f-\lambda_1 g}, -\frac{1}{f-\lambda_1 g}\right) \text{ and } \left(\frac{\lambda_2}{f-\lambda_2 g}, -\frac{1}{f-\lambda_2 g}\right), \qquad \text{.. (2)}$$

where λ_1, λ_2 are the two roots of the quadratic

$$c\lambda^2+B\lambda+2H = 0. \qquad \text{..} \qquad \text{..} \qquad \text{.. (II)}$$

Furthermore, subject to this condition, the osculating (i.e. six-pointic) conics of Γ at the three *cognate* sextactic points α, β, γ are respectively

$$\left.\begin{array}{l} S = 0 \\ S_1 \equiv S+3\lambda_1 x^2+3\lambda_1^2 xy+\lambda_1^3 y^2 = 0 \\ S_2 \equiv S+3\lambda_2 x^2+3\lambda_2^2 xy+\lambda_2^3 y^2 = 0 \end{array}\right\}, \qquad \text{..} \qquad \text{..(III)}$$

and

and will be henceforth called *cognate* sextactic conics.

We note, for future reference, the relations

$$\lambda_1+\lambda_2 = -\frac{B}{c} \text{ and } \lambda_1\lambda_2 = \frac{2H}{c}, \qquad \text{..} \qquad \text{.. (IV)}$$

which follow from (II).

ART. 3. By the prescribed methods of Analytical Projective Geometry it can be shewn without much difficulty that an arbitrary right line:

$$lx+my+n = 0$$

will cut the three 'cognate' sextactic conics S, S_1, S_2, defined by (III) of the previous article in (three) pairs of points forming an *involution*, provided that

either, $n = 0$

or else, $3(cm^2+bn^2-2fmn)+2(\lambda_1+\lambda_2)(gmn+fnl-hn^2-clm)$

$$+\lambda_1\lambda_2(an^2+cl^2-2gnl) = 0.$$

In view of (IV) of Art. 2, this second relation simplifies to

$$3c(cm^2+bn^2-2fmn)-2B(gmn+fnl-hn^2-clm)+2H(an^2+cl^2-2gnl) = 0.$$

Inasmuch as the relation last written is fulfilled automatically as soon as we put

$$l = g,\ m = f,\ \text{and}\ n = c,$$

we infer at once that the harmonic polar L, which answers to the point of inflexion O and has for its Cartesian equation

$$gx+fy+c = 0,$$

intersects the three 'cognate' sextactic conics S, S_1, S_2 in three pairs of points forming an involution.

If, then, P, Q be the two foci of the aforesaid involution, it is crystal-clear that the two points of intersection of any of the three conics (S, S_1, S_2) with the line L must be harmonically conjugate with P, Q. If with this

Fig. 2

(L) ..... Harmonic polar
(gx + fy + c = 0)
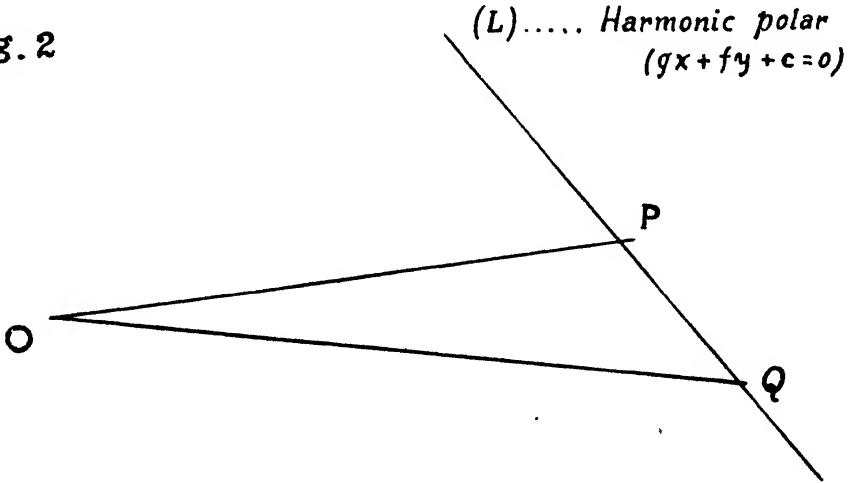
we couple the obvious fact that the polar of O w.r.t. each of the three conics S, S_1, S_2 is none other than the line L—which contains P, Q—we are squarely led to the conclusion that the triangle OPQ is self-polar (or self-conjugate) with respect to each of the three conics. We thus arrive at the proposition*:

Any three cognate sextactic conics (S, S_1, S_2) *of a bicursal cubic Γ possess a common self-conjugate triangle, one of whose vertices is the related point of inflexion and the opposite side is the corresponding harmonic polar.*

* A *more general* proposition has been established by me in my *Note on Conics of double osculation of a cubic.*

In order to find, in a simple form, the equations of the three sides of the common self-conjugate triangle OPQ in Fig. 2 we may bank upon the well-known lemma that the Jacobian of three conics, endowed with a *common* self-conjugate triangle, is a degenerate order-cubic made up of the three sides of the triangle. In the present case it can be easily verified that the equation

$$J\,(S,\,S_1,\,S_2) = 0$$

is equivalent to

$$(gx+fy+c)\left\{3x^2+2(\lambda_1+\lambda_2)xy+\lambda_1\lambda_2y^2\right\} = 0,$$

i.e. $(gx+fy+c)(3cx^2-2Bxy+2Hy^2) = 0,$ by (IV) of Art. 2.

Hence emphasizing that the first factor, equated to zero, represents the harmonic polar L, we conclude that the combined equation to the pair of lines $(OP,\,OQ)$ is

$$3cx^2-2Bxy+2Hy^2 = 0. \qquad .. \qquad .. \quad \text{(I)}$$

SECTION II

ART. 4. Keeping to the notations of Art. 1, let us as before represent a given (bicursal) cubic Γ in the form :

$$S\,.\,y = x^3, \qquad .. \qquad .. \qquad .. \quad \text{(I)}$$

where $S \equiv ax^2+2hxy+by^2+2gx+2fy+c, \quad (A \equiv 0).$

The Hessian Γ' of Γ can then be obtained in the symbolic form:

$$(gx+fy+c)\,.\,U = yV, \qquad .. \qquad .. \quad \text{(II)}$$

where $U \equiv \begin{vmatrix} -3x+ay, & ax+2hy+g \\ gy, & gx+2fy+c \end{vmatrix},$

and $V \equiv \begin{vmatrix} -3x+ay, & ax+2hy+g, & g \\ ax+2hy+g, & 2hx+3by+2f, & f \\ gy, & gx+2fy+c, & c \end{vmatrix}.$

On actual expansion and re-shuffling of terms, (II) can be put in the form:

$$(3cx-By)\left\{g^2x^2+k_1xy+k_2y^2+2c(gx+fy)+c^2\right\} = k_3y^3, \qquad .. \text{(III)}$$

where k_1, k_2, k_3 are three constants defined by

$$k_1 \quad \frac{2cag^2+12cfg-c^2a^2-6c^2h-g^4}{3c},$$

$$k_2 \quad \frac{B(2cag^2+12cfg-c^2a^2-12c^2h-g^4)}{9c^2},$$

and $k_3 \equiv c(abc+8fgh+3bg^2+4ch^2)-Bk_2.$

If we now set

$$T \equiv g^2x^2+k_1xy+k_2y^2+2c(gx+fy)+c^2,$$

and $u \equiv \dfrac{3cx-By}{k_3},$

the equation (III) of Γ' can be presented in the compact form

$$T \cdot u = y^3. \qquad \cdot\cdot \qquad \cdot\cdot \qquad \cdot\cdot \quad (IV)$$

Noticing that the line $(y = 0)$ touches the conic $(T = 0)$ at the point $\left(-\dfrac{c}{g},\, 0\right)$ and interpreting the equation (IV) geometrically, we conclude that the point $\left(-\dfrac{c}{g},\, 0\right)$—which may be symbolized as α'—is one of the three sextactic points of Γ' (that lie on the harmonic polar L) and that $T = 0$ is the osculating conic of Γ' at α'. To ascertain the other two sextactic points β', γ' of Γ', cognate with α', the straightforward method consists in dealing with the equation (IV)—written above—in precisely the same manner as we have done with the equation (I) of Γ in Art. 2. Following this somewhat laborious process, one can find not only the other two sextactic points β', γ' of Γ' that lie on Γ, but also the osculating (i.e. six-pointic) conics at these points. The reader, who is interested in all this affair, may pursue the course outlined as above.

What we are mainly concerned with at present is to compare the relative positions of the two sets of cognate sextactic points of Γ and Γ', viz. (α, β, γ) and $(\alpha', \beta', \gamma')$, without any reference whatsoever to their associated sextactic conics.

ART. 5. Reverting to the equation (II) of Art. 4, which denotes Γ', and remembering that the sextactic points $(\alpha', \beta', \gamma')$ of Γ' are simply the three points of intersection of Γ' with the harmonic polar L, viz.

$$gx + fy + c = 0, \qquad \cdot\cdot \qquad \cdot\cdot \qquad \cdot\cdot \quad (1)$$

we learn that the co-ordinates of α', β', γ' must satisfy also the subsidiary equation: $V = 0$,

i.e.
$$\begin{vmatrix} 3x - ay, & ax + 2hy + g, & g \\ ax + 2hy + g, & 2hx + 3by + 2f, & f \\ gy, & gx + 2fy + c, & c \end{vmatrix} = 0. \qquad \cdot\cdot \quad (2)$$

Consequently the combined equation to the line-pair $(O\beta', O\gamma')$ is nothing but the *homogeneous* quadratic equation (in x, y) that can be evolved algebraically out of the two equations (1) and (2). In this way, the equation to $(O\beta', O\gamma')$ can, after some algebraic manipulations, be put in the abridged form:

$$\left. \begin{aligned} \Psi(x, y) &= 0, \\ \text{where} \qquad \Psi(x, y) &\equiv (B^2 - 6cH)x^2 - 2BHxy + 4H^2y^2. \end{aligned} \right\} \qquad \cdot\cdot \quad (3)$$

If we now look back upon Art. 2, the fact stands out that the combined equation to the three lines

$$(O\alpha, O\beta, O\gamma)$$

can be put in the condensed form:

$$\left. \begin{aligned} \phi(x, y) &= 0, \\ \text{where} \qquad \phi(x, y) &\equiv cx^3 - Bx^2y + 2Hxy^2. \end{aligned} \right\} \qquad \cdot\cdot \quad (4)$$

If for the moment one shuts one's eyes to the geometrical aspect and looks at the matter from a purely *algebraic* standpoint, one can verify without much trouble that the binary quadratic $\Psi(x, y)$ is nothing but the Hessian of the binary cubic $\phi(x, y)$. In other words, there subsists an algebraic identity of the form:

$$\begin{vmatrix} \dfrac{\partial^2 \phi}{\partial x^2}, & \dfrac{\partial^2 \phi}{\partial x \partial y} \\[2ex] \dfrac{\partial^2 \phi}{\partial x \partial y}, & \dfrac{\partial^2 \phi}{\partial y^2} \end{vmatrix} \quad (\text{const.}) \times \psi(x, y). \qquad .. \qquad .. \quad (5)$$

Geometrical interpretation of (5) automatically leads to certain inferences regarding the relative positions of the two triads of cognate sextactic points of Γ, Γ', viz.

$$(\alpha, \beta, \gamma) \text{ and } (\alpha', \beta', \gamma'). \qquad .. \qquad .. \quad (6)$$

Thus, for instance, the sextactic point α' of Γ'—which is none else than the intersection of the inflexional tangent at O (to Γ) with the harmonic polar L—being ignored, the other two sextactic points β', γ' (of Γ') are so related to the corresponding sextactic points α, β, γ of Γ that each of the two ranges of points

$$(\alpha, \beta, \gamma, \beta') \text{ and } (\alpha, \beta, \gamma, \gamma') \qquad .. \qquad .. \quad (7)$$

is *equi-anharmonic* *; the simple reason is that the points (β', γ') are determined by the Hessian of the cubic, which defines the points (α, β, γ).†

A subsidiary inference is that the two triads of points (6) cannot be both real; even when α, β, γ are real points—so that, as a matter of course, the harmonic polar L, which contains them is also real, and therefore along with it the tangent to Γ at the inflexion O (appertaining to L) is real—the point α' is doubtless real, but the other two points β', γ' are both imaginary. Putting this and that together, we may summarize our conclusions in the following terms:—

A bicursal cubic Γ and its Hessian Γ' have, in common, all the nine points of inflexion $\{I_r\}$ and all the nine (associated) harmonic polars $\{L_r\}$. Further, each of the two cubics Γ, Γ' has 27 sextactic points, lying, three by three, on the nine harmonic polars $\{L_r\}$. If $(\alpha_r, \beta_r, \gamma_r)$ and $(\alpha'_r, \beta'_r, \gamma'_r)$ be respectively the two triads of 'cognate' sextactic points of Γ and Γ'—that lie on L_r—then one of the points of the second triad (say, α'_r) must be the conjugate pole of the (related) point of inflexion I_r on the Hessian Γ', whereas the other two points, viz. β', γ', are also conjugate poles on Γ'. Moreover, each of the two ranges of points $(\alpha_r, \beta_r, \gamma_r, \beta'_r)$ and $(\alpha_r, \beta_r, \gamma_r, \gamma'_r)$ is equi-anharmonic.

ART. 6. Suppose (as before) that L is one of the nine common harmonic polars of a given (bicursal) cubic Γ and its Hessian Γ' and that (α, β, γ) and $(\alpha', \beta', \gamma')$ are respectively their triads of sextactic points, located on L. Then, as proved heretofore, (α', O) and (β', γ') are two pairs of conjugate poles on Γ'.

Now the axes of co-ordinates being the same as those selected in Art. 3, we find, on referring to (3) of Art. 5, that the combined equation to the line-pair $(O\beta', O\gamma')$ is

$$(B^2 - 6cH)x^2 - 2BHxy + 4H^2y^2 = 0. \qquad .. \qquad .. \quad (1)$$

Further, the points P, Q being, as in Art. 3, supposed to be the two foci of the involution system, determined on the harmonic polar L by its inter-

---

* A range of (four) collinear points is said to be *equi-anharmonic*, when its six cross-ratios consist of $-\omega$, $-\omega^2$ (each counted thrice), ω being an imaginary cubic root of unity. (See Graustein's *Introduction to Higher Geometry* (1946), p. 146.)

† See Grace and Young's *Algebra of Invariants* (1903), Art. 166.

sections with the 'cognate' sextactic conics S, S_1, S_2 (of Γ), the joint equation to the line-pair (OP, OQ) is, by (1) of the said article,

$$3cx^2 - 2Bxy + 2Hy^2 = 0. \qquad .. \qquad .. \quad (2)$$

For obvious reasons, the two line-pairs (1) and (2) are harmonically

Fig. 3

(L) ..... Harmonic polar
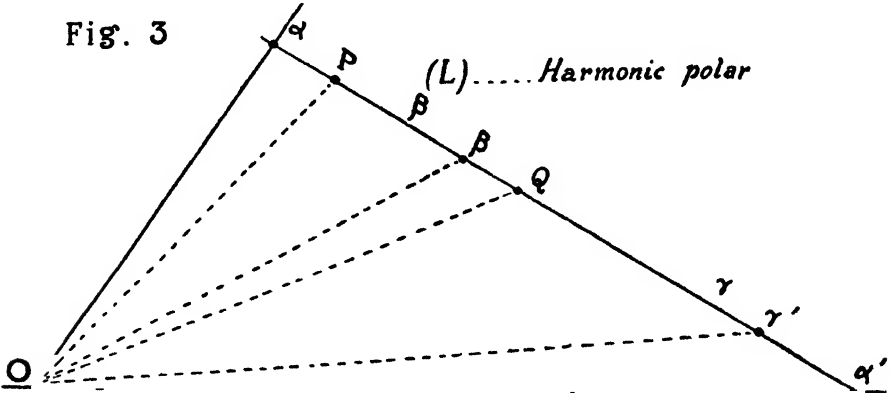
conjugate, and therefore also the two point-pairs (P, Q) and (β', γ') are harmonically conjugate (see Fig. 3). Bearing in mind that an involutory system is determined by *two* pairs of corresponding elements, we may finalize our results in the undermentioned form:—

Any of the nine harmonic polars L of a bicursal cubic intersects the associated triad of cognate sextactic conics (S, S_1, S_2) in pairs of points in involution. This involution has, for a special pair of corresponding points, two of the 'cognate' sextactic points of the Hessian that lie on L. Furthermore, the two foci (or double points) of the said involution and the inflexion O— appertaining to the harmonic polar L—constitute a triangle, self-conjugate with respect to the three conics (S, S_1, S_2).

ART. 7. We shall now close this topic with a brief reference to a far-reaching consequence of the proved result of Art. 5, viz. that the two ranges of points $(\alpha, \beta, \gamma, \beta')$ and $(\alpha, \beta, \gamma, \gamma')$ of Fig. 3 are both equi-anharmonic.

At the very outset we observe that, whenever the positions of α, β, γ are *assigned* beforehand, the positions of the two points β', γ' (real or imaginary)—which have to fulfil the relation stated above—are perfectly *determinate*. Now *a priori* reasoning makes it plain that to be given three 'cognate' (and therefore collinear) sextactic points (say, α, β, γ) of a cubic is tantamount to $(3 \times 2 - 1)$ or five conditions. Regard being had to the presence of nine structural constants in the general bicursal cubic, it follows that, when the positions of three cognate sextactic points of a cubic Γ— otherwise undefined—are known beforehand, the totality of possible cubics (like Γ)—and therefore also of their Hessians—is ∞^{9-5}, i.e. ∞^4. Palpably on the strength of the established result quoted above we can safely assert that two of the sextactic points (viz. β', γ') of any of the ∞^4 Hessians are *absolutely fixed*, depending, as they do, *in a peculiar manner*, upon the pre-assigned positions of α, β, γ. We thus arrive at the result:

If a variable (bicursal) cubic has three given collinear points for a triad of 'cognate' sextactic points, its (variable) Hessian will always pass through two fixed points which are no other than two of its sextactic points.

LECITHIN AND VENOM HAEMOLYSIS

By A. C. ROY

(Communicated by Dr. K. N. Bagchi)

The importance of lecithin in connection with haemolysis was first brought out from the researches of Kyes and his collaborators (1902, 1903), who showed that snake venom haemolysis was strongly accelerated in the presence of lecithin. It is well known that the erythrocytes from different species of animals exhibit wide variations in their susceptibility to venom haemolysis and the venoms obtained from different species of snakes also vary considerably with respect to their haemolytic activity. Venom haemolysis therefore depends to a very large extent both upon the nature of the erythrocytes as also upon the nature of the venom concerned. For instance, the erythrocytes of the guinea-pig, the cat, and the dog are the most susceptible to venom haemolysis whereas those of the ox, the goat, the sheep, the cow, and the buffalo are entirely refractory. The r.b.c. of some other species of animals such as the rat, the rabbit, the pig, the horse, etc., occupy intermediate positions and have varying degrees of susceptibility. Of the venoms, those obtained from the Colubridae are haemolytic in varying degrees whereas the viperidae species of snakes yield venoms which are mostly non-haemolytic. In the presence of a trace of lecithin, however, all the different species of erythrocytes, susceptible or refractory, lyse very readily with all venoms irrespective of their nature. Morgenroth and Carpi (1906) found this property of lecithin to be true also with respect to the poison of the bee.

Friede (1924) reported that lecithin activated not only venom haemolysis but also that due to a number of other substances of diverse chemical character such as quinine, strychnine, aniline, aspirin, arsenic acid, boric acid, etc., and even in some cases where the substances themselves in high concentrations did not haemolyse. Roy and Chopra (1941), however, have shown that the accelerating effects of lecithin on haemolysis observed in the large majority of cases other than the snake venoms and some other animal poisons, were due to the oxidation products of lecithin and other impurities present and not to an inherent property of lecithin itself. Venom haemolysis therefore stands as a special class by itself with respect to its relation to lecithin, and has been the subject of great interest and speculation ever since its remarkable venom activating property was discovered.

To assess fully the significance of lecithin in connection with venom haemolysis, the various theories which have been put forward from time to time to explain the haemolytic action of the venoms, should be taken into account as these have direct or indirect bearing on this remarkable property of lecithin.

The haemolytic action of cobra venom was first described by Stevens and Myers (1898). Flexner and Noguchi (1902) demonstrated that the blood corpuscles of certain species of animals haemolysed in contact with snake venom when a suitable serum was present and believed that venom

haemotoxin was of the nature of an amboceptor that was active only in the presence of serum complement. A little later Kyes (1902) showed that venom might haemolyse the corpuscles of certain animals without the addition of serum. He believed that the complement like activator was contained within the corpuscles in such cases and called it 'endocomplement'. This endocomplement unlike serum complement was found to be thermostabile. The difference in the susceptibility of the different species of erythrocytes to venom haemolysis was accounted for as being due to the difference in the endocomplement contents thereof, the non-susceptible species containing no endocomplement. The presence of such activating substance inside the susceptible species of corpuscles was sought to be demonstrated by the fact, that the addition of these to a mixture of venom and non-susceptible corpuscle, effected a lysis of the resistant species as well, and that the destruction of the integrity of the cell as by laking, resulted in no diminution of this activating power. After the discovery by Kyes of the remarkable venom activating property of lecithin, this endocomplement was supposed to be identical with lecithin (Kyes and Sachs, 1903) and it was suggested that the variation in the haemolytic susceptibility of the different species of r.b.c. was dependent on the amount of lecithin contained in the cells. But since even the most resistant species of corpuscles were found to contain on alcoholic extraction sufficient lecithin to activate venom haemolysis, Kyes (1910) thought that it was rather the degree of availability of this lecithin rather than the actual amount present which determined the susceptibility of a particular species of erythrocytes to venom haemolysis. According to this view, therefore, none of the lecithin contained in the non-susceptible species of corpuscles is available for venom activation. Kyes further believed that cobra venom formed a true chemical compound with lecithin (lecithid). According to him the quantitative relations existing between lecithin and venom correspond closely with those observed for complement and amboceptor and are indicative of a chemical reaction between these substances.

Coca (1912), von Dungern and Coca (1912) and Manwaring (1910), on the other hand, regard this product as a venom-free lecithin derivative and not a 'lecithid'. They have shown that the venom haemotoxin is a lipase and that venom-lecithin haemolysis is brought about by the fermentative action of the venom on lecithin, whereby the latter, a non-haemolytic substance, is split into two parts, oleic and the lecithin rest, both of which are strongly haemolytic. They called the active principle in the cobra venom 'cobra lecithinase' and the haemolysin 'desoleolecithin' (lysolecithin) or lecithin from which one molecule of oleic acid has been removed.

Coca (1915) claimed to have demonstrated the presence of desoleolecithin in the fluid resulting from the direct haemolytic action of cobra venom on the susceptible corpuscles. The absence of any such strongly haemolytic substance when the selfsame corpuscles were lysed with distilled water or in the case of amboceptor-complement haemolysis, according to him, left no room for doubt as to the mechanism of the haemolytic action of the venoms. The natural resistance of certain species of corpuscles, viz. ox, sheep, goat, etc., was supposed to depend upon a physical condition of the cell substance that prevented the haemotoxin from penetrating into the lipoids of the corpuscles. Coca refers to the discovery of Goebel (1905) in support of his contentions, viz. that the mere suspending of the naturally resistant corpuscles in a chemically inert solution of sugar sufficed so to alter the physical conditions of the corpuscular substance that the haemotoxin could then enter the cells, reach the lipoids and cause haemolysis. It is evident that these workers regarded the mechanism of the direct haemolytic

action of a native venom upon a susceptible species of erythrocytes to be the same as that of its indirect haemolytic action in the presence of extra-cellular lecithin, the lecithin in the former case being assumed to be supplied by the corpuscles concerned.

The next notable work in this connection was that of Huges (1935), who got very interesting results from his study of the action of snake venoms on unimolecular lecithin films, as measured by the change in surface potential. He used venoms obtained from five varieties of snakes, viz. black snake, black tiger, copper head, cobra and daboia, the first four belonging to the Colubridae and the last to the Viperidae species. His results showed that cobra venom which is a well-known haemolytic agent, had no appreciable action on lecithin film, while daboia venom which attacked a lecithin film energetically was non-haemolytic even towards guinea-pig erythrocytes, which are known to be amongst the most susceptible species of r.b.c. Yet he seems to have identified the lecithinase with the haemolysin of the venom. He concludes, 'Haemolysis conducted concurrently with experiments on surface films show a direct relation between haemolysis and lecithinase content as measured by rate of attack on a lecithin film.'

Cobra and Russell's viper belong to two different species of snakes, viz. the Colubridae and the Viperidae respectively and though the venoms obtained from these have some characteristics in common they differ also strikingly with respect to others. As cobra venom haemolysed the susceptible species of r.b.c. in varying degrees but Russell's viper venom did not, Roy and Chopra (1938) made a comparative study of some of the biochemical properties of these venoms, hoping by this means to be able to spot out the factors responsible for this difference in their haemolytic behaviour. They found that the viper venom contained more of the albumin but less of the pseudo-globulin portion than that of the cobra. Euglobulin was found to be absent in the cobra venom but the viper venom contained it to the extent of 3·6%. None of the venoms contained any invertase or diastatic enzymes but they both possessed the property of digesting fibrin, liquefying gelatine, clotting milk and also of digesting caesin. The viper venom appeared to be somewhat more active proteolyti-cally than the cobra venom. None of the venoms had any appreciable action on an emulsion of olive oil but they split up lecithin energetically.

Roy (1938) also made a more detailed quantitative study of the lipolytic action of these venoms. The results may be summed up as follows:—

(a) Both cobra and Russell's viper venoms could split up fatty acids from lecithin energetically, producing strongly haemolytic substances. The lecithinase present in these venoms were found to possess identical properties. They were thermo-stabile, no appreciable diminution of their activity being observed even when the venom solutions were heated in a boiling water bath for fifteen to twenty minutes. On auto-claving the venom solutions for 30 minutes under 15 lbs. pressure, however, the lecithinase activity was entirely de-stroyed. The autoclaved venom solutions were found to be non-haemolytic even in the presence of lecithin.

(b) Cobra venom was found to act energetically on ethyl butyrate but the viper venom had no appreciable action upon it. This esterase activity, however, does not run parallel to the haemolytic activity of the venom, as the former is altogether destroyed by heating the venom solution to 56°C. for half an

hour, but the haemolytic activity is not appreciably affected by this treatment.

(c) None of the venoms could split up an emulsion of cholesterol oleate but in the presence of cobra venom there was an appreciable clarification of the emulsion, whereas with the viper venom, a flocculation of the emulsion was observed.

If we review the earlier works on this subject in the light of these findings, we are confronted with certain serious difficulties. As has already been stated, the most striking difference regarding the lipolytic activities of these venoms so far studied, seems to be, that while the cobra venom contains both an esterase and a lecithinase, the viper venom contains a somewhat stronger lecithinase but no esterase. That the haemolytic activity of cobra venom does not run parallel to its esterase activity has already been pointed out. The lecithinase activity of cobra venom as well as its haemolytic activity no doubt run closely parallel, being unaffected by moderate heat and both destroyed when autoclaved, but if the lecithinase of a venom is regarded as the criterion for determining its haemolytic behaviour, as has been assumed even by some recent workers, then we are unable to explain why the Russell's viper venom, which contains a fairly strong lecithinase, should be non-haemolytic towards the susceptible species of red blood cells. That the lecithinase present in these two types of venoms are not different has been shown by the formation in the presence of lecithin, of very active haemolysins from both having almost identical properties (Roy, 1938). Kyes (1910) who prepared and isolated 'lecithids' from many different varieties of venoms observed, that the general characteristics of these corresponded with those displayed by the 'lecithid' of cobra venom. Again, supposing the susceptibility of the erythrocytes to haemolysis by native venom to depend upon the availability of corpuscular lecithin, a particular susceptible species of erythrocytes, that of the human being for instance, should be readily haemolysed by both these types of venoms, which is contrary to observed facts. The presence of free or 'available' lecithin in the large majority of the species of erythrocytes, therefore, seems to be highly improbable and the mechanism of the direct haemolytic action of a native venom seems to bear no relation to its lecithinase content and it is entirely different from that of its indirect activation in the presence of extracellular lecithin.

Repetition of Kyes' experiments as also those of Coca lead to the same conclusion. Kyes based his hypothesis on his finding that the addition of susceptible corpuscles to a mixture of cobra venom and one of the resistant species of erythrocytes effected a lysis of the resistant corpuscles as well, the former, according to him, supplying the endocomplement or available lecithin which is absent in the resistant species.

The results of the repetition of Kyes' experiments are given in Table I.

With Russell's viper venom, no haemolysis could be observed under otherwise exactly similar conditions.

It will appear from the above table that while human red blood cells alone are readily lysed (in less than half an hour) by cobra venom in a concentration of 1 in 5,000, the same dose of the venom effects only a partial lysis (10%) of a mixture of human and sheep red blood cells in two hours and complete haemolysis is registered only in the 21 hours' reading. The presence of sheep cells, therefore, appears to retard appreciably the haemolytic action of the venom on human red cells. The ultimate lysis of the sheep cells does not appear to be due to any free or 'available' lecithin ('endo-

TABLE I

Experiments with intact corpuscles

Cobra venom solution .. .. .. ·05% in normal saline.
Suspension of thrice washed sheep and
   human r.b.c. .. .. .. 3% in normal saline.

No.	c.c. sheep r.b.c.	c.c. venom solution	c.c. normal saline	c.c. human r.b.c.	Haemolysis in			
					½ hr.	1 hr.	2 hrs.	21 hrs.
1	0·6	..	0·4	..	−	−	−	−
2	0·6	0·4	..	..	−	−	−	−
3	0·3	0·4	..	0·3	−	−	0·1	1·0
4	0·3	0·2	0·2	0·3	−	−	−	1·0
5	0·3	0·1	0·3	0·3	−	−	−	1·0
6	0·3	0·05	0·35	0·3	−	−	−	±
7	..	..	0·4	0·6	−	−	−	−
8	..	0·4	..	0·6	1·0	1·0	1·0	1·0
9	..	0·2	0·2	0·6	0·1	1·0	1·0	1·0
10	..	0·1	0·3	0·6	0·1	0·25	1·0	1·0
11	..	0·05	0·35	0·6	±	±	±	1·0
12	0·3	..	0·4	0·3	−	−	−	−

1·0 - complete haemolysis.
± doubtful haemolysis.
· no haemolysis.

complement') that may be present in the human cells, as in that case haemolysis would have been effected in a much shorter time and the substitution of Russell's viper venom for cobra venom should have made no material difference in the rate of haemolysis. It appears probable that the lysis of the resistant species of cells in such cases, is effected by some component or components of the susceptible variety of r.b.c., which are released as a result of their lysis by cobra venom.

Experiments with the ethereal extracts * of susceptible as well as resistant species of r.b.c. also show that while the former is feebly activating in the presence of cobra venom, it fails to activate the viper venom as well. The ethereal extracts of sheep red cells, however, have no activating action in the presence of either cobra or Russell's viper venom as will appear from Table II.

It is of interest in this connection to note the views of Noguchi (1907) who held, that although lecithin exists in the stroma of all kinds of corpuscles, it is not present in a form available for venom activation in any of them and the susceptibility to haemolysis depends chiefly upon the amount of other ether soluble activators present in the cells, as for example, fatty acids, neutral fats and soluble soaps. He could isolate an oily-substance by the ether extraction of susceptible corpuscles but not from the insusceptible varieties. The oily mass was found to be venom activating but did not contain lecithin.

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* The ethereal extracts were prepared in the following manner: The washed and packed r.b.c. (both human and sheep) obtained from 10 c.c. of blood were lysed with three volumes of distilled water. The dark red coloured fluid was then rendered isotonic by the addition of the required amount of solid sodium chloride and thoroughly shaken up with two successive lots of ether. The combined ethereal extracts were evaporated to dryness and the residue was emulsified with 2 c.c. of normal saline. 1 c.c. ethereal extract = r.b.c. from 5 c.c. of blood.

TABLE II

Experiments with ethereal extracts of r.b.c.

	No.	c.c. r.b.c. 3%	c.c. venom soln. ·05%	c.c. normal saline	c.c. r.b.c. extract	Haemolysis in			
						½ hr.	1 hr.	2 hrs.	21 hrs.
Sheep	1	0·3	..	0·6	0·1*H*	—	—	—	—
r.b.c.	2	0·3	0·5	0·1	0·1*H*	0·1	0·25	0·4	0·8
and	3	0·3	0·2	0·4	0·1*H*	0·1	0·20	0·5	0·85
cobra	4	0·3	0·5	0·1	0·1*S*	—	—	—	—
venom.	5	0·3	0·5	0·2	..	—	—	—	—
Human	6	0·3	..	0·6	0·1*S*	—	—	—	—
·.b.c. and	7	0·3	0·5	0·1	0·1*S*	—	—	—	—
Russell's	8	0·3	0·2	0·4	0·1*S*	—	—	—	—
viper	9	0·3	0·5	0·1	0·1*H*	—	—	—	0·8
venom.	10	0·3	0·5	0·2	..	—	—	—	0·8
Human ·.b.c. and cobra venom.	11	0·3	0·5	0·2	..	1·0	1·0	1·0	1·0

H = Ethereal extract of human r.b.c.
S = Ethereal extract of sheep r.b.c.

Coca's hypothesis regarding the mechanism of cobra venom haemolysis already referred to, was based on the fact that he could demonstrate the presence of desoleolecithin in the fluid resulting from the direct haemolytic action of cobra venom on susceptible corpuscles, but not when haemolysis of the self same corpuscles was brought about by other means such as by distilled water or in the case of amboceptor-complement haemolysis.

The formation of desoleolecithin no doubt indicates the pre-existence of lecithin in a form available for venom activation, but the question is, whether that lecithin is present as such in the susceptible species of cells or is merely released from combination either as a result of the lysis of these cells by some other mechanism or more probably by the method of alcoholic extraction employed by Coca. After a careful consideration of the process of extraction employed by him, we are strongly inclined to the latter view. That alcoholic extraction has the effect of isolating lecithin equally well from both the susceptible and the non-susceptible species of red blood cells is well known. Once free, it may then be acted upon by cobra venom with the formation of active desoleolecithin. Employing this method of extraction, one may demonstrate the presence of desoleolecithin from any of the resistant species of r.b.c. in combination with any of the non-haemolytic venoms as well.

In the light of our present knowledge on the subject, therefore, the conclusion seems to be irresistible that the susceptibility of red blood, corpuscles to venom haemolysis does not depend upon the degree of availability of lecithin in the corpuscles concerned and that lecithinase is not identical with the haemolysin of the venom. That the haemolytic activity is neither due to cephalinase has been demonstrated by Dunn (1934). From the data so far obtained by us it appears probable that some other component of the cell, such as cholesterol and its esters might be directly or indirectly responsible in determining its susceptibility to venom haemolysis. Roy's experiments (1938) on the action of cobra and Russell's viper venom

on cholesterol oleate may serve as a clue in this direction. This aspect of the question will be more fully dealt with in a separate communication.

Haemolysis effected by snake venoms in the presence of extracellular lecithin, however, stands on an altogether different footing in that,

> (1) all venoms irrespective of their nature are strongly haemolytic in the presence of lecithin;
> . (2) all species of erythrocytes susceptible or refractory are haemolysed with great readiness by any venom in the presence of lecithin.

The strongly haemolytic substance resulting from the interaction of venom and lecithin (lysolecithin) was obtained in the following manner, for a study of some of its properties:—

Merck's light brown lecithin (ex ovo) was extracted several times with hot acetone till the extract was almost colourless. It was freed from acetone and an approximately one per cent emulsion in normal saline was prepared.*

10 c.c. of this lecithin emulsion and 10 c.c. of a 0·5% solution of the venom in normal saline are mixed and incubated for 3 hours at 37°C. It is then transferred to a porcelain basin and evaporated to dryness on a water bath and extracted with four successive lots of hot acetone. The combined acetone extracts consisting of fatty acids split up by the action of venom upon lecithin is evaporated to dryness and may be employed either for determining the lecithinase activity of the venom (Roy, 1938), or the haemolytic activity of the fatty acid portion. The residue is washed with several successive lots of ether to get rid of free lecithin, freed from ether and made up to 10 c.c. with normal saline. This is called 1 in 100 solution as representing the dilution of lecithin originally employed and not the actual concentration of lysolecithin obtained from it. The lysolecithin and the fatty acid portions thus obtained by the action of a venom upon lecithin will be called C and D fractions respectively as distinguished from A and B fractions which are similarly obtained from lecithin alone (control).

Haemolysis was studied in the same general manner as in previous experiments (1940) and unless otherwise mentioned sheep r.b.c. were used. In the following tables (Tables III and IV) the haemolytic action of C and D fractions obtained by the interaction of both cobra and Russell's viper venom on lecithin, at different dilutions as also their respective surface tension values (du Noüy) are given.

From the above tables it appears that both C and D fractions obtained by the action of cobra and Russell's viper venom respectively on extra cellular lecithin are strongly haemolytic even towards sheep red blood cells which are not lysed by any of the known venoms alone, the C fractions of each being much more haemolytic than the respective D fractions. The corresponding surface tension values are more or less of the same order and show that though haemolytic activity on the whole decreases with rise of surface tension of solutions, there is no strict proportionality between the two. The results are in agreement with those obtained in the case of other haemolysins (Roy, 1943).

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* The weighed amount of lecithin was taken in a 100 c.c. beaker and dissolved in a little ether. Normal saline was then added stirring the contents of the beaker all the time. The beaker was heated over a water bath to remove the ether completely. It was then transferred to a stoppered measuring cylinder, the beaker being washed with small amounts of normal saline. It was made up to the proper volume with normal saline and thoroughly shaken.

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TABLE III

Cobra venom—Lecithin.
'C' and 'D' fractions.

No.	Concn. of lysin	'C' fraction				'D' fraction			
		Time for complete haemolysis			Surface tension (du Noüy)	Time for complete haemolysis			Surface tension (du Noüy)
			2 hrs.	21 hrs.			2 hrs.	21 hrs.	
1	1/4,000	0' 20"			87·0	11' 20"			88·0
2	1/8,000	0' 40"			94·5	30' 0"			94·0
3	1/10,000	2' 0"			96·0	51' 0"			100·0
4	1/12,000	8' 30"			104·5	90' 0"			105·0
5	1/14,000	17' 0"			105·5		—	0·5	111·0
6	1/16,000	25' 30"			111·0		—	0·3	116·0
7	1/18,000	42' 0"			116·0		—	0·1	118·0
8	1/20,000		0·9	0·95	126·5		—	—	121·0
9	1/25,000		0·1	0·2	135·0		—	—	133·0
10	1/30,000		—	0·1	135·0		—	—	135·0
11	1/40,000		—	—	139·0		—	—	137·0

Minute = '
Second = "

TABLE IV

Russell's viper venom—Lecithin.
'C' and 'D' fractions.

No.	Concn. of lysin	'C' fraction				'D' fraction			
		Time for complete haemolysis			Surface tension (du Noüy)	Time for complete haemolysis			Surface tension (du Noüy)
			2 hrs.	21 hrs.			2 hrs.	21 hrs.	
1	1/4,000	0' 35"			79·0	7' 0"			83·0
2	1/8,000	1' 5"			84·0	30' 0"			92·5
3	1/10,000	20' 0"			91·0	55' 0"			101·0
4	1/12,000	25' 0"			93·5	120' 0"			108·0
5	1/14,000		0·9	1·0	94·5		0·5	1·0	111·0
6	1/16,000		0·8	0·95	101·0		0·1	0·2	115·5
7	1/18,000		0·5	0·8	102·0		—	0·05	119·0
8	1/20,000		0·1	0·1	111·0		—	—	125·0
9	1/25,000		—	—	115·0		—	—	131·5

Since the venoms obtained from all species of snakes contain the same type of lecithinase, viz. lecithinase *A* (Contardi and Ercoli, 1933) which splits up lecithin only in a particular manner, namely, into a molecule of oleic acid and desoleolecithin (lysolecithin) and since the latter is capable of dissolving even the most resistant species of red blood cells, their universal lytic action on these corpuscles in the presence of lecithin is self-evident.

SUMMARY AND CONCLUSIONS

1. The rôle of lecithin with respect to venom haemolysis has been discussed.

2. The mechanism of the direct haemolytic action of native venom upon the susceptible species of erythrocytes does not appear to be the same as that of its indirect haemolytic action in the presence of lecithin.

3. There is no evidence to show that lecithin is present in a form available for venom activation in the susceptible species of red blood cells.

4. The haemolytic activity of a venom does not appear to be proportional to its lecithinase activity as has hitherto been supposed.

5. The universal lysis of all species of erythrocytes by all venoms in the presence of lecithin seems to be satisfactorily explained.

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PROCEEDINGS OF THE ANNUAL MEETING, 1948
FEBRUARY

The Annual General Meeting of the Royal Asiatic Society of Bengal was held on Monday, the 7th February, 1949, at 4 p.m.

Present:

The Hon'ble Mr. Justice R. P. Mookerjee, M.A., B.L., President. (in the Chair).

Members:

Agarwal, B.M.,
Bagchi, K. N.,
Banerjee, J. N.,
Bhaduri, J. L.,
Biswas, K. P.
Biswas, B. M.,
Bhattacharjya, A. N.,
Bhattacharyya, Asutosh,
Bhattacharjee, Haridas,
Bhattacharyya, Nirmal,
Bose, J. K.,
Chakravarti,Chitaharan,
Chakravarti, P.,
Chatterjee, P. P.,
Chatterjee, R.,
Chatterji, Suniti Kumar,
Chatterji, Mrs. T.,
Das, Tarak Ch.,
Das Gupta, C. C.,
Faweus, L. R.,
Ganguli, K.,
Ghosh, D. P.,
Ghosh, R. C.,
Ghosh, Susil,
Ghosal, U. N,
Griffiths, Walter G.,
Gupta, A. B.,
Habibullah, A. B. M.,
Hai, Saiyed Md. Abdul

Haldar, M.,
Hora, S. L.,
Hossain, Mohibbul,
Husain, Mahdi,
Jacob, K.,
Majumdar, A. K.,
Majumdar, G. P.,
Majumdar, J.,
Mallya, B. G.,
Mitra, S. K.,
Mukerji, B.
Mukherji, Dhirendra Kumar,
Mukherjee N. D.,
Mukerjee, S. K.,
Majumdar, P. C.,
Nag, Kalidas,
Rau, S. K.,
Ray, Niharranjan,
Saraf, C. F.,
Saraswati, S. K.,
Sarbadhikari, P. C.,
Sen, J. M.,
Sharma, Y. D.,
Sircar, Ganapati,
Sivaramamurti, C.,
Ukil, A. C.,
Vedantatirtha, N.,
Waddington, H.,
West, W. D.,

Visitors:

Bagchi, K.,
Basu, M. N.,
Bhattacharya, Bhabatosh,
Bose, Nirmal Kumar,
Chakrabarty, S. C.,
Ghosh, K. M.,
Majumdar, C. M.,
Mukerjee, P. N.,

Prasad, K. Narayan,
Ray, G.,
Sarkar, Kshitish, C.,
Sastry, M. V. A.,
Sen, S.,
Sharman, D. P.,
Swami, V. Narayana.

The President declared the Annual Meeting open and said:

Ladies and Gentlemen:

Voting for the election of the new Council for 1949 and the election of an Ordinary Fellow, will begin at 4 p.m. and members may kindly record their votes. Voting will start at 4 p.m. and will be closed at 5 p.m. Before members register their votes their qualifications to vote will be verified. Votes will then be registered in accordance with the procedure laid down in Rule 44(b). Dr. K. Biswas and Dr. A. C. Ukil will be in charge of all arrangements in connection with the election.

Voting concluded at 5-00 p.m.

At 5-05 the President appointed two scrutineers, viz: Dr. B. Mukerji and Dr. G. P. Majumdar to examine the votes recorded in accordance with Rule No. 44(a).

The President occupied the Chair and called upon the General Secretary to read the Annual Report for 1948.

The General Secretary read the Report.

Mr. R. C. Ghose and Mr. J. M. Sen then queried whether any member could question or offer suggestions about the report

The President said that the Rules did not provide for such discussion at this meeting but an opportunity would be given at a Monthly Meeting as in the last year.

The President then made the following announcements:—

The posthumous award of the **Peace and Culture Medal** to Mahatma Gandhi was decided upon by the Council only this afternoon. It is not possible to award this Medal at this meeting as it is not yet ready

Annandale Memorial Medal: This medal is awarded triennially for important contributions to the study of Anthropology in Asia. The medal this year goes to Professor Nirmal Kumar Bose, M.Sc. for his conspicuously important contributions to the study of Anthropology. Professor N. K. Bose received the medal personally.

Durga Prasad Khaitan Memorial Medal: The medal is awarded every two years. It is bestowed on the person who is considered to have made in India a notable and original contribution to Science, including social science and to industry during the five years preceding the year of the award. The medal is ordinarily awarded alternately to an Industrialist and a Scientist.

(1) **Industry.**—The recipient for the medal for 1946 was Sri Ghanshyam Das Birla, a great industrialist. As he was not able to come personally, the medal was received by the Secretary to be forwarded to him.

(2) **Science.**—It was decided to award the Durga Prasad Khaitan Medal for 1948 to Dr. J. C. Ghose, an eminent scientist, now Director General for Industries and Supplies, Government of India. Official duties made it impossible for him to receive the medal in person. The medal was received by the Secretary to be forwarded to him.

ELECTION OF A FELLOW: Dr. Niranjan Prasad Chakravarti, M.A. (Cal.), Ph.D. (Cantab.), O.B.E., Director-General of Archaeology in India, has been unanimously elected as a Fellow.

COUNCIL ELECTIONS: As reported by the scrutinisers, the names as proposed for the new Council, and given below, have all been duly elected. In the case of most of the members the election was unanimous. The members and office bearers as proposed by the Council have all been duly elected

The names of the new Council Members were then read out at the request of the members present:

President:

The Hon'ble Mr Justice R. P. Mookerjee, M.A., B.L

Vice Presidents.

Dr S. K Chatterji M.A. D Litt , F.R A S.B.,
Dr M. N Saha, D Sc., F.R.A.S.B., F.N.I., F.R S ,
Dr M. Z Siddiqi, M.A., B.L., Ph D.,
Dr R C. Majumdar, M.A., Ph.D , F.R A.S.B.

Secretaries and Treasurer:

General Secretary   Dr. K N. Bagchi, B.Sc , M.B., D.T.M., F.R.I.C., F N I

Treasurer. Dr. S. C Law, M.A , B.L , Ph D., F.Z.S., M B C U., F N I.

Philological Secretary   Dr N Dutt. M.A , B L , Ph.D., D.Litt

Jt Philological Secretary - Dr. A. B M. Habibullah, M.A , Ph.D , Dip.Lib.

Natural History Secretaries. 〈 Physical Science   Dr S K Mitra, M.B E. D Sc., F.N I.
〈 Biology.—Dr J L. Bhaduri, D.Sc., F.N.I

Anthropological Secretary —Rev Dr. W G. Griffiths, M.A., B.Sc., B.D , Ph D

History and Archaeological Secretary:- Dr U N. Ghosal, M.A., Ph.D., F.R.A S B.

Medical Secretary   Dr A C. Ukil, M.B., M.S P.F , F.S.M.F.B., F.N I.

Library Secretary   Dr. N. R. Roy, M.A., D Litt., D.Phil., Dip Lib , F.L.A.

Other Members of the Council:

Mr. H. Waddington, M.B E., F.S.A.,
Dr. K. P. Biswas. M.A., D.Sc., F R.S.E.,
Mr. K. P. Khaitan, M.A., B.L., Barrister-at-Law.
Mr. A. P. Benthall, F.L.S.,
Mr. J. M. Sen, B.Sc., M.Ed., T.D., Dip Ed., F.R.G S , F.N.I

The President added:

I thank you for electing me President for the second time.

I have just now inflicted upon you a 40 minute speech and I do not wish to speak at length to you again. I deem it a great honour to have the opportunity of serving the Society along with my family whose associations with it have been some of the longest, and I think my family has contributed, with me, three Presidents to this great Society. (Applause) For that reason this position has a peculiar sanctity for me. It meant that the members and the Staff helped me always in the discharge of my duties which I most thankfully acknowledge. Had it not been for that willing help and co-operation it could not have been possible for me to do even a small fraction of what had been done. As I have already intimated in my address to you that you have just made the beginning and I have had the good fortune of enlisting your sympathy and co-operation. Much that remained to be done was executed though not completed. I thank you most heartily for giving me the opportunity of serving you another year more, and I expect that you will carry on as office bearers with the same feeling of unstinted support, co-operation and comradeship as were extended to me during the period I worked as the President in 1948. Once more I thank you all.

The President then declared the Annual Meeting closed and requested the members to begin the Ordinary Monthly Meeting for the transaction of formal business of the meeting, and invited the guests to inspect a collection of exhibits displayed on the main landing.

ANNUAL ADDRESS, 1948-49

Fellow members, Ladies and Gentlemen,

I deem it a great privilege to accord a cordial welcome to all, who are assembled here this evening and, in accordance with the established practice, to deliver an address on this occasion of the Annual Meeting.

Dr. West, whom we elected at the Annual General Meeting as the President for the year, would have been in the usual course in the Chair today, but unfortunately shortly after his assumption of office he intimated his inability to continue. It appeared to him that the growing demands of the Department of which he was in charge, would not allow him sufficient time and leisure to do justice to the work of this Society, so manifold were the problems here which required the immediate attention of the head of this institution. In the situation so created I was invited, by the unanimous wish of the members, to step into the breach, and this inspite of my request to nominate a more distinguished person to the Presidentship of the oldest and the most eminent literary and scientific society in the East.

We have to record the loss, by death, during the last year, of two of our prominent members. In Dr. Beni Madhab Barua, who was elected only last year as one of our Fellows, we have lost one of the foremost scholars in Pali and in the Buddhistic lore. His contributions to ancient Indian Art, Archaeology, Epigraphy and Philosophy bear unmistakable testimony to his profound knowledge in diverse departments and to his acute critical acumen. He was a typical nature's gentleman and was absolutely incapable of either bearing any malice, far less doing any harm towards any person. He ungrudgingly assisted every scholar who wanted his advice and assistance. Not only this Society but the University of Calcutta as well, where he occupied with distinction for many decades the position of the head of the department of Pali, is distinctly the poorer today and it will be difficult to fill up the void created by his unexpected death. With the death of Prof. Nicholas Roerich passes away a cultured exponent of the hidden treasures of our Indian tradition and Asian culture. Born at St. Petersberg, as it was then known, he studied law and painting in Russia and France and roamed about the untrodden paths of Central Asia as a member of an Art Expedition collecting data of Asiatic culture and Philosophy. Himself a painter, he interpreted some of the most profound thoughts through colours. He had removed himself from the crowd and built an Asrama in the upper reaches of the Himalayas where he lived in peace and tranquility offering to his less fortunate fellow beings his cultured experiences while in communion with the hidden forces of Nature.

In course of the last year we honoured Dr. D. R. Bhandarkar, though very belated, by electing him an Honorary Fellow of the Society in recognition of his scholarship and high attainments. The role of Honorary Fellows contains some of the foremost scholars and investigators in the world. Prof. K. V. Rangaswami Iyengar, who has unravelled many an unknown chapter of the past history of this great land of ours and Dr. F. G. Percival, whose researches in Geological subjects have already re-

ceived recognition from those who are competent to express an opinion, were elected Fellows at the last Annual Meeting.

It now behoves upon me to place before you a brief outline of the present position of the Society and the progress of our work during the past year.

During the last few weeks we have had the honour of receiving Hon'ble Maulana Abul Kalam Azad, Minister in charge of Education in the Central Government, as also the President and members of the Indian Universities Commission. We tried to impress upon the honoured visitors the value of the work which is being done by the Society and more particularly the role which this Society can and should play in an Independent India. We welcome such visitors and the interest evinced by them in the work which we have been doing since 1784, when the great founder established this institution. It is only through state help and recognition that the resources of this Society can be put to the best use by other institutions and scholars throughout the world. We confidently hope that the interest evinced by the Hon'ble Minister will bear fruit and we shall be given the opportunity and facilities not only to continue the work we have in hand but also to expand the same in diverse directions.

That the Central Government is already conscious of the importance of an institution like this Society of ours is borne out by the enquiries already being made and the desire expressed to undertake the responsibility attendant upon such recognition. During the last year the Central Government of India had also sanctioned grants aggregating £3,000 to the Royal Asiatic Society of London and the London School of Oriental and African Studies for promoting oriental studies abroad. This is in addition to the provisions made for the advanced training of Indian students abroad and for the dissemination of correct opinion about Indian culture and civilization amongst foreign scholars. The facilities offered in India for advanced oriental studies must be improved quickly and effectively so as to make unnecessary, in the near future, for our Indian students to go to Europe and America for learning the history of their own past. During the last few decades works by Indian scholars have conclusively shown that they can easily stand on the same platform with the savants working in other countries. All that is necessary is to replenish our museums, galleries and libraries with the treasures which had been taken out of India by European scholars and administrators, either by bringing them back in original, wherever possible, or, at any rate, to make copies of the same for completing our collection and facilitating study of students and research workers in India.

Immediate steps have also to be taken by the authorities in power to stop effectively the outflow of national treasures whether they be manuscripts, art-objects, inscriptions, and remains which are of historical importance. The provisions as regards treasure-trove become wholly ineffective and meaningless if more stringent measures are not contrived to stop the loss of national treasures by being taken out of India. Because of lack of attention in this direction many priceless documents of Indian history have gone out of India and it is unfortunate that no first-hand study of such aspects of Indian history and culture, as Mughal painting, Gupta numismatics, Indian contribution to the culture of western and central Asia, etc., is possible here in India, as the most important records bearing on them are now housed in different institutions in Europe and America.

Although there was no additional subvention either from the Central or the Provincial Government, during the last year and we had to be satisfied with grants earmarked for special work, it was possible for the Council to take up new responsibilities, introduce reforms and bring about reorganisation urgently called for. We record with satisfaction that the membership of the Society as at the end of the last year was the highest since its foundation. Our publications were sought for by scholars throughout the world and the sale proceeds therefrom have also been the highest on record. We should not, however, lapse into complacency as there is the risk of a large drop in our membership in the immediate future. As a result of the constitutional changes in August, 1947, a large number of Europeans have left the shores of India and a substantial section now find themselves as nationals of a separate State. We fervently hope that the changes in the political sphere will not in any way affect the solidarity of the cultural world and all persons, irrespective of their nationality, religion or place of abode will continue to evince an abiding interest in the activities and progress of this, the oldest cultural institution of the East.

The most important item of work taken up during the last few months was the reorganisation of our Library. The outstanding possession of ours is the priceless collection of printed books and manuscripts. I record with regret that this resource of ours has not been utilised in the past in the best and fullest manner possible. There had not been any stock-taking of our collection and there was no complete and proper catalogue even. Stock-taking has now been almost completed and steps taken for the preparation of a complete card catalogue of all the collections; better facilities have been provided by reserving the entire first floor of our building for the cultural activities of the Society and more particularly for quiet and uninterrupted studies by scholars. The library hours have been lengthened and readers can now use the library upto late hours in the evening. Scholars have already taken advantage of these new arrangements; but these are only the preliminaries and further improvement can and must be made without any further delay. The decision recently made for the appointment of a whole time scholar-librarian, not only to remain in charge of the library but also to help and direct scholars and researchers, must be implemented without any loss of time. The amount spent for new acquisitions had been very meagre during the last few years and no attempt was being made to acquire fresh manuscripts. The library allotment was increased during the year by drawing upon provisions, made for the administrative staff. In anticipation of larger financial assistance from the public exchequer orders have already been and are still being placed to make the library, in both the sections of printed books and original manuscripts, more complete and representative than at present.

In this connection I should refer to a very serious problem which has arisen as a result of the partition of India and many of the cultural heritages of one part being lodged in the other. It is the bounden duty of the respective States to devise ways and means for the protection, preservation and utilisation of the manuscripts, as also of other relics of ancient and mediaeval civilisation which are now in public institutions. So far as the private collections are concerned the movement of one section of population from one part to the other raises a problem that calls for immediate action and an inter-dominion arrangement. For the cause of historical research I would advocate the transfer of manuscripts and other movable relics be-

ing allowed by the Governments concerned in cases where the owners have already migrated or intend in future to migrate from one dominion to the other.

Due to circumstances over which the authorities had no control our Journal and annual Publications had fallen into arrears. We note with satisfaction that it has now been possible to make up the arrears and the Journal in the Science section is already up to date. With the issue of another number in the immediate future we shall have brought out the Letters section also to the same position. The Year Books for 1946 and 1947 have already been printed off and arrangements have been made for bringing out the 1948 issue immediately after this Annual meeting as under the rules a report of this meeting is to be included in that number. There should not, henceforward, be any difficulty in bringing out the Journal regularly.

Of the outstanding publications during the year, reference must be made to the third volume of the Ain-i-Akbari, now being revised under the guidance and supervision of Professor Jadu Nath Sarkar. This work contains a mine of information of the literature, philosophy, science and custom during the age of Akbar, and the ripe experience and scholarship of the most distinguished of the historians of the Mahomedan period of Indian history have enhanced the value of the revised edition of this work. The authoritative work on "Upper Atmosphere" by Professor Sisir Kumar Mitra, which deals with a highly fascinating subject in a masterly manner, has attracted the attention and approbation of scientists throughout the world. The monograph by Dr. Siddheswar Varma on "the Bhalesi Dialect" has brought to the notice of the philologists, the phonology as well as the morphology and vocabulary of a most interesting form of speech, valuable for the history of the Indo-Aryan.

The cultural activities as evidenced by the discourses and lectures delivered under the auspices of the Society bear ample testimony to the interest evinced by scholars and experts, who were not limited to this province, or even to this subcontinent of ours, in a variety of subjects in different departments of arts and science. As many as twenty-eight different courses of lectures had been arranged for before the end of the year. We express our grateful thanks to those scholars who had readily agreed to be associated with this Society in the pursuit of our objects. Greater emphasis on this important branch of work has created an interest in scholars both in and outside Bengal. During the last few weeks we have had the advantage of welcoming within these walls experts from outside the limits of this province and even some who have come to our shores from abroad. An innovation has just been made in not limiting the lectures in the only language in which they had so long been restricted. Last weekend the first lecture delivered in Bengali was by Dr. Suniti Kumar Chatterjee on the fascinating subject of "Indo-Mongoloids and Indian Culture". Arrangements are being made for the delivery of lectures in Hindi and also in Sanskrit, the mother of Indian languages. This we expect, will be welcomed by those, who, though not very familiar with the English language, are still anxious to have an opportunity of getting acquainted with topics and subjects which are usually discussed in the English language only. This will also greatly enrich the principal provincial languages. The discussion meetings on diverse subjects of a general interest have of late been attracting, at least some of them, an audience unprecedented in the annals of this Society.

I have the greatest pleasure to announce that the Jones Bi-Centenary Commemoration Volume which had been directed to be prepared to celebrate the 200th anniversary of the birth of our Founder is now ready. Late we are, no doubt, in bringing out this volume but we have the satisfaction to demonstrate that the modern scholars still remember with gratitude the great foresight, breadth of vision and the cultural achievements of Sir William Jones.

Of the various medals awarded by the Royal Asiatic Society of Bengal, the Durga Prasad Khaitan Memorial Gold medal for this year falls to be awarded at this meeting. This medal goes to Dr. J. C. Ghosh for his notable contributions, as a scientist, towards the development of industry in India. His work in the domain of science and his attempts for the regeneration and development of industry are too well-known to be recounted in detail. The first award of this medal had been decided upon year before last but was not presented to the recipient at the last annual meeting. Under the Rules the award was to be in favour of an Industrialist and Sri Ghanasyam Das Birla, the great industrial and business magnate, was selected to receive this decoration. The Annandale Memorial Medal for important contributions to the study of Anthropology in Asia is awarded to Professor Nirmal Kumar Bose whose work in the domain of Anthropology, Archaeology and Ancient Civilization has already evoked general appreciation.

I would not detain you any longer over the recounting of our activities during the last year and would now attempt to draw the attention of all concerned to the great possibilities of concerted action in not only maintaining the good and beneficent work so long undertaken but, to my mind, the more important aspect of attempting to expand the field of work so that we may justify our existence in the new set up of a free and independent India. Our needs and requirements for the future must be formulated with an eye to this aspect of the question.

Whatever is produced by Nature or performed by Man within the whole of the Asiatic continent was declared by the Founder to be the domain of the activities of this Society. During the last quarter of the 18th century the Asiatic Society under the guidance of Sir William Jones and his colleagues functioned as the only all-round Academy for the study of Asian Languages and Cultures. Each Annual Discourse by William Jones opened up a new portal of research into the languages and literatures, arts and philosophy of India and the Orient. Each volume of the Asiatic Researches presented to enquirers, in the East and the West, devoted studies of pioneer workers, travellers and explorers, epigraphists and archaeologists, historians and philosophers, linguists and ethnologists. Inspite of unavoidable difficulties and shortcomings, as there must be in all pioneer works in untrodden fields, they still stand out as outstanding land-marks in the study of Indology and Orientalism. Jones, a prodigy of a linguist, well laid the foundation with materials from Sanskrit, Pali, Arabic, Persian, Turkish and even the Chinese language and literature. Colebrooke, one of his successors, was a savant of Oriental thought and language and he settled down to specialised studies on Hindu and Mahomedan Laws, Institutions of the Vedas and made excursions into later Vedic philosophical texts, Hindu Astronomy, Medicine, etc. This progress was well-maintained in the first quarter of the 19th century when the Fort William College popularised

the study of the living languages of India—Bengali, Hindi, Urdu, Tamil, Telugu and others. On the closing down of the Fort William College the rich collection of manuscripts, was handed over to the Asiatic Society. The collection of manuscripts, as also of coins and inscriptions, had already been initiated and from 1814, with the opening of the first museum in India, the Asiatic Society became the only resort for scholars and investigators, in every conceivable subject, affecting the culture and civilization of Asian peoples.

After the establishment of the Asiatic Society in Bengal in 1784 the literary society of Bombay was started in 1804 and in 1822 the Societe Asiatique was established at Paris. The next year Henry Thomas Colebrooke, one of our past Presidents, helped in the foundation of the Royal Asiatic Society of Great Britain and Ireland. The establishment of Societies, with similar objects in different parts of the world, widened the sphere of the cultural activities of this original Society. Just a century ago Rajendralal Mitra entered the Asiatic Society of Bengal as an humble librarian and was partly instrumental in opening a new chapter by making the publication of what is known as the Bibliotheca Indica possible. It is worthy of note that the original proposal was to bring out Bibliotheca Asiatica but an humbler scope of work was self-imposed. Whatever the Asiatic Society has done since then for over a century was not limited to the propagation of Indian culture only. Manuscripts and sculptures enriched the Society's collections even from far distant Java, Indonesia, Champa, Cambodia, Burma and Ceylon, not to speak of Tibet, Nepal and China. Greater India was progressively brought under the purview of the Asiatic Society. Hodgson manuscripts from Nepal, Csoma de Koros and Sarat Chandra Das manuscripts from Tibet and Haraprasad Sastri manuscripts from different parts of India occupy each an important place in our collections. The Tibetan Grammar and Dictionary under the supervision of Sarat Chandra Das and more recently the Dictionary of Lushai language were brought out in justification of the wider field of work of the Society.

In this the 165th anniversary of the foundation of the Society we may legitimately claim that successive generations of scholars have continued to follow implicitly the directions left by the Founder. Books, manuscripts, transactions and papers bear ample testimony to the scope and the variety of subjects dealt with. Investigators have been drawn from all parts of the world irrespective of colour, religion or political persuasion, the Society may truly claim to have been the centre of research and scholarship for the whole of the Asiatic continent. We cannot but recall that within our publications are contained the earliest researches in every conceivable department of science, art, history, philosophy, religion, language and literature. The organisers of this Society had not only conceived but had actually started a museum which has now grown into the biggest museum in the East, the Indian Museum. The departments of Geology, Zoology, Botany, Anthropology, now maintained as separate Surveys under the Central Government, were originally developed by the members of this Society. Glorious as might have been our past the role of this Society in the present set up has now become much more onerous and important.

This Society is not only to adapt itself to the conditions in an Independent India, but must take due note of the new upsurge throughout

the length and breadth of Asia—Asia has now rediscovered its soul. India must play a very important part in the growth of Asian uplift. During the last few centuries most of the countries in Asia had been dominated politically and economically by different western powers and an idea had been propagated that the peoples inhabiting the different parts of Asia are as between themselves fundamentally different in their culture and heritage. With the gain of freedom in India, Burma, Ceylon and some of the countries in the Far East, it is now possible for the peoples of Asia to think freely and express frankly what their ideals in life had been and should be. Representatives of the different Asian countries have been meeting and fortunately two of such conferences were held in India, thanks to the foresight and breadth of vision of our Prime Minister, Pandit Jawaharlal Nehru. It has been emphasised that the meeting of the Asiatics to have a common platform grows out of a legitimate desire to see the Asian continent to rise to its full stature but it must be remembered that there is no spirit of hostility, much less of threat, to those in other lands who used to domineer, in the past, over whatever was Eastern. An opportunity must be afforded to the Asians to plan and execute, orderly and co-ordinate, a development among humanistic and international lines. I am not at this place so much concerned with the political aspect of the question but rather with the cultural unity of all who are in Asia. The political disputes and differences and the clashes of political ideals, as we are noticing in China, Burma, Malaya, Siam, Indonesia, Syria, Palestine and at other places, will not stand in the way of the Asian meeting on a common platform for more and greater correlation on cultural problems. Everybody recognises that wisdom went from the East to the West. Can anybody forget that the Vedic seers, Zarathustra, Gautama Buddha, Moses, Jesus, Confucius and Mohammed were all Asiatics? The message of hope, message of truth, message of love all emanated from the East. It is still possible for the East to continue to contribute its quota to the solution of the various problems which face the much-distracted present day world.

Unity in diversity has been the principal factor in the development of Asia's ideal and history; this has been so inspite of the apparent diversity of the physical world, and though in customs, habits and religion the peoples are outwardly widely different.

The innate unity in the ideals of life, which were nothing more nor less than spiritual idealism, was to a great extent due to the contact between India of the past with the other countries in Asia.

The history of the contact between Tibet and China on the one hand and India on the other is a fascinating one and has captured the imagination of successive generations of scholars. Buddhism in Tibet was introduced about the 7th century A.D. principally from India and from shortly thereafter there had been constant contact between the intellectuals of India with those in the mountain recesses. Santarakshita, Guru Padmasambhava, Atisa Dipankara Sri-Jnana carried the torch of light from India to Tibet and were followed by several others in succeeding ages. Translation of Buddhist Sanskrit works into Tibetan in that early period had made it possible for the present day world to study those works, which had subsequently disappeared from India in course of time. Some of the monasteries in Tibet function as residential universities of modern times and the classics of knowledge enshrined in Tibetan are still studied with reverence. In one of those viz., Depung Vihara near Lasha, there are even

now 10,000 resident monks studying. As far as I know this is even now the biggest residential university in the world. In another, Sera Monastery, there are actually more than 7,000 pupils The Kangyur and the Tangyur are repositories of knowledge and learning carried to Tibet mainly from India and China. Towards the beginning of the 11th century the translation by Pandit Somnatha of Kala-Chakra Jyotisha introduced into Tibet the Brihaspati cycle of 60 years. The new year day, as even now observed at least in certain parts of Tibet, is the Sukla Pratipad of Margasirsha, just as we find described in the days of the Mahabharata. The Holy Kailasa and Manasarovar are, according to both Hindu and Tibetan scriptures, the holiest of the holy spots in the world. The intimate relationship between India and China is sealed by a fact, seldom recorded in the history of two powerful neighbours, viz., that there was never a war between them throughout the period of close contact ranging over thousands of years. It started with the introduction of Buddhism from India, and was strengthened by a series of Chinese scholars and pilgrims who came to India and also notable Indian teachers who went out to China. The Indian spirit is also reflected in the teachings of Confucius and the Zen system of philosophy of China. Fa Hien and Hiuen Tsang are only two of the many sojourners from the North to the sacred land of India and the contact between India and China was more intimate than is generally supposed. A comparative study of the cultures of China, Tibet and India accord ample proof of such contact.

According to Herodotus and Ctesias, Badakhshan Beloor-Land, the Western boundary mountains of Little Bokharia or Little Tibet and even the desert of Gobi were all considered to belong to India. Traces of Sanskrit may be found along this track. On the authority of early Chinese writers, Remusat (in his Historic de la Ville de Khotan) had traced that Sanskrit language prevailed in the province. Fa-Hien at a later period states that though the people speak different dialects, their religion and literature were Indian—Buddhism was already established throughout the region.

There is a concensus of opinion that the valleys of the Indian Caucasus were included within India; their inhabitants; at least as far as the Pamir ranges and Badakshan were Indians—subsequently a tributary of Persia and later on of some branches of the Greek race of Bactrian kings.

Excursion into the country of the Dards, along the northern ranges of the Hindu Kush from Kafristan to Little Tibet, discloses the fact that the language used in Kafristan was allied to Sanskrit and this unmistakably shows the inhabitants being of Hindu descent. The Markandeya Purana includes the Daradas among the peoples of India.

Horace Hayman Wilson gave in ARIANA ANTIQUA a descriptive account of the antiquities and coins in Afghanistan. The report submitted by the pioneer of the workers in this area, Mr. Masson, as also critical notes by Prinsep, who revealed the secrets of the Asoka inscriptions, were published for the first time in the Journals of this Society. Countries between Persia and India were given the collective designation of Ariana. The civilization in this is, as evidenced in the Antiquities, Architecture and Coins, was either Indian, Bactrian or Indo-Scythic. A large portion of this area was at one time a part of Ancient India and had come under the influence of Indian civilisation. The coins discovered in this area also show unmistakably the later contacts of the people inhabiting this region

and India on the one hand and the Eastern parts of Europe on the other. It is within this area that we find reference to the gold desert and the gold making ants. In the Sabhaparva of the Mahabharata where the feudatory kings are described as presenting the natural or artificial products of other several countries as complimentary offerings, various mountain tribes bring to King Yudhisthira large lumps of local gold, denominated Pippilaka, because it is excavated by large ants. The Pashais occupying the 7 valleys of Nijrao are considered by the Afghans as a kind of Tajiks, i.e., the people older than themselves. Their language is chiefly a mixture of Persian and Sanskrit. We have had only the other day an announcement that the Kabul University is making special provisions for the study of Sanskrit books because of the akinness between Pushtu and the mother of languages, Sanskrit. This meeting place of Hellenistic, Iranian and Indian cultures is described as Ariana. In fact, the Government of Afghanistan are recently giving continued preference to the name Ariana in their cultural activities and publications. It is also to be noted that besides the island of Bali and Eastern Java, survivals of Hindu religion and culture are still to be traced in certain region of Afghanistan.

The earliest evidence of intercourse between India and the Near East is furnished by the discovery of Indus Valley Seals in the Sumerian sites in the Tigris-Euphrates Valley. This takes us back to the 3rd millenium B.C.

Asokan rock edicts bear unmistakable testimony to the cultural missions sent out by Emperor Asoka to Syria, Epirus and also to Egypt and Macedon. Recent Nile excavations have laid bare evidence about such contact in succeeding periods also between India and Egypt. The Pythagorian theory of transmigration of soul either originated or at least was greatly influenced by the contact with Indian philosophers at Alexandria. Even in distant Pompeii exquisite Indian ivory carving dating back to the opening centuries of the Christian era have been unearthed.

India had prolific trade connections with the Roman Orient as has been stated by the classical writers and Roman gold coins, belonging to the period between 1st century B.C. and 2nd century A.D., have been found along the coast line of the Arabian Sea and the Bay of Bengal. The recent excavations at Arikamedu near Pondicherry and Kondapur in Hyderabad State are also claimed to have disclosed the remains of Roman connections with India.

Detailed studies have been undertaken about the contact between India and the countries on its North and South-East but unfortunately investigators as regards the contact between Indian culture and that of the countries to the West have not been very many. What India has given to the West or has received from the West still remains untraversed except by a few enquirers.

When we turn our eyes to the South and the East of this sub-continent of ours, ancient history unfolds a picture of fascinating interest and that by itself has been recognised to be a grand chapter of human history. We even now find evidence in Ceylon, Burma, Bali, Java, Malaya, Siam, Indo-China and Philippines of Indian culture having percolated in such far distant places. The impress of Brahminic culture and Buddhistic ideas in Indonesia as far as Borneo and Celebes was unfolded by French and Dutch archaeologists. It was not merely a commercial contact between India and the Far East; with the peoples of these far-flung places

ancient Indians did mix and exchange ideas to such an extent that an indelible stamp was left on the people and the country, and that to such an extent that even after the lapse of many centuries this has not been obliterated.

The Polynesian culture too, tinted with Indian influence, was carried to New Zealand and other South Pacific Islands. The history and development of Maya civilization and its relation to Indian culture are subjects of abiding interest and offer a fruitful field for study and research.

I have attempted to give a very imperfect, incomplete and hurried picture of the contacts between ancient India and other countries far and near. Although India was a subject nation for centuries such subjugation has not been able to destroy its soul. It is now not only possible but absolutely necessary to turn our eyes and thoughts to compile a new history of India and Asia. We must, in this connection, direct our attention to those far off countries, which, even in those early days of unsatisfactory communication, had been drawn very close to Indian ideals and culture. All such countries may rightly be claimed to belong to one brotherhood.

Conferences of Asian countries, which are now being organised, are either for political discussions, as the recent one held to consider the Indonesian problem, or to discuss diverse questions—political, economic and cultural. An example of the latter type was the first Asian Conference of 1947. An early attempt should be made for convening another meeting of the representatives of the Asian countries to consider the cultural problems and none else. It is not only possible but desirable to emphasise the fact that irrespective of the political conflicts in particular countries, the cultural unity of the East may be envisaged and worked upon.

If there be any institution wherefrom this work of co-ordination between the different Asian countries can be attempted it is the Royal Asiatic Society of Bengal. This Society had for more than a century helped to maintain a cultural homogeneity of Asian countries. The unique collection of printed books and manuscripts, not only in European and Indian languages but also in Tibetan, Chinese, Persian, Arabic, Burmese, Sinhalese, Siamese, etc., has been attracting scholars from different countries. By developing the library and other resources make this, more truly, a representative Asiatic Society. Fling open the doors to all students and scholars who may come here to seek after truth; make arrangements not only for their study and research in quiet academic environments but arrange for their stay; engage a body of investigators not only to unravel the wisdom contained in the tomes of books and manuscripts but also to carry on new work.

The ideal and scope of work envisaged by the founder as being whatever is done by man or produced by nature in Asia should be further widened so as to include, within its scope, investigation of everything that has been done in Asia or influenced by Asia, by her men and women in other parts of the world. Let the East bring out in an unmistakable manner the contribution made by the East to the West and correspondingly the effect of the impact of the West on the East.

The ideal set before us demands the unstinted support of the State and of all well wishers of the country. Erect a building worthy of the object, make necessary arrangements for the preservation of the priceless treasures of printed books and manuscripts, equip it in a befitting manner for facilities of study and research, man it by competent scholars who may not

only use for their own study the accumulated wealth but also help, guide and direct scholars willing and anxious to utilise the opportunities afforded. I have no doubt that the authorities will seriously consider this question and give us the privilege and opportunity of remoulding and re-organising this Society as not only the pivot of Indian culture but a meeting place of all persons dealing with Asiatic culture.

Before I bring this address to a close I would refer to a decision just made by the Council. At the last Annual General Meeting our Patron His Excellency Chakravarti Rajagopalachari, while dilating upon the high and representative position occupied by this Society as a cultural institution, had suggested that we should consider the foundation of a new medal, to be awarded to a person who had rendered the greatest service during the year, for peace, unity and progress of the Asiatic peoples. A Committee had been appointed to draw up detailed rules governing the award. It is proposed to institute the medal to be awarded to one who has contributed towards peace, well-being and culture, or may have made valuable contribution for the unity and progress of the Asiatic people, through original and outstanding researches in art, literature, philosophy, history or the different branches of Science. On the recommendation of the Special Committee so appointed the Council has just decided that the First Award for 1948 should be announced at this meeting. The recipient for the first award is Mahatma Gandhi, but alas it can only be a posthumous one! The position occupied by Mahatmaji and his services for the unity and progress of mankind had been so high and great that the Committee had no difficulty in making the first choice. Sacrificing himself at the altar of duty he raised himself and all Asians in the estimation of the world, he now occupies a place never before attained by any other person in modern times.

OFFICERS AND MEMBERS OF COUNCIL
ROYAL ASIATIC SOCIETY OF BENGAL
Elected at the Annual Meeting, 7th February, 1949

President:

The Hon'ble Mr. Justice R. P. MOOKERJEE, M.A., B.L

Vice-Presidents:

Dr. S. K. CHATTERJI, M.A., D.Litt., F.R.A.S.B.

Dr. M. N. SAHA, D.Sc., F.R.A.S.B., F.N.I., F.R.S.

Dr. M. Z. SIDDIQI, M.A., B.L., Ph.D.

Dr. R. C. MAJUMDAR, M.A., Ph.D., F.R.A.S.B

Secretaries and Treasurer:

General Secretary:— Dr. K. N. BAGCHI, B.Sc., M.B., D.T.M., F.R.I.C., F.N.I.

Treasurer:—Dr. S. C. LAW, M A B.L., Ph.D., F.Z.S., M.B.C.U., F.N.I.

Phiolological Secretary:—Dr. N. DUTT, M.A., B.L., Ph.D., D.Litt.

Joint Philological Secretary:—Dr. A. B M. HABIBULLAH, M.A., Ph.D., Dip.Lib.

Natural History Secretaries:— { Physical Science:—Dr. S. K. MITRA, M.B.E., F.N.I { Biology:—Dr. J. L. BHADURI, D.Sc., F.N.I.

Anthropological Secretary:—Rev. Dr. W. G. GRIFFITHS, M.A., B.Sc., B.D., Ph.D.

History and Archaeological Secretary:—Dr. U. N. GHOSAL, M.A., Ph.D., F.R.A.S.B.

Medical Secretary:—Dr. A. C. UKIL, M.B., M.S.P.E., F.S.M.F.B., F.N.I.

Library Secretary:—Dr. N. R. ROY, M.A., D.Litt., D.Phil., Dip.Lib., F.L.A

Other Members of the Council:

Mr. H. WADDINGTON, M.B.E., F.S.A.

Dr. K. P. BISWAS, M.A., D.Sc., F.R.S.E.

Mr. K. P. KHAITAN, M.A., B.L., Barrister-at-Law.

Mr. A. P. BENTHALL, F.L.S.

Mr. J. M. SEN, B.Sc., M.Ed., T.D., Dip.Ed., F.R.G.S., F.N.I.

Royal Asiatic Society of Bengal

ANNUAL REPORT FOR 1948

The Council of the Royal Asiatic Society of Bengal have the honour to submit the following report about the Society's affairs during the year ending 31st December, 1948.

Patrons

H.E. Rear-Admiral the Earl Mountbatten of Burma, K.G., P.C., G.M.S.I., G.M.I.E., G.C.V.O., K.C.B., D.S.O., D.C.L., LL.D., Governor-General of the Dominion of India (till June, 1948); H.E. Sri C. Rajagopalachari, B.L. LL.D., Governor-General of the Dominion of India; H.E. Dr. K. N. Katju, M.A., LL.D., Governor of West Bengal (from September, 1948), and also H.E. Sir Frederick Bourne, K.C.I.E., C.S.I., C.I.E., Governor of Eastern Pakistan, were pleased to be the Patrons of the Society during the year 1948.

Honorary Fellows.

Dr. D. R. Bhandarkar, M.A., Ph.D., F.R.A.S.B. was elected an Honorary Fellow under Rule 13 thus bringing the total at the end of the year to 14, the statutory maximum being 30.

Ordinary Fellows

Rao Bahadur K. V. Rangaswami Aiyangar, M.A., Madras, Dr. F. G. Percival, O.B.E., Ph.D., F.G.S., Jamshedpur, Dr. Benimadhav Barua, M.A., D.Litt., F.R.A.S.B., Calcutta were elected Ordinary Fellows.

Special Anniversary Honorary Members

There was no change in the personnel of such membership during the year, 10 members remaining on the roll as in the last year.

Institutional Members

The number stands at 19 as during 1947.

Associate Members

Prof. P. C. Sen Gupta, M.A., was elected an Associate Member during the year, the total of such members thus coming up to 10, the maximum according to Rules being 15.

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Ordinary Members

Gains			Losses		
Elections carried forward ...	11		Lapses of Election	...	10
New elections	...	60	Elections carried over	...	6
		—	Deaths	...	6
		71	Resignations	...	41
			Under Rule 40	...	4
					—
					67

Initial total 1016, gain only 4; final total 1020.

Deaths

16- 2-48	...	P. K. Dey
1- 3-48	...	Nicholas Roerich
5- 4-48	...	B. M Barua
6- 9-48	...	S. Das Gupta
6-12-48	...	Ambuj Nath Bose
14-12-48	..	John Clough

By the death of Dr. B. M. Barua, an Ordinary Fellow elected this year and a profound scholar, the cultural activities in the domain of Buddhist philosophy and literature received a set back.

Membership Statistics

In Appendix I will be found the Membership statistics for the last 50 years. The total number of members at the close of the year stands the highest within the last 50 years. It is a matter of great satisfaction that the membership roll of the Society has not yet been affected as much as was anticipated by the division of India and particularly by the partition of Bengal though the chances of depletion are still there.

Council

Up to December the Council met 15 times, as there were three special meetings, one in April, one in June and the other in September.

The attendance averaged 9 members.

Mr. K. P. Khaitan, Treasurer of the Society, resigned his office in the month of March, 1948, owing to his impending absence from Calcutta from time to time, and the Council appointed Mr. Ramaprasad Mookerjee, M.A., B.L., in his place. The appointment was confirmed by the Ordinary Monthly Meeting on the 5th of April.

Lt.-Col. C. L. Pasricha, Medical Secretary, resigned his office in the month of February, 1948, owing to his appointment as Medical Adviser to the High Commissioner for India in the United Kingdom, and the Council appointed Dr. A. C. Ukil, M.B., M.S.P.E. (Paris), F.N.I. Principal, Medical College, Calcutta, in his place. The appointment was confirmed by the Ordinary Monthly Meeting on the 5th of April.

Dr. W. D. West, President of the Council, resigned his office in the month of May, 1948, owing to his, increased and heavy work as the Director of Geological Survey of India and the Council elected The Hon'ble Mr. Justice Ramaprasad Mookerjee, M.A., B.L., in his place. The appointment was confirmed by the Ordinary Monthly Meeting on the 5th of July.

Mr. C. C. Blagden, a member of the Council, resigned in the month of May, 1948, owing to his absence from Calcutta, and the Council elected Dr. M. Z. Siddiqi, M.A., B.L., Ph.D., in his place. The appointment was confirmed by the Ordinary Monthly Meeting on the 5th of July.

Dr. K. P. Biswas, Natural Science Secretary (Biology) of the Society was elected Honorary Treasurer of the Society by the Council vice Mr. R. P. Mookerjee. The appointment was confirmed by the Ordinary Monthly Meeting on the 5th of July.

The Council also elected Dr. N. Ray, M.A., D.Litt. & Phil. (Leiden), Dip. Lib. (Lond.), F.L.A. a member of the Council in the month of May, 1948.

The Council of 27-9-48 elected Dr. J. L. Bhaduri, D.Sc. (Edin.), as Natural Science Secretary (Biology) vice Dr. K. P. Biswas (Hony. Treasurer) officiating as such in addition to his own duties. The appointment was confirmed by the Ordinary Monthly Meeting on the 1st of November.

There were three special meetings of the Council, one to consider the shifting of the Office to the ground floor and re-opening of the Library after re-organisation and stock-taking. The other special meetings of the Council were held to meet and discuss with movers of motions at the Ordinary Monthly Meeting of 1-3-48, re: (1) Sale of Society's publications by Mr. B. M. Agarwal; (2) Financial administration of the Society by Dr. A. K. Sen; (3) General administration, direction, management of affairs and cultural activities of the Society by Dr. A. K. Sen; (4) Portrait of Rabindranath Tagore by Dr. N. Ray; (5) To implement the proposal of H.E. the Governor of Bengal to institute a Medal for "Peace and Culture" by Mr. T. C. Das; and (6) The proposal that the Library Secretary shall ordinarily be a resident member of the Society by Prof. N. C Bhattacharyya. (With regard to motion No. 5 another Special Committee was called subsequently and that Committee made recommendations.)

Committees of the Council

The Standing Committees of the Council, namely, the Finance, the Publication, the Bibliotheca Indica and the Library Committees met regularly.

In addition to these the following Committees were also appointed by the Council for special purposes:

1. A Special Committee to make recommendations with regard to the Society's Zoological Collections on loan with the Trustees of the Indian Museum. The Committee's recommendation was accepted by the Council.

2. A Sub-Committee to look into the matter of the salary, allowances and service Rules of the Lower Grade Employees of the Society. Rules were framed and approved of by the Council.

3. A Special Committee to examine the question of creation of the post of a full-time paid Secretary, promotion and confirmation of certain members of the Staff. This matter was postponed for the time being.

4. A Committee for implementing "the programme of Bicentenary Celebrations of the Birth of Sir William Jones" drawn up in 1945. Necessary action was taken by Dr. J. N. Banerjee who was entrusted with the work. The printing of the Bicentenary Volume has been completed.

5. A Special "Organisation Committee" to consider the re-organisation of the different departments. Committee's work is not yet completed.

6. A Committee "to investigate in the affairs of the Journal and to recommend measures for its improvement". Everything was found in order and the alleged charges were not substantiated.

7. A Research Fellowship Committee to frame regulations for the guidance of the Research Fellows. Draft regulations were framed.

Besides the above, the Special meetings as below were also held:

1. A meeting of the Resident Fellows under Regulation 3 regarding the Election of Fellows, and for consideration of other items e.g., the proposal for increasing the number of Fellows from 50 to 100. The proposal was not accepted.

2. A meeting of the Board of Accounts. The Board made some important recommendations e.g., keeping of separate banking accounts for different trust funds, modification of the form of presentation of annual budgets etc., which are being implemented.

Cultural and Scientific Advisory Boards and Specialist Sectional Committees

A joint meeting of the Scientific and Cultural Advisory Boards was held to consider the desirability of reviving the Specialist Sectional Committees. Ten specialist committees were duly formed.

The Cultural Advisory Board met four times during the year and the Scientific Advisory Board met three times.

Lists of members of the Council, Committees, Boards, and Specialist Sectional Committees are given in Appendix III.

Donations .

This year the Society received a donation of Rs. 325/- from Dr. B. C. Law for the following purposes:—

(1) Rs. 100 to be paid as honorarium to Dr. Arthur Upham Pope for his lecture on "Some New Aspects of the Pre-historic Unity of Asia."

(2) Rs. 225 to meet the expenses of the tea party in honour of His Excellency Sri C. Rajagopalachari, Governor of West Bengal and a Patron of the Society.

Last year donations amounted to Rs 14,927 almost the entire amount being donated by Dr. B. C. Law.

Office

During the year the office of the General Secretary was held by Dr. K. N. Bagchi. On occasions he was away from Calcutta for very short periods and Dr. M. Ishaque. Dr. S. K. Chatterji and Dr. S. K. Mitra officiated for him.

One very important change has been made during the year. The general office of the Society has been shifted fronm the first floor to the ground floor and the entire first floor is now available for use as Reading Room and Library and for cultural activities only. This much-needed change will enable the members, outside scholars and research workers, to make better use of the unique and rich collections of books and manuscripts belonging to this Society.

Staff.—There was no whole time paid Secretary. The Society lost during the year the services of Rao Saheb P. O. Matthai, M.A., B.D., who left the Society after serving it as its Superintendent for 22 years and as the Assistant Secretary for about a year with credit. For a short period Sri R. N. Banerjee B.L., General Assistant in the office, carried on the duties of the Superintendent till Sri Rakhahari Chatterjee, M.A., B.L. (Vidyasagar Medalist), B.C.S. (Resigned), an old member of this Society, was appointed as the Superintendent from 18-9-48.

Rules and Regulations

Revision of Rules and Regulations had been engaging the attention of the members during the last three years. The proposed new Rules were not finalised last year owing to the difficulties which were enumerated in detail in the report for 1947. During 1948 the work could not be completed but the very urgent and much needed revision of the Regulations regarding Leave and Provident Fund was completed. These will come into effect from the beginning of 1949.

Representations

1. Indian Museum—The Society's representative on the Board of Trustees of the Indian Museum, under the Indian Museum Act X of 1910, was Mr. K. P. Khaitan as in the last year.

2. National Institute of Sciences of India—The Society's representatives on the Council of the National Institute of Sciences of India was Dr. A. C. Ukil and Prof. J. M. Sen as additional Vice-President and member respectively.

3. Sarojini Basu Gold Medal—The Society's nominee to serve on the Special Committee for the award of the medal administered by the University of Calcutta was Dr. S. K. Chatterji.

4. Indian Historical Records Commission—The Society's representative to serve on the Commission (Publication Section) was Mr. Mohibbul Hasan Khan. He was appointed for a period of five years with effect from May, 1947.

5. Advisory Board of Archaeology in India—Dr. R. C. Majumdar was nominated to represent the Society on the Board.

Deputations

(1) International Congress of Orientalists, 21st Session, held in Paris in July 1948. Dr. S. K. Chatterji was nominated to represent the Society.

(2) Congress International des Sciences Anthropologiques et Ethnologiques, 3rd Session, held in Brussles in August, 1948. Dr. B. S. Guha, Prof. K. P. Chattopadhyay and Dr. S. K. Chatterji were nominated to represent the Society.

(3) All India Library Conference, 8th Session, to be held at Nagpur in January, 1949. Mr. T. A. Wellsted of Nagpur was nominated to represent the Society.

Honours

The following members of the Society were elected Corresponding members of the Ecole Francaise de l' Extreme Orient, Indocine, Hanoi:—

Dr. Suniti Kumar Chatterji, M.A., D.Litt., F.R.A.S.B. He was also elected an Honorary Member of the American Oriental Society.

Dr. B. S. Guha, M.A., A.M. Ph.D. ,F.N.I., F.R.A.S.B.

Dr. P. C. Bagchi, M.A., Dr-es-Letters, F.R.A.S.B.

Dr. Niranjan Prasad Chakravarti, O.B.E., M.A. Ph.D. (Cantab.).

Prof. K. P. Chattopadhayay, M.Sc. He was also elected Vice-President, Commission Internationale des Arts et Traditions Populaires, Institut International de Recherches Ethnographiques et Folkloriques, Paris.

Awards

Elliot Prize for Scientific Research.—The annual prize offered for the year 1948 was for original research in Mathematics. No paper in Mathematics was received.

Annandale Memorial Medal.—The triennial award of this medal for important contributions to the study of Anthropology in Asia was due this year. The Council on the recommendation of the Medal Committee decided to award the medal to Sri Nirmal K. Bose, M.Sc.

Dr. Bimala Churn Law Gold Medal and Sarat Chandra Roy Memorial Medal.—These will not be awarded this year as it was decided to make the awards biennially. Due to the rise in the price of gold the annual income of the Endowments cannot cover the expenses of an annual award in these cases.

Durga Prosad Khaitan Memorial Gold Medal.—It was decided to award the first medal for the year 1946 at the Annual Meeting in 1948 for notable contribution towards the development of Industry in India and the selected recipient was Mr. G. D. Birla, the great industrialist and business magnate, but the Medal was not actually awarded in February 1948 as the design for the medal could not be made ready in time. The second award for 1948 is now due. The Council on the recommendation of the Medal Advisory Board decided to award the medal for 1948 to Sir J. C. Ghosh, D.Sc. (Lond.), F.N.I., F.R.A.S.B., one of the most eminent scientists of India. The awards for the two years will be made at the Annual General Meeting in 1949.

Library

The Society's Library is exceptionally rich from the cultural point of view because of its highly specialised collections of books and rare and unique manuscripts, copper plates and inscriptions. The library however does not possess an up-to-date scientific catalogue of all its books and manuscripts. At the suggestion of the present President and with the help of an expert Librarian lent by the University authorities a comprehensive stock-taking was undertaken during the year. The Library had to be kept closed for some months for completing this important work and the thanks of the Council are conveyed to the members and general readers for their forbearance and co-operation in this matter. As a result of the stock-taking many facts have come to light and it will now be easier for the Council to formulate definite schemes about an all round improvement of the Library and its better use by all seekers after knowledge and truth. Steps for the preparation of a complete card index have already been initiated.

There was no change in the personnel of the Library. Appointment of a competent whole-time paid Librarian was sanctioned during the year and the selection of the incumbent is expected to be made early next year. The Asst. Librarian, Sri Sivadas Chaudhuri, B.A., Dip. Lib. who was in charge during the period of stock-taking had to work very hard and the other members of the staff also co-operated willingly and fully with him in this connection and they all therefore deserve the thanks of the Council.

During this year precautionary measures were taken for guarding all egresses from the Library as thefts by one of the Library bearers were detected. He was caught redhanded and ultimately convicted by the Court. This detection took place in course of the stock-taking due to vigilance of the Library staff.

Accessions

Many interesting and valuable accessions were made during the year through purchase, gifts and exchange.

770 volumes were added to the collection of the Library, of which 245 volumes were purchased and 525 volumes were received in exchange or as presentations. This figure is exclusive of the serial publications which are received in exchange from other cultural institutions throughout the world.

As it is desirable to adopt the latest scientific methods for preservation of manuscripts, books &c., it has been decided to have an up-to-date mending department and a microfilming section attached to the Library and arrangements are being made accordingly.

Manuscript Section

Ever since the foundation of the Society in 1784, the Society has been acquiring manuscripts, and as a result, the Manuscript Section is a very valuable repository of original sources for the study of the history, culture and civilisation of India specially and of the East generally. Due to various reasons the work of collection of fresh manuscripts has for some years past been in abeyance but this work too is expected to be restarted as soon as the necessary facilities are again made available.

The preparation of the Descriptive Catalogue of Sanskrit manuscripts is proceeding. During the period of stock-taking this work had to be stopped temporarily and that is why the progress shown last year in this direction could not be maintained this year. The two cataloguers, Pandit N. C. Vedantatirtha, M.A., and Pandit Pulin Behari Chakravarti, M.A., Sankhya-Vyakaranatirtha, were entrusted with the work of compiling the Descriptive Catalogue of manuscripts belonging to the "Indian Museum Collection" which comprises 11,286 volumes. During the stock-taking it was detected that the number of manuscripts would exceed 11,500 as some of the volumes which appeared in the list under one single head were found to contain more than one dissertation on different topics altogether. It was further detected that there were two extra bundles containing stray leaves which did not even find any mention any where in the list of the Museum Collection.

It was found in course of scrutiny that the collection comprises almost all the principal branches of Sanskrit literature.

Besides the "Indian Museum Collection," there is the Society's own collection consisting of about 4,000 manuscripts, some of which are extremely rare and have so far been little noticed by scholars.

Publications

Due to various causes the work of the Publication Department had been in arrears but the Council have the satisfaction to record that this year the leeway has been made up completely as may be seen from the list of publications which were ready during the year.

Journal and Year-Book—The following issues were published during the year.

(1) Journal Vol. XIII, 1947, Science, Nos. 1 & 2.
(2) ,, ,, XIII, 1947, Letters, Nos. 1 & 2.
(3) ,, ,, XIV, 1948, Science, Nos. 1 & 2.
(4) ,, ,, XIV, 1948, Letters, No. 1.
(5) Year-Book for 1946, Vol. XIII, 1947.

The following are in the press and are expected to be out early in 1949:—

(a) Journal, Vol. XIV, 1948, Letters No. 2.
(b) ,, Vol. XV, 1949, Science No. 1.
(c) Year Book for 1947, Vol. XIV, 1948.

Year Book for 1948, Vol XV, 1949, is ready for the Press.

Bibliotheca Indica Series

Ain-i-Akbari of Abul Fazl-i Allami. Vol. III.

This is an encyclopaedia of Hindu philosophy, science, literature and customs, with the life of the author and Akbar's wise sayings. Translated into English by Colonel H. S. Jarret. Revised and further annotated by Sir Jadunath Sarkar.

Descriptive Catalogue of Sanskrit and Arabic Mss.

1. Vol. XI, Philosophy, prepared by MM. H.P Shastri and revised and edited by Prof. N. C. Vedantatirtha. Pages 1-208 have been printed.

2. Descriptive Catalogue of Arabic Mss. (pp. 1-233) Editor, Dr. M. Ishaque, has been printed.

Monograph Series

1. The Upper Atmosphere by Dr. S. K. Mitra has been published.
2. The Bhalesi Dialect, by Prof. S. Varma has been published.
4. The Blue Annals by Dr. G. N. Roerich is in the press.
5. The Inscriptions on Kambuja by Dr. R. C. Majumdar is in the press.

4

Books under preparation

1. *Ain-i-Akbari*, Vol. II, Editor, Sir Jadunath Sarkar, in the press.

2. *Haft Iqlim*, Vol. II, The editing of this work is complete and the Ms. is ready for the press.

3. *Rawzatu'l Jannat*, Edited by Dr. M. Ishaque. The Ms. is ready for the press.

4. *Bharata's Natyashastra*, Editor, Dr. M. Ghose, is in the press.

5. *Vidhanaparijata*, Editor, Pt. Iswar Chandra Shastri, is being made ready for the press.

6. *Masir-ul-Umara*, Editor, Dr. Baini Prashad. The complete Mss. is being revised by the author to make it ready for the press.

7. *Saddharma Pundarika*, Editor, Dr. N. Dutt in the press.

8. *Prithiraj Raso*, VIIth Canto, Editors, Profs. L. Sukul and and Subimal Dutt.

9. *Danasagara of Ballalsena*, Editor, Pandit Bhabatosh Bhattacharya.

10. *Descriptive Catalogue*, Sanskritic, Editors, Pt. N. C. Vedantatirtha and Pt. P. B. Chakrabarty, Sankhya-Vyakaranatirtha.

11. *Catalogue of Printed books (Sanskritic)* by Pt. K. Sankara Sarma.

Miscellaneous

The Bicentenary Commemoration Volume, Editor, Dr. K. Nag has been printed.

Introducing India, Pt. II, Editors, Dr. K. N. Bagchi and Dr. W. G. Griffiths, is in the press.

The sale proceeds of our publications this year amounted to over Rs. 20,000, the maximum in the history of the Society's sales so far.

Cultural Activities

The number of meetings of all descriptions held so far came up to 126. Ordinary monthly meetings were held regularly with the exception of the recess month. The average attendance was about 21. Visitors averaged about half a dozen. Some of the Discussion Meetings were very well attended.

The following papers were read in the Monthly Meetings:—

Dr. Bimala Churn Law—*Mithila, an ancient city.*

Mr. Devaprasad Guha—*Metres in the Jatakas—Catukkanipata.*

Mr. Kalipada Mitra—*A Jaina tale—its Origin and Developments.*

Dr. S. L. Hora.—*Sanskrit Names of Fish and their Significance.*

Mr. Bikash Basu—*Some problems of Snow Survey in the Eastern Himalayas.*

Dr. H. K. Mookerjee and Mr. Sivatosh Mookerjee—*Two Cases of Atypical Development in Chick.*

Prof. M. S. Mani.—*Cecidozoa and Zoocecidia from India.*

Dr. S. L. Hora.—*Knowledge of the ancient Hindus concerning Fish and Fisheries of India.*

Mr. K. H. Alikunhi—*On a new hermaphrodite Species of Microphthalmus (Polychaeta-Hesionidae) from the Sandy Beach, Madras.*

Dr. Riazul Islam.—*Ibahatiyas.*

Dr. D. C. Sircar.—*Two Stone Inscriptions.*

Dr. (Mrs.) Bina Chatterjee.—*Geometrical Interpretation of the Motion of the Sun, Moon and the five Plants as found in the mathematical Syntaxis of Ptolemy and in the Hindu Astronomical Works.*

Mr. Harit Krishna Deb—*Vedic India and the Middle East.*

Dr. D. C. Sircar.—*A Stone Inscription in the Patna Museum.*

Messrs. C. T. Rajagopal and A. Venkataraman—*Sine and Co-sine Power-series of Hindu Mathematics.*

Mr. A. C. Roy.—*Haemolysis by Bile Salts.*

Dr. D. C. Sircar.—*Two Pillar Inscriptions.*

Dr. A. Halim—*Kol Inscription of Sultan Altamash.*

Exhibits

The following interesting exhibits were shown by Pandit P. Chakravarty. M.A. Sankhya-Vyakaranatirtha:—

1. A Manuscript of a hitherto unknown commentary on the Pancartha Bhasya of Kaundinya.

MS. No. Im. 7163. It forms a fragment of the Commentary on the Kaundinya-Bhasya of Nakulisa-Pasupata System of thought. Of the vast literature belonging to this school, only the Bhasya and the Ganakarika are available to scholars....The Commentary is replete with quotations from ancient teachers of whom very little is known elsewhere. It frequently refers to one Mahabhasya which is distinct from the Bhasya of Kaundinya.

2. A Manuscript of a hitherto unknown Commentary on the Kiranavali by Bhatta Vadindra.

MS. No. Im. 9262 is a Commentary on the Kiranavali of Udayana. The author is Bhatta Vadindra whose Maha-vidya-vidambana is well-known to scholars. One or two leaves in the beginning as well as in the end are wanting. No notice of this important MSS. has so far appeared anywhere else.

Discussion Meetings

Date	Opener	Subject
19-2-48	Dr. P. C. Bagchi	*Indological Research in Chinese Universities.*
4-3-48	Mr. L. R. Fawcus	*The Zoological Garden of Calcutta.*
11-3-48	Mr. A. R. Foster	*Soil Fertility and ·Balanced Manuring.*
1-4-48	Dr. Arun Ganguly	*Industrial Absenteeism.*
18-11-48	Sir Jadunath Sarker	*The European Military System in Mughal India.*
25-11-48	Dr. S. K. Mitra	*Upper Atmosphere (Illustrated with lantern slides).*
2-12-48	Prof. Hiralal Chopra	*Sufecism in Panjabi Poetry.*
9-12-48	Prof. Chintaharan Chakravarty	*On the Study of Manuscripts with special reference to the Collection of the MSS. of the Royal Asiatic Society.*
16-12-48	Prof. G. Sankaran	*Sugar and Synthetic Butter from Paddy Husk, Straw etc.*
23-12-48	Dr. J. L. Bhaduri	*Biologic Tests for early Pregnancy.*

General Lectures

Date	Opener	Subject
16-1-48	Dr. Santi Ranjan Palit	*Plastics.*
18-2-48	Dr. Arthur Upham Pope	*Some new aspects of the Prehistoric Unity of Asia*
25-2-48	Dr. Nihar Ranjan Ray	*Creative Librarianship.*
5-3-48	Dr. (Mrs.) Bani Chatterjee	*Applied Music (with demonstrations).*
2-7-48	Mr. J. Banerjee	*Himalayan Snow Survey.*

ESTABLISHMENT OF CULTURAL RELATIONS WITH OTHER LEARNED SOCIETIES OF THE WORLD

In the last year's report it was noted for the information of all concerned that the British Committee for Cultural Relations with India agreed to introduce the Members of the Society to the learned Societies in Great Britain. Members who like to avail themselves of this facility should contact the Secretary, Committee for Cultural Relations with India, care of The British Academy, Burlington Gardens, London, W. 1.

Regarding the establishment of cultural relations with China and other Asian countries, not much appreciable progress was possible in that direction due to the disturbed political condition of most of those countries However this year too in pursuance of the wishes of the Secretary to the Government of India, Ministry of Education, a further consignment of 220 books in 3 boxes was sent to the address of the National Peking University, Peiping, China, in addition to 80 volumes sent last year. Besides that arrangements were also made to present 76 volumes of our publications to the Jogjakarta University and Singaradja Library in Bali at the request of the Government of India.

The suggestion about deputing a scholar to Tibet made by the Government of India, a reference to which is to be found in the report of the last year, was readily agreed to by the Society and the name of Dr. N. Dutt was forwarded to the Government of India.

Finance

Appendix II contains the statements showing the accounts for 1948. Certain changes have been made in the form of their presentation.

The fund accounts show their invested assets and the Investment Account (No. 31) shows the allocations of invested papers to each fund specifically.

Statement No. 33 shows the Balance Sheet of the Society and the different funds administered by and through it.

During the year 3% Government papers to the face value or Rs. 15,000/- have been transferred to the Permanent Reserve Fund of the Society, being the compounding fees received during the period January 1936 to July 1948. The question of transferring the amount received as admission fees to the Permanent Reserve is under further consideration of the Council. The total investment in the Permanent Reserve as at the end of the year therefore stands at Rs. 2,69,200.

The Government of West Bengal have continued the 20% cut in some of the grants made by them to the Society during the year although representations have been made to the Government for restoration of the cut.

The special annual grant of Rs. 20,000/- made by the Government of India, as also Rs. 5,000/- for the Arabic and Persian Mss. and Cataloguing fund, for the year 1947-48 were received during the year.

The Government Securities, shown in Statement No. 31 are held in safe custody by the Imperial Bank of India, Park Street Branch

The Budget Estimates (Appendix IV) for probable expenditure have been framed to meet the growing demands under various heads commensurate with the ever increasing activities of the Society in all directions. Special allocations have also been made towards the reorganisation of the Library and for the purchase of a larger number of books for the Library by making savings in all possible directions

The probable receipts (Appendix IV) have been estimated carefully and cannot be said to be too optimistic in any way. It will be noticed that the Budget Estimates too have been presented in a new form to make the particulars easily understood by members.

The interest derived from the Temporary Investments (Fixed Deposits) of Rs. 90,000/- has been allocated pro rata to the various funds.

Grants for research and research activities

The Society did not receive up to 31-12-48 Rs. 10,000/- out of the sanctioned grant of Rs. 50,000/- made by the Government of Bengal for five years in the year 1945 as per their letter No. 837 Misc. dated

19-11-45. The bill has been sent and it is expected that the amount will be forthcoming within 31-3-49 if not much earlier. This grant was made for the publication of works hitherto unpublished relating to the history of Bengal—Bihar. The work is continuing under the editorship of Sir Jadunath Sarkar assisted by Mr. N. B. Roy, M.A.

The second grant of Rs. 7,200/- for the creation of four research fellowships has not yet been renewed but it is expected that the grant will not be discontinued. The following four research scholars unappointed for research under the Bengal Government grant:—

(1) Sir William Jones Fellowship for Sanskritic Studies was held by Dr. Batakrishna Ghosh, under the Supervisor Scholar Dr. Suniti Kumar Chatterji.

(2) James Prinsep Fellowship for research on Epigraphy and Numismatics is being held by Mr. Sunil Chandra Ray, M.A. under the supervision of the Supervisor-scholar, Dr. J. N. Banerjee.

(3) Rajendra Lal Mitra Fellowship for Buddhistic Studies was held by Mr. P. C. Majumdar, M.A., under the guidance of the Supervisor-Scholar, Dr. N. Dutt.

(4) R. G. Casey Fellowship for Islamic Studies was held by Miss Abeda Islam, M.A., under the supervision of Dr. M. Ishaque.

The continuance of the valuable research work taken up by these scholars or other research workers in future will depend on the generosity of the Provincial Government in this connection.

Besides the 4 research fellows noted above, Miss Roma Niyogi, M.A., Government research scholar, also utilised the Library of the Society.

New Building for the Society.

For many years past the special attention of the members is being drawn to the necessity for having a more commodious building erected in place of the present one which is old and too small for the growing needs of expansion of the cultural activities of the Society. The plan is for a nice up-to-date structure of at least 5 storeys so that the same may serve as the centre for all cultural and scientific societies of India like the Burlington House of London. The cost of erecting such a building may go up to over Rupees 30 lakhs hence the Central Government have been approached for adequate financial assistance and the rich people of Calcutta will have to be requested for making substantial donations for this purpose.

Printers

The Baptist Mission Press continued to be the chief Printers for the numerous publications of the Society and the work of the Press as usual was up to the standard. The thanks of the Society are due to Mr. N. A Ellis and also to Mr. B. G. Ellis for supervising the work entrusted to the Baptist Mission Press.

Selling Agents

There was no change in the selling agents for the Society's publications in Europe, America and India but attempts are being made to select a few more agents, specially in America with the help of the Indian Embassy at Washington, D.C., and of Swami Nikhilananda in charge of the Ramkrishna Mission Centre at New York so that the sales may be accelerated.

Solicitors

The Society's Solicitors, Messrs. B. N. Basu and Company continued to render good service as in previous years whenever any occasion arose for getting their services.

Auditors

The Auditors, Messrs. Price, Waterhouse, Peat and Company, deserve thanks for quick auditing of the Accounts though this year their work increased a great deal.

Conclusion

In the preceding paragraphs an attempt has been made at giving a clear idea of the many-sided activities of the Society throughout the year. With the attainment of freedom by India that the other countries of the world will be taking more and more interest in Indological subjects is a foregone conclusion hence it behoves all members now to try to enhance the international prestige of this Society through their combined efforts in the field of research and culture.

		ORDINARY							
	PAYING					NON-PAYING			
Year.	Resident.	Non-Resident.	Foreign.	Total.	Absent.	Life.	Non-Subscribing.	Total.	Total Ordinary Members.
1899 ...	120	119	13	252	27	21	1	49	301
1900 ...	116	124	18	258	30	22	1	53	311
1901 ...	123	133	13	269	37	22	Nil	59	328
1902 ...	126	116	14	256	47	21	...	68	324
1903 ...	127	126	14	261	46	21	...	67	334
1904 ...	132	130	14	276	46	21	...	67	343
1905 ...	144	133	12	289	48	20	...	68	357
1906 ...	173	147	15	335	52	20	...	72	407
1907 ...	174	175	20	369	31	20	...	51	420
1908 ...	181	193	17	391	38	19	...	57	448
1909 ...	183	217	13	413	40	20	...	60	473
1910 ...	209	217	16	442	43	23	...	66	508
1911 ..	200	225	19	444	53	22	...	75	519
1912 ...	203	229	19	451	43	23	...	66	517
1913 ...	200	211	19	430	46	23	...	69	499
1914 ...	191	187	19	397	50	26	...	76	473
1915 ...	171	188	21	380	40	25	...	65	445
1916 ...	145	159	18	322	60	25	...	85	407
1917 ...	150	144	15	309	45	24	. .	69	378
1918 ...	153	145	17	315	43	24	. .	67	382
1919 ...	141	128	15	284	64	25	...	89	373
1920 ...	161	134	15	310	32	26	...	58	368
1921 ...	160	132	16	308	26	26	...	52	360
1922 ...	160	141	16	317	26	26	.	52	369
1923 ...	147	120	13	280	30	27	...	57	337
1924 ...	209	134	12	355	29	28	...	57	412
1925 ...	263	137	12	412	23	27	...	50	462
1926 ...	319	162	20	501	23	28	...	51	552
1927 ...	328	167	18	513	28	33	...	61	574
1928 ...	344	167	23	534	42	46	...	88	622
1929 ...	331	181	21	533	46	49	...	95	628
1930 ...	291	194	37	522	22	52	...	74	596
1931 ...	228	184	29	441	26	52	...	78	519
1932 ...	222	126	23	371	27	54	...	81	452
1933 ...	194	126	27	347	33	56	...	80	436
1934 ...	217	112	30	359	26	57	...	83	442
1935 ...	206	107	28	341	28	56	...	84	425
1936 ...	214	106	24	344	16	55	...	71	415
1937 ...	205	99	29	333	20	55	..	75	408
1938 ...	193	98	21	312	24	54	...	78	390
1939 ...	187	103	21	311	21	54	...	75	386
1940 ...	190	108	18	316	14	57	...	71	387
1941 ...	173	113	16	302	22	58	...	80	382
1942 ...	171	108	12	291	28	56	..	84	375
1943 ...	195	125	12	332	23	57	...	80	412
1944 ...	240	148	13	401	23	59	...	82	483
1945 ...	418	176	23	617	20	77	...	97	714
1946 ...	602	199	24	825	20	83	...	103	928
1947 ...	665	205	28	898	31	87	...	118	1016
1948 ...	671	204	24	899	29	92	...	121	1020

DIX I.
from 1899-1948
50 years

the 31st of December)

		EXTRAORDINARY				FELLOWS	
Centenary Honorary.	Associate.	Institutional.	Special Aniversary Honorary member.	Total.	Grand Total Membership.	Honorary.	Ordinary.
4	12		..	16	317	..	..
4	12		..	16	327	..	..
4	12		..	16	344	..	..
4	13		..	17	341	..	..
4	13		..	17	351	26	..
4	13		..	17	360	24	..
4	13		..	17	374	30	..
4	12		..	16	423	29	..
4	12		..	16	436	30	..
4	13		..	17	465	28	..
4	14		..	18	491	30	..
4	14		..	18	526	28	17
3	14		..	17	536	27	17
3	13		..	16	533	28	19
3	14		..	17	516	27	24
3	14		..	17	490	27	28
3	15		..	18	463	24	27
3	15		..	18	425	29	31
2	12		..	14	392	26	33
2	10		..	12	394	22	33
2	11		..	13	386	22	30
2	11		..	13	391	18	36
2	12		..	14	374	28	38
2	13		..	15	384	28	40
2	11		..	13	350	30	39
2	12		..	14	426	28	37
2	12		..	14	476	27	37
2	12		..	14	566	26	34
2	13		..	15	589	25	34
1	12		..	13	635	28	38
1	10	2	..	13	641	28	40
1	8	2	..	11	607	27	43
1	8	5	..	14	533	29	47
1	7	5	..	13	465	29	46
..	7	6	..	13	449	28	45
..	6	7	..	25	467	26	49
..	5	7	12	23	448	26	47
..	5	10	11	26	441	24	44
..	5	12	11	27	435	21	46
..	4	12	10	26	416	19	49
..	6	12	10	28	414	19	45
..	7	12	10	29	416	22	46
..	6	12	10	27	409	21	49
..	6	12	9	27	402	18	48
..	6	12	9	27	439	17	48
..	8	14	9	32	515	16	45
..	10	16	10	36	750	14	46
..	9	17	10	36	964	14	43
..	9	19	10	38	1054	13	41
..	10	19	10	39	1059	16	43

APPENDIX III

LIST OF MEMBERS OF THE COUNCIL, COMMITTEES, SUB-COMMITTEES BOARDS, ETC., OF THE ROYAL ASIATIC SOCIETY OF BENGAL FOR 1948

Council

President.—Dr. W. D. West (upto 6-6-1948), The Hon'ble Mr. Justice R. P. Mookerjee (from 7-6-1948).

Vice-Presidents.—Dr. B. C. Law, Maharajadhiraja Bahadur Sir U. C. Mahtab of Burdwan, Dr. M. N. Saha and Sir B. L. Mitter.

General Secretary.—Dr. K. N. Bagchi.

Hony. Treasurer.—Mr. R. P. Mookerjee (upto 6-6-1948), Dr. K. Biswas (from 7-6-1948).

Philological Secretary.—Dr. S. K. Chatterji.

Jt. Philological Secretary.—Dr. M. Ishaque.

Natural History ⎫ Biology.—Dr. K. Biswas (upto 31-10-1948), Dr.
⎬ J. L. Bhaduri (from 1-11-1948).
Secretaries ⎭ Physical Science.—Dr. S. K. Mitra.

Anthropological Secretary.—Dr. Verrier Elwin.

Historical and Archaeological Secretary.—Mr. H. Waddington.

Medical Secretary.—Lt. Col. C. L. Pasricha (upto 4-4-1948), Dr. A. C. Ukil (from 5-4-1948).

Library Secretary.—Dr. B. S. Guha.

Members of Council.—Mr. C. C. Blagden (upto 4-6-1948), Dr. M. Z. Siddiqi (from 5-6-1948), Mr. H. F. Bensly, Dr. A. H. M. Mohiyuddin, Sir A. H. Ghuznavi and Dr. N. R. Ray (from 2-8-1948).

Advisory Boards

A. Cultural

Sir B. L. Mitter, Maharajadhiraja Sir U. C. Mahtab, Dr. S. K. Chatterji, Dr. M. Ishaque, Dr. N. Dutt, Dr. M. Z. Siddiqi, Mr. L. R. Fawcus (*Secretary*), Mr. Atul Bose, Mr. H. Waddington, Mr. K. P. Khaitan, Dr. A. H. M. Mohiyuddin, Rai Bahadur B. B. Mukherji, Mr. S. Chaudhuri, Sir A. H. Ghuznavi, Dr. K. Nag (*Chairman*).

B. Scientific

Dr. W. D. West, Dr. M. N. Saha (*Chairman*), Dr. K. N. Bagchi, Dr. K. Biswas, Dr. S. K. Mitra, Dr. Verrier Elwin, Dr. B. S. Guha, Dr. A. C. Ukil, Mr. M. L. Schroff, Mr. K. B. Sen, Dr. S. C. Law. Dr. B. Mukherji, Dr. A. K. Sen (*Secretary*).

(1) *Finance*

The President, General Secretary and Hony. Treasurer (*ex-officio*). Mr. A. J. Elkins, Dr. M. Ishaque and Dr. B. S. Guha.

(2) *Library*

The President, General Secretary, Hony. Treasurer, Philological Jt. Philological, Biological Physical Science, Library, Anthropological, Historical & Archaeological and Medical Secretaries (*ex·officio*), Dr. N. Ray and Dr. A. H. M. Mohiyuddin.

(3) *Publication*

President, General Secretary, Hony. Treasurer, Philological, Jt. Philological, Biological, Physical Science, Library, Anthropological, Historical & Archaeological and Medical Secretaries (*ex-officio*), Mr. Norman A. Ellis, Dr. A. H. M. Mohiyuddin and Dr. W. G. Griffiths.

(4) *Bibliotheco Indica*

President, General Secretary, Hony. Treasurer (*ex-officio*), Sir Jadunath Sarkar, Dr. M. Ishaque, Dr. K. Nag, Dr. M. Z. Siddiqi, Dr. S. K. Chatterji, Dr. N. Dutt, Dr. Satkori Mukherji, Dr. A. H. M. Mohiyuddin and Dr. A. B. M. Habibullah.

(5) *Building*

President, General Secretary, Hony. Treasurer (*ex-officio*), Dr. M. N. Saha, Dr. A. J. Elkins, Sir B. L. Mitter, Mr. B. Mathews, Dr. S. C. Law, Maharajadhiraja of Burdwan.

Specialist Sectional Committees

A. Cultural (Humanities)

(*1*) *History and Archaeology.*—Dr. U. N. Ghosal (*Chairman*), Dr. K. Nag, Mr. H. Waddington, Dr. N. Roy, Dr. B. C. Sen, Dr. P. C. Gupta, Dr. D. C. Sarcar, Mr. S. K. Saraswati and Dr. J. N. Banerjee (*Secretary*), and *3 ex-officio members*.

(2) *Art, Architecture and Regional and Town Planning (including National Parks).*—Dr. A. C. Ukil (Chairman), Dr. S. L. Hora, Mr. E. T. D. Lambert, Mr. O. C. Gangooly, Dr. S. Kramrisch, Mr. W. H. Prosser, Mr. C. S. Rangaswami, Mr. Saila K. Mukherjee, Mr. B. Mathews, Dr. A. Carbone and Mr. J. A. Parks (*Secretary*), and *3 ex-officio members*.

(3) *Sanskritic Studies,*—Dr. N. Dutt (*Chairman*), Dr. B. C. Law Mrs. Tuhinika Chatterjee, Mr. J. C. Ghatak, Pandit N. C. Vedanta-tirtha, Mr. B. Banerjee, Rai Bahadur R. D. Chokani, Dr. A. P. Banerji-Sastri, and Dr. J. B. Chaudhuri (*Secretary*), and *3 ex-officio members*.

(4) *Islamic Studies.*—Sir Jadunath Sarkar (*Chairman*), Dr. M. Ishaque, Dr. M. Z. Siddiqi (*Secretary*), Dr. A. B. M. Habibullah and Dr. A. H. M. Mohiyuddin, and *3 ex-officio members.*

(5) *Language, Literature, Religion and Philosophy.*—Dr. Satkori Mookerjee, Dr. S. K. Chatterji, Rai Bahadur K. N. Mitra, Dr. (Mrs.) J. B. Chaudhuri, Dr. A. P. Banerji-Sastri, Mr. C. Sivaramamurti, Dr. B. K. Ghosh, Dr. K. D. Nag and Mr. K. P. Khaitan and *3 ex-officio members.*

(6) *Anthropology and Ethnology.*—Prof. K. P. Chattopadhyaya (*Chairman*), Mr. G. D. Birla, Mr. P. C. Mitra, Dr. U. P. Basu, Dr. Verrier Elwin, Dr. A. K. Sen, Dr. J. K. Bose. Mr. T. C. Das (*Secretary*) and *3 ex-officio members.*

B. *Scientific*

(1) *Medicine and Public Health.*—Dr. K. K. Sen-Gupta (*Chairman*), Dr. B. Mukherji, Dr. B. P. Neogi, Dr. R. B. Lal, Dr. K. N. Bagchi, Dr. B. P. Trivedi, Dr. A. C. Ukil, Dr. P. Brahmachari, Lt. Col. B. G. Mallya, Lt. Col. P. C. Banerji. Dr. A K. Sen (*Secretary*) and *3 ex-officio members.*

(2) *Botany, Forestry and Agriculture.*—Dr. K. P. Biswas (*Chairman*), Dr. S. K. Basu, Dr. S. K. Mukherjee, Mr. S. K. Dey, Mr. E. A. R. Banerjee, Mr. S. Chaudhuri, Dr. P. C. Sarbadhikari, Mr. J. N. Das, Mr. M. M. Basu, Mr. P. Lancaster, Rai Bahadur B. B. Mukherjee (*Secretary*) and *3 ex-officio members.*

(3) *Zoology and Fisheries.*—Dr. S. L. Hora (*Chairman*), Dr. S. C. Law. Mr. I. P. Mukherjee, Mr. L. R. Fawcus, Dr. T. J. Job, Mr. S. P. Basu, Dr. K. N. Bagchi, Dr. A. K. Sen, Mr. S. Iaqub, Dr. J. L. Bhaduri (*Secretary*) and *3 ex-officio members.*

(4) *Engineering and Industrial Development.*—Mr. G. W. Tyson (*Chairman*), Mr. G. D. Birla, Mr. P. C. Mitra, Dr. U. P. Basu, Dr. A. K. Sen, Miss Priti Mitra, Mr. B. P. Khaitan, Mr. T. C. Das, Dr. J. K. Bose (*Secretary*) and *3 ex-officio members.*

Medal Advisory Boards

(1) *Annandale Memorial Medal (Anthropology).*—Dr. V. Elwin, Dr. J. L. Bhaduri, Dr. A. C. Ukil, Hon'ble Mr. Justice R. P. Mookerjee, Dr. K. N. Bagchi and Dr. K. Biswas.

(2) *Durga Prosad Khaitan Memorial Medal (Industry and Science).*—Dr. S. K. Mitra, Dr. V. Elwin, Dr. J. L. Bhaduri, Director, Board of Scientific and Industrial Research or his nominee, Sir B. N. Mukherjee, Mr. Tulsi Prasad Khaitan (Donor). Hon'ble Mr. Justice R. P. Mookerjee, Dr. K. P. Biswas, Dr. K. N. Bagchi, Dr. M. N. Saha, Mr. A. P. Benthall.

(3) *Elliott Prize for Scientific Researches. (Mathematics)*—The President of the Royal Asiatic Society of Bengal, the Vice-Chancellor of the Calcutta University, and the Director of Public Instruction, Bengal (*Trustees of the Elliott Prize*).

APPENDIX IV

Budget Estimates, 1949.

Receipts.

	Budget Heads	1946 Actuals	1947 Actuals	1948 Budget Estimates	1948 Revised Estimates	1949 Budget Estimates	Remark
I	Interest on Investment	9.147	3,440	8,810	14,390	8,810	
I	Interest on Fixed Deposit.	450	1,350	1,350	450	450	
I	Advertisement	10,200	10,200	10,200	10,200	10,200	
r	Rent	10,680	11,130	11,580	11,580	11,580	
r	Miscellaneous	2,906	992	900	1,000	1,000	
I	Members' Subscriptions	17,873	18,927	19,000	27,000	25,000	
I	Admission Fee	7,826	4 368	2,500	1,700	2,500	
I	Compounding Fees	4,083	700	—	1,160	260	
	Donations	5,000	520	—	324	150	
	Special Grant, Govt. of India	—	20,000	20,000	20,000	20,000	
	Proportional Share for General Expenditure ;						
	1. Oriental Publication Fund No. 1	2,000	2,000	2,500	2,500	2,500	
	2. Sanskrit MSS. Fund	1,500	1,500	1,500	1500	1,500	
	3. Publication Fund	3,000	3,000	3,500	3,500	2,500	
	4. Arabic and Persian MSS. Fund	—	1,000	1,000	1,000	1,000	
		74,665	79,127	82,840	96,305	87,450	

APPENDIX IV

Budget Estimates,   1949.

Expenditure.

Nos.	Budget Heads	1946 Actuals	1947 Actuals	1948 Budget Estimates including Extra Additional Allotment	1948 Revised Estimates.	1949 Budget Estimates	Remarks
I.	Secretary's Salary	3270	7530	9000	—	—	
II.	Salaries and Allowances :—						
	General Secy's Allowance	1050	1639	1800	1800	1800	
	Salary of Office Staff ⎫	24741	27551	31000	18700	21000	
	Salary of Library Staff ⎭				6400	13500	
III.	Provident Fund Contribution	801	591	700	600	700	
IV.	Dearness Allowances :—						
	Office Staff ⎫	8323	9637	9800	8325	8350	
	Library Staff ⎭				2735	3000	
V.	Interim Relief :—						
	Office Subordinate Staff ⎫	—	—	2960	2960	2500	
	Library Subordinate Staff ⎭	—	—	—	1102	1100	
VI.	Gratuity	—	570	—	50	—	
VII.	Commission	487	401	400	730	500	
VIII.	Stationery	1566	1693	1900	1600	1500	
IX.	Printing Notices, Circulars, Reports, Etc.	2300	1226	2200	1925	2000	
X.	Contingencies	1782	2457	1800	2250	1800	
XI.	Postages	1384	1594	1800	2500	2300	
XII	Electric Charges	795	515	1250	850	1000	
XII.	Telephone	402	428	—	400	400	
XIV.	Transfer to Building Repair Fund	1000	1000	1500	1500	1500	
XV.	Taxes	2575	2704	2703	2830	2850	
XVI.	Insurance	853	853	855	750	750	
XVII	Lower Subordinate Staff Uniform Etc	—	622	300	275	300	
XVIII	Furniture :—						
	Purchase ⎫ Repair ⎭	3836	8482	800	175	200	
XIX.	Audit Fee	250	250	250	250	500	
XX.	Library Book Purchase	1240	2209	4000	4000	5000	
XXI.	Library Book Binding	1539	959	2000	750	1500	
XXII.	Library Improvement (including stock-taking and Cataloguing.)	1117	735	5000	4650	7500	
XXIII	General Improvement and Publications.	—	—	5000	10376	4000	
XXIV	Transfer of Compounding fee to Permanent Reserve	—	—	—	—	1200	
XXV.	Miscellaneous	—	—	—	—	100	
		59311	73646	87018	78486	83250	

Abstract Statement

of

Receipts and Disbursements

of the

Royal Asiatic Society of Bengal

for

the Year 1948

STATEMENT NO. 1.   *General*

Income and Expenditure Account

	Rs. As. P.	Rs. As. P.
To ESTABLISHMENT :		
General Secretary's Allowances	1,800 0 0	
Salaries	26,146 1 3	
Commission	727 8 0	
Dearness Allowance ..	11,158 1 0	
Interim Relief	3,784 12 0	
		43,616 6 3
GENERAL EXPENDITUREH		
Interest on Security Deposit ...	5 0 0	
Stationery	1,585 9 6	
Fans and Light ...	899 0 6	
Telephone	419 15 0	
Taxes	2,892 4 0	
Postage	2,362 11 9	
Contingencies	2,103 2 1	
Printing Circulars, Forms, etc.	1,902 9 0	
Audit Fee .	250 0 0	
Insurance .	750 0 0	
Lower Subordinate Staff, Uniforms	266 4 0	
Furniture and Repairs .	233 11 0	
Gratuities . .	50 0 0	
		13,660 2 10
LIBRARY AND COLLECTIONS :		
Books	9,975 1 3	
Binding	658 2 0	
Improvement, including Reading Room accommodation. Stock-taking and Safety Measures	7,465 8 0	
		12,098 11 3
Publication and General Improvement	. ....	9,575 7 3
Provident Fund Contributions, 1948 .	. ...	597 13 9
		79,548 9 4
Transfer to Building Repair Fund Account	......	1,500 0 0
SUNDRY ADJUSTMENTS :		
Arrears of Members' Subscription written off	1,642 0 0	
Adjustment on account of revaluation or investments at Face Value	5,685 10 0	
		7,327 10 0
BALANCE AS PER BALANCE SHEET :		
G.P. Notes, Rs. 2,81,200 ...	2,81,200 0 0	
½% Loan, Rs. 11,400 ...	11,400 0 0	
Fixed Deposit Rs. 30,000 ...	30,000 0 0	
Surplus at date	37,838 13 1	
		3,59,988 13 1
		4,48,315 0 5

Fund. *1948*

for the year ended 31st December, 1948.

				Rs. As. P.			Rs. As P.		
By Balance form last Account	...	...	•			......	8,52,789	9	4
Cash Receipts :									
Interest on Investments			..	14,390	4	0			
Interest on Fixed Deposits	..	..		450	0	0			
Govt. of India Grant	...	...		20,000	0	0			
Advertising	..	...	...	10,200	0	0			
Rent	..	...	...	11,630	0	0			
Miscellaneous	..	..	...	1,051	6	3			
Donation	..	..	.	.	325	0	0		
Society's Share of Provident Fund Written Back	..	...	...	308	12	10			
							58,355	7	1
Personal Account :									
Members' Subscriptions	..	...		25,719	0	0			
Admission Fees	...	.	...	1,762	0	0			
Compounding Fees	..	...	...	1,162	0	0			
							28,643	0	0
Amount at Credit Written Back					......		27	0	0
Transfer from Funds :									
Proportionate Share in General Expenditure—									
O.P. Fund No. 1 Account	...	.		2,500	0	0			
Sanskrit MSS. Fund Account		..		1,500	0	0			
Arabic and Persian MSS. Fund Account			1,000	0	0				
Publication Fund Account	.	...		3,500	0	0			
							8.500	0	0
							4,48,315	0	5

STATEMENT No. 2.   *Oriental Publication*

From a monthly grant made by the Government of Bengal, for the publi-
(Rs. 500, *Less* 20% *from the 1st of April*, 1932), and for the

	Rs. As. P.	Rs. As. P.
To Adjustment on account of revaluation of investments at Face Value	......	278 2 0
Proportionate Share in General Expenditure	......	2,500 0 0
Editing	.....	776 12 0
Purchase of paper	......	700 11 9
Balance as per Balance Sheet—		
Rs. 5,000, 3% War Loan, 1951-54 ..	5,000 0 0	
Rs. 5,000, 3% Victory Loan, 1957 ...	5,000 0 0	
Fixed Deposit	30,000 0 0	
Surplus at date	8,808 11 1	
		48,808 11 1
		53,064 4 10

STATEMENT No. 3.   *Oriental Publication*

From an annual grant made by the Government of Bengal of
Historical
(*Less* 20% *from the*

	Rs. As. P.	Rs. As. P.
To Balance from last Account .	، . ..	3,075 1 10
		3,075 1 10

STATEMRNT No. 4.   *Sanskrit Manuscripts Fund*

From an annual grant of Rs. 3,200 made by the Government of Bengal
by the Society; and Rs. 3,600
from the same Government

	Rs. As. P.	Rs. As. P.
To Adjustment on account of revaluation of investments at Face Value	......	137 8 0
Proportionate Share in General Expenditure	.....	1,500 0 0
Cataloguing	......	10,037 12 0
Repairs to MSS	.. ..	1,222 0 0
Printing	.....	295 15 6
Purchase of Mss	. ..	358 15 9
Stationery	......	26 2 9
Balance as per Balance Sheet—		
Rs. 5,000, 3% Victory Loan, 1957 ..	5,000 0 0	
Fixed Deposit	5,000 0 0	
Surplus at date	1,264 10 7	
		11,264 10 7
		24,843 0 7

Fund No. 1, *in Account with R. A. S.B.*   **1948.**

cation of Oriental Works and Works of Instruction in Eastern Languages
publication of Sanskrit Works hitherto unpublished, Rs. 250.

				Rs.	As.	P.
By	Balance from last Account	..	..	40,365	2	10
	Annual Grant	...	...	11,950	0	0
	Interest realized during the year	...		299	2	0
	Interest from Fixed Deposit	..	...	450	0	0
				53,064	4	10

Fund No. 2, *in Account with R. A. S: B.*   **1948.**

Rs. 3,000 for the publication of Arabic and Persian Works of
Interest.
1st of April, 1932).

				Rs.	As.	P.
By	Annual Grant	.	.	2,400	0	0
	Balance as per Balance Sheet		..	675	1	10
				3,075	1	10

Account *in Account with R. A. S B.*   **1948.**

for the publication of the Catalogue of Sanskrit Manuscripts acquired
(*Less 20% from the 1st of April, 1932*).
for Research Work.

				Rs.	As.	P.
By	Balance from last Account	...	..	18,538	6	7
	Annual Grant	.	..	6,080	0	0
	Interest realized during the year	.		149	10	0
	Interest from Fixed Deposit	.	.	75	0	0
				24,843	0	7

STATEMENT NO. 5.   *Arabic and Persian Manuscripts*

From an annual grant of Rs. 5,000 made by the Government of India for
by the Society; for the purchase of further Manuscripts,
Manuscripts found in

	Rs. As. P.	Rs. As. P.
To Proportionate Share in General Expenditure	. . . .	1,000 0 0
Cataloguing	. . .	1,270 15 0
Printing	. ...	667 11 6
Purchase of MSS	. ..	504 3 3
Balance as per Balance Sheet—		
Fixed Deposit	5,000 0 0	
Surplus at date . .	4,910 1 6	
		9,910 1 6
		13,352 15 3

STATEMENT NO. 6.   *Barclay Memorial*

From a sum of Rs. 500 odd given in 1896 by the Surgeon
encouragement of Medical

	Rs. As. P.	Rs. As. P.
To Adjustment on account of revaluation of investment at Face Value		9 10 0
Cost of Medal .		16 4 0
Balance as per Balance Sheet—		
Rs. 700, 3% Conversion Loan, 1946 .	700 0 0	
Surplus at date .	196 1 11	
		896 1 11
		921 15 11

STATEMENT NO. 7.   *Servants' Pension Fund*

Founded in 1876 as the Piddington Pension Fund

	Rs. As. P.	Rs. As. P.
To Adjustment on account of revaluation of investment at Face Value	......	41 4 0
Pension	......	156 0 0
Balance as Per Balance Sheet—		
Rs. 3,000, 3% Conversion Loan, 1946	3,000 0 0	
Surplus at date	536 12 8	
		3,536 12 8
		3734 0 0

Fund Account, *in Account with R. A. S. B.*   *1948.*

the cataloguing and binding of Arabic and Persian Manuscripts, acquired
and for the preparation of notices of Arabic and Persian
various Libraries in India.

				Rs. As. P.	Rs. As. P.
By Balance from last Account	...	..	...		8,277 15 3
Annual Grant	...	.	..	....	5,000 0 0
Interest from Fixed Deposit	.	...	.....		75 0 0

	13,352 15 3

Fund Account, *in Account with R. A. S. B.*   *1948.*

General, I.M.S., for the foundation of a medal for the
and Biological Sciences.

		Rs. As. P.	Rs. As. P.
By Balance from last Account		. .	886 1 11
Interest realized during the year			35 14 0

	921 15 11

Account, *in Account with R. A. S B.*   *1948.*

with Rs. 500 old from the Piddington Fund.

				Rs. As. P.
By Balance from last Account	...	...		3,582 14 8
Interest realized during the year	...	......		151 2 0

	3,734 0 8

STATEMENT NO. 8.   *Annandale Memorial Fund*

From donations by subscription.

	Rs. As. P.	Rs. As. P.
To Adjustment on account of revaluation of investment at Face Value	......	55 0 0
Balance as per Balance Sheet—		
Rs. 4,000, 3% Conversion Loan	4,000 0 0	
Surplus at date	798 0 9	
		4,798 0 9
		4,853 0 9

STATEMENT No. 9.   *Permanent Library Endowment*

From gifts received.

	Rs. As. P.	Rs. As. P.
To Adjustment on account of revaluation of investment at Face Value		198 8 0
Balance as per Balance Sheet—		
Rs. 14,000, 3% Conversion Loan	14,000 0 0	
Fixed Deposit	5,000 0 0	
Surplus at date .	1,556 11 8	
		20,556 11 8
		20,749 3

STATEMENT No. 10.   *Sir William Jones Memorial*

From a sum gifted for the purpose in

	Rs. As. P.	Rs. As. P.
To Adjustment on account of revaluation of investment at Face Value	......	41 4 0
Balance as per Balance Sheet—		
Rs. 3,000, 3% Conversion Loan, 1946	3,000 0 0	
Deficit at date	267 15 0	
		2,732 1 0
		2,773 5 0

STATEMENT No. 11.   *Pramathanath Bose Memorial*

From a sum gifted for

	Rs. As. P.	Rs. As. P.
To Adjustment on account of revaluation of investment at Face Value ...	......	24 12 0
Balance as per Balance Sheet—		
Rs. 1,800, 3% Conversion Loan, 1946	1,800 0 0	
Surplus at date	437 2 9	
		2,237 2 9
		2,261 14 9

Account, *in Account with* R. A. S. B.　　　　**1948.**

Started in 1926.

	Rs. As. P.	Rs. As. P.
By Balance from last Account	......	4,651 0 9
Interest realized during the year .	......	202 0 0

	4,853 0 9

Fund Account, *in Account with* R. A. S. B.　　　　**1948.**

Started in 1926.

	Rs. As. P.	Rs. As. P.
By Balance from last Account .	......	19,966 5 8
Interest realized during the year	......	707 14 0
Interest from Fixed Deposit . .	.. .	75 0 0

	20,749 3 8

Fund Account, *in Account with* R. A. S. B.　　　　**1948.**

1926, by Dr. U. N. Brahmachari.

	Rs. As. P.	Rs. As. P.
By Balance from last Account	. . .	2,622 3 0
Interest realized during the year .	......	151 2 0

	2,773 5 0

Fund Account, *in Account with* R. A. S. B.　　　　**1948.**

the purpose in 1935.

	Rs. As. P.	Rs. As. P.
By Balance from last Account	......	2,170 14 9
Interest realized during the year ..		91 0 0

	2,261 14 9

STATEMENT No. 12.   **Joy Govind Law Memorial**

From a donation for the purpose

	Rs. As. P.	Rs. As. P.
To Adjustment on account of revaluation of investment at Face Value ...	......	41 4 0
Cost of Medal	......	648 6 6
Balance as per Balance Sheet—		
Rs. 3,000, 3% Conversion Loan, 1946	3,000 0 0	
Deficit at date ...	261 3 6	
		2,738 12 6
		3,428 7 0

STATEMENT No. 13.   **Calcutta Science Congress Prize**

	Rs. As. P.	Rs. As. P.
To Adjustment on account of revaluation of investment at Face Value	......	41 4 0
Balance as per Balance Sheet—		
Rs. 3,000, 3% Conversion Loan, 1946	3,000 0 0	
Surplus at date	590 4 7	
		3,590 4 7
		3,631 8 7

STATEMENT No. 14.   **Dr. Bruhl Memorial**

From a sum gifted for the purpose in

	Rs. As. P.	Rs. As. P.
To Adjustment on account of revaluation of investment at Face Value	......	13 12 0
Cost of Medal	......	9 14 0
Balance as per Balance Sheet—		
Rs. 10,00, 3% Conversion Loan, 1946	1,000 0 0	
Surplus at date	388 15 0	
		1,388 15 0
		1,412 9 0

STATEMENT No. 15.   **Dr Bimala Churn Law**

From a sum gifted for the purpose

	Rs. As. P.	Rs. As. P.
To Adjustment on account of revaluation of investment at Face Value	......	110 0 0
Cost of Medal	......	240 0 0
Balance as per Balance Sheet—		
Rs. 8,000, 3% Conversion Loan, 1946	8,000 0 0	
Surplus at date	375 15 9	
		8,375 15 9
		8,725 15 9

Fund Account, *in Account with R.A.S.B.*   ***1948.***

in 1929, by Dr. Satya Churn Law.

		Rs. As. P.	Rs. As. P.
By Balance from last Account	...	......	8,277 5 0
Interest realized during the year	...	......	151 2 0
			8,428 7 0

Fund Account, *in Account with R.A.S.B.*   ***1948.***

		Rs. As. P.	Rs. As. P.
By Balance from last Account	...	......	8,480 6 7
Interest realized during the year	...	... .	151 2 0
			8,631 8 7

Fund Account, *in Account with R.A.S.B.*   ***1948.***

1929, by the Bruhl Farewell Committee.

		Rs. As. P.	Rs. As. P
By Balance from last Account	...	......	1,362 5 0
Interest realized during the year	.	..	50 4 0
			1,412 9 0

Gold Medal Fund Account, *in Account with R.A.S. B.*   ***1948.***

by Dr. B. C. Law.

		Rs. As. P.	Rs. As. P
By Balance from last Account	...	......	8,321 7 9
Interest realized during the year	...	......	404 8 0
			8,725 15 9

STATEMENT NO. 16.   *Sarat Ch. Roy Medal*

	Rs. As. P.	From a sum gifted Rs. As. P
To Adjustment on account of revaluation of investment at Face Value	.	110 0 0
Balance as per Balance Sheet—		
Rs. 4,000, 3% Victory Loan, 1957	4,000 0 0	
Surplus at date	38 15 10	
		4,038 15 10
		4,148 15 10

STATEMENT NO. 17. *Durga Prasad Khaitan Memorial Medal*

	Rs. As. P.	From a sum donated Rs. As. P
To Adjustment on account of revaluation of investment at Face Value		187 6 0
Balance as per Balance Sheet—		
Rs. 10,000, 3% Loan, 1970-75	10,000 0 0	
Surplus at date	829 10 6	
		10,829 10 6
		11,017 2 6

STATEMENT NO. 18.   *Sir Jadunath Sarkar*   *Medal*

	Rs. As. P.	From a sum donated Rs. As. P.
To Adjustment on account of revaluation of investment at Face Value	.	110 0 0
Cost of Medal		443 3 0
Balance as per Balance Sheet—		
Rs. 8,000, 3% Conversion Loan, 1946	8,000 0 0	
Surplus at date ...	441 5 0	
		8,441 5 0
		8,994 8 0

STATEMENT NO. 19.   *Dr Bimala Churn Law Collection*

	Rs. As. P.	From a sum donated Rs. As. P.
To Balance as per Balance Sheet ..	... ..	953 12 6
		953 12 6

Fnnd Account, *in Account with R.A.S.B.*   *1948.*

by Mrs. S. C. Roy for the purpose.

	Rs. As. P.	Rs. As P.
By Balance from last Account	.	4,036 15 10
Interest realized during the year	.	82 0 0
		4,148 15 10

Fund, *in Account with R.A.S.B.*   *1948.*

by Mr. T. P. Khaitan

	Rs. As. P.	Rs. As. P
By Balance from last Account	. ...	10,811 14 6
Interest realized during the year	......	205 4 0
		11,017 2 6

Fund. *in Account with R.A.S.B.*   *1948.*

by Dr. B. C. Law

	Rs. As P.	Rs. As. P.
By Balance from last Account		8,620 11 0
Interest realized during the year	. .	373 13 0
		8,994 8 0

Fund, *in Account with R.A.S.B.*   *1948.*

by Dr. B. C. Law.

	Rs. As. P.	Rs. As. P
By Balance from last Account		953 12 6
		953 12 6

STATEMENT NO· 20   *Research Fellowship Fund*

From an annual grant of Rs. 7,200

		Rs. As. P.	Rs. As. P.
To Balance from last Account	...	... .	115 0 0
Scholarships	...	......·.	3,210 8 0
Balance as per Balance Sheet	...	.. ..	3,874 2 0
			7,200 0 0

STATEMENT NO. 21.   *Historical Publication Fund*

From an annual grant of Rs. 10,000

		Rs. As. P.	Rs. As. P
To Salary paid to N. B. Roy	... ...	. ...	3,840 0 0
Stationery		.	22 8 0
Printing	.. ..	. . .	4,315 13 6
Binding	. .	. ...	670 15 0
Balance as per Balance Sheet—			
Fixed Deposit		5,000 0 0	
Surplus at Date	.	7.066 4 9	
			12,066 4 9
			20,915 9 3

STATEMENT NO. 22.   *Rajasthani Fund*

From a sum donated

		Rs. As. P.	Rs. As P
To Salary paid during the year	... .	. ...	1,100 0 0
Balance as per Balance Sheet	...	......	1,748 7 0
			2,848 7 0

STATEMENT No. 23.   *Building Repair*

		Rs. As. P.	Rs. As. P.
To Balance from last Account	... ...	......	4,527 10 6
Repairs during the year	... ...	......	1,609 1 0
			6,136 11 6

Account, *in Account with R.A.S.B.*   ***1948***.

made by Government of Bengal.

	Rs.	As.	P.
By Grant received during the year	7,200	0	0
	7,200	0	0

Account, *in Account with R.A.S.B.*   ***1948*.**

made by the Government of Bengal.

	Rs. As. P.	Rs.	As.	P.
By Balance from last Account	. ....	10,648	9	3
Annual grant received during the year	...	10,000	0	0
N. B. Roy's contribution to Provident				
Fund for the year . .	. . .	192	0	0
Interest from Fixed Deposit .	. .	75	0	0
		20,915	9	3

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in Account with R.A.S.B.   ***1948*.**

by G. D Birla.

	Rs As. P.	Rs.	As.	P.
By Balance from last Account		2,848	7	0
		2,848	7	0

Fund Account. *in Account with R.A.S.B.*   ***1948*.**

	Rs. As. P.	Rs.	As.	P.
By Transfer from R.A.S.B. General Fund . .	. . ...	1,500	0	0
Balance as per Balance Sheet ...	. ....	4,636	11	6
		6,136	11	6

STATEMENT No. 24.   *Provident Fund*

From contributions by the

	Rs. As. P.	Rs. As. P.
To Adjustment on account of revaluation of investment at Face Value ..	.....	189 12 0
Payments during the year ..	.....	437 4 10
Cost of stamp	.. ..	0 1 0
Balance as per Balance Sheet—		
Rs. 6,000, 3% Conversion Loan, 1946 6,000 0 0		
Rs. 5,200, 3% G P. Notes, 1963-65 5,200 0 0		
Savings Bank .. 3,753 0 4		
Advances 660 0 0		15,613 0 4
		16,240 2 2

STATEMENT No. 25.   *Provident Fund Advances Account*

	Rs As. P.	Rs. As. P.
To Balance from last Account		669 0 0
Payments during the year		777 0 0
		1,446 0 0

STATEMENT No. 26.   *Personal*

	Rs. As. P.	Rs. As. P.
To Balance from last Account		18,083 1 6
Advances		1,716 2 0
Amount Written Back, R.A.S.B.		27 0 0
R.A.S.B. Subscriptions, etc. ...	28.643 0 0	
Book Sales, etc.	18,820 11 6	
		47,463 11 6

67,289 15 0

Account, *in Account with R.A.S.B.*   **1948.**

Society and its Staff.

	Rs. As. P.	Rs. As. P.
By Balance from last Account		14,558 3 8
Interest realized during the year	75 14 0	
Staff Contribution for the year	597 13 9	
Society's Contribution for the year	597 13 9	
		1.271 9 6
Interest realized from Savings Bank	.. ...	410 5 0

		16,240 2 2

in Account with **R.A.S.B.**   **1948.**

	Rs. As. P.	Rs. As. P.
By Refunds during the year	..	786 0 0
Balance as per Balance Sheet	...	660 0 0
		1,446 0 0

Account.   **1948.**

	Rs. As. P.	Rs. As. P.
By Cash Receipts during the year—		
Members' Subscriptions, etc.	30,426 6 0	
Book Sales, etc	11,164 11 9	
Advances	2,371 6 0	
		43,962 7 9
Contribution to Tagore Portrait Fund	.. ...	173 0 0
Books returned	.. ..	199 1 0
Arrears of Members' Sub-cription written off, R.A.S.B.	......	1,642 0 0
Balance as per Balance Sheet	......	21,313 6 3

Outstandings.	Amount due to the Society.			Amount due by the Society.		
	Rs.	As.	P.	Rs.	As.	P.
Members ...	15,222	14	0	1,496	13	0
Publications, etc.	8,586	14	3	336	15	0
Bill Collector's Deposit ...	...	...	...	100	0	0
Tagore Portrait Fund ...	...	...	...	173	0	0
Miscellaneous ...	189	0	0	578	10	0
	23,998	12	3	2,685	6	0

		67,289 15 0

STATEMENT No. 27. *Publication Fund Account,*

	Rs. As. P.	Rs. As. P.
To· Adjustment on account of revaluation of investment at Face Value ...		275 0 0
Proportionate Share for General Expenditure		3,500 0 0
Books returned		199 1 0
Journal and Proceedings		5,455 6 6
Monograph		2,509 12 0
Bulletin		1,025 0 6
Advertising		45 13 0
Refund		650 14 0
Sales-Counter		541 0 0
Balance as per Balance Sheet—		
Rs. 10,000, 3% Victory Loan, 1957 . . 10.000 0 0		
Rs. 10,000. Fixed Deposit . 10,000 0 0		
Surplus at date 10.654 12 2		
		30,654 12 2
		44,856 11 2

STATEMENT No. 28. *Discussion Meetings Fund Running*

	Rs. As. P.	Rs. As. P.
To Balance as per Balance Sheet ˉ		32 4 3
		32 4 3

STATEMENT No. 29. *(1) Deposit Account Provident Fund*

	Rs. As. P.	Rs. As. P.
To Balance from last Account		2,499 7 8
Deposit of Interest realized from loans during the year	75 14 0	...
Deposit of Contributions during the year .	1,195 11 6	
Deposit of Advances returned	786 0 0	
		2,057 9 6
Interest on Investments and from Bank		410 5 0
		4,967 6 2

STATEMENT No. 30. *(2) Deposit Account (Fixed Deposit*

	Rs. As. P.	Rs. As. P.
To Balance from last Account		90,000 0 0
		90,000 0 0

in Account with R.A.S.B. .   **1948.**

	Rs. As. P.	Rs. As. P.
By Balance from last Account		21,763 7 11
Grant received during the year		2,100 0 0
Book Sales	16,820 11 6	
Cash Sale of Publication ... 1,723 3 9		
		20,543 15 3
Interest realized during the year		299 4 0
Interest from Fixed Deposit		150 0 0
		44,856 11 2

Account, in Account with R.A.S.B.   **1948.**

	Rs. As. P.	Rs. As. P.
By Balance from last Account		92 4 3
		92 4 3

(Savings Bank Deposit with Imperial Bank of India). **1948.**

	Rs. As. P.	Rs. As P.
By Withdrawal for Staff Advances, etc. .		1,211 4 10
Cost of a stamp		0 1 0
Balance as per Balance Sheet		3,753 0 4
		4,967 6 2

(with Imperial Bank of India).   **1948.**

	Rs. As. P.	Rs. As. P.
By Balance as per Balance Sheet		90,000 0 0
		90,000 0 0

STATEMENT No. 31.   (3) *Investments*

				Rs. As. P.
To Balance from last Account	.	...	.....	3,99,844 2 0
	...			
				3,99,844 2 0
	...			

FUNDS	Face Value Rs.	
ROYAL ASIATIC SOCIETY OF BENGAL.		
PERMANENT RESERVE.		
3% Conversion Loan, 1946 . .	2,53,700	
3% Conversion Loan, 1946 . . .	500	
3% War Loan, 1951-54	5,000	
3% Defence Loan, 1953-55	10,000	
TEMPORARY RESERVE.		
3% Conversion Loan, 1946	12,000	
4½% Loan, 1955-60	11,400	2,92,600
ORIENTAL PUBLICATION FUND No. 1.		
3% War Loan, 1951-54	5,000	
3% Victory Loan, 1957	5,000	
SANSKRIT MSS. FUND.		
3% Victory Loan, 1957	5,000	
BARCLAY MEMORIAL FUND		
3% Conversion Loan, 1946	700	
SERVANTS' PENSION FUND.		
3% Conversion Loan, 1946	3,000	
ANNANDALE MEMORIAL FUND.		
3% Conversion Loan, 1946	4,000	
PERMANENT LIBRARY ENDOWMENT FUND.		
3% Conversion Loan, 1946 . .	14,000	
SIR WILLIAM JONES MEMORIAL FUND		
3% Conversion Loan, 1946.	3,000	
PRAMATHANATH BOSE MEMORIAL FUND.		
3% Conversion Loan, 1946 ...	1,800	
JOY GOBIND LAW MEMORIAL FUND.		
3% Conversion Loan, 1946	3,000	
CALCUTTA SCIENCE CONGRESS PRIZE FUND.		
3% Conversion Loan, 1946	3,000	
DR. BRUHL MEMORIAL FUND.		
3% Conversion Loan, 1946 . ..	1,000	
DR. BIMALA CHURN LAW GOLD MEDAL FUND.		
3% Conversion Loan, 1946	8,000	
SARAT CH. ROY MEDAL FUND		
3% Victory Loan, 1957.	4,000	
D. P. KHAITAN MEMORIAL MEDAL FUND.		
3% Loan (1970-75)	10,000	
SIR JADUNATH MEDAL FUND.		
3% Conversion Loan, 1946	8,000	
PUBLICATION FUND.		
3% Victory Loan, 1957.	10,000	
PROVIDENT FUND.		
3% Loan (1963-65)	5,200	
3% Conversion Loan, 1946	6,000	
		99,700
	...	
		3,92,300

Account.   *1948/9.*

			Rs.	As.	P
By Adjustment on account of revaluation of investment at Face Value	. .	...	7,544	2	0
Balance as per Balance Sheet		...	3.92,300	0	0
			3,99,844	2	0

STATEMENT No. 32.   *Cash*

For the year ended 31st

To			Rs. As. P.	Rs. As. P.
Balance from last Account	...	...	......	25,782 11 6
General Fund Account		.. ...		58,355 7 1
Oriental Publication Fund No. 1 Account	...	.		12,699 2 0
Oriental Publication Fund No. 2 Account	.	.		2,400 0 0
Sanskrit Manuscripts Fund Account	..	.		6,304 10 0
Arabic and Persian Manuscripts Fund Account				5,075 0 0
Barclay Memorial Fund Account	.	.		35 14 0
Servants' Pension Fund Account	...	.		151 2 0
Annandale Memorial Fund Account	, .	.		202 0 0
Permanent Library Endowment Fund Account				782 11 0
Sir William Jones Memorial Fund Account				151 2 0
Pramatha Nath Bose Memorial Fund Account		. .		91 0 0
Joy Gobind Law Memorial Fund Account				151 2 0
Calcutta Science Congress Prize Fund Account				151 2 0
Dr. Bruhl Memorial Fund Account	.	. .		50 4 0
Sarat Ch. Roy Medal Fund Account		..		82 0 0
Dr. Bimala Churn Law Gold Medal Fund Account				404 8 0
Durga Prasad Khaitan Medal Fund Account		. .		205 4 0
Sir Jadunath Medal Fund Account	..	...	...	373 13 0
Research Fellowship Fund Account	...	.....		7,200 0 0
Historical Publication Fund Account	. .			10,267 0 0
Provident Fund Account	...	. . .		1,271 9 6
Advance Account	.	...	.	786 0 0
Personal Account		.	. .	44,135 7 9
Publication Fund Account				4,272 7 9
Savings Bank Deposit Account, Imperial Bank of India, Calcutta				1,214 1 10

1,82,595 13 5

Account.   *1948.*

December, 1948

By	Rs. As. P.	Rs. As. P.
General Fund Account	. .	79,548 9 4
Oriental Publication Fund No. 1 Account ...	. . .	1,477 7 9
Sanskrit Manuscripts Fund Account		11,940 14 0
Arabic and Persian Manuscripts Fund Account	..	2,442 13 9
Barclay Memorial Fund Account .	. ..	16 4 0
Servants' Pension Fund Account ..	. .	156 0 0
Joy Gobind Law Memorial Fund Account ..	.	648 6 6
Dr Bruhl Memorial Fund Account ..	....	9 14 0
Dr Bimala Churn Law Gold Medal Fund Account		240 0 0
Sir Jadunath Medal Fund Account ...		443 3 0
Research Fellowship Fund Account ..	,.	3,210 8 0
Historical Publication Fund Account .	,	8,849 4 6
Rajasthani Fund Account .. .		1,100 0 0
Building Repair Fund Account ..	.. ...	1,609 1 0
Provident Fund Account .	.	487 4 10
Advances Account ...	. . .	777 0 0
Personal Account	. .	1.716 2 0
Publication Fund Account ..	. . .	10,227 11 0
Savings Bank Deposit Account, Imperial Bank of India		2,057 9 6
Balance as per Balance Sheet—		
In hand		93 5 9
With the Imperial Bank of India, on Current Account	..	55,594 3 6

	1,82,595 13 5

STATEMENT No. 33.   *Balance*

As at 31st

LIABILITIES.

	Rs. As. P.	Rs. As. P.
General Fund Account	.	8,59,936 13 1
Oriental Publication Fund No. 1 Account	.	48,808 11 1
Sanskrit Manuscripts Fund Account	. .	11,264 10 7
Arabic and Persian Manuscripts Fund Account	. .	9.910 1 6
Barclay Memorial Fund Account	.....	896 1 11
Servants' Pension Fund Account	. .	9,536 12 8
Annandale Memorial Fund Account	. .	4,798 0 9
Permanent Library Endowment Fund Account	.	20,556 11 8
Sir William Jones Memorial Fund Account	.	2,732 1 0
Pramatha Nath Bose Memorial Fund Account	. ...	2,237 2 9
Joy Gobind Law Memorial Fund Account	. .	2,738 12 6
Calcutta Science Congress Prize Fund Account	.....	3,590 4 7
Dr Bruhl Memorial Fund Account	.	1,388 15 0
Dr. Bimala Churn Law Gold Medal Fund Account		8,375 15 9
Sarat Ch. Roy Medal Fund Account	.... .	4,038 15 10
Durga Prasad Khaitan Medal Fund Account	...	10,829 10 6
Sir Jadunath Medal Fund Account	.	8,441 5 0
Dr. Bimala Churn Law Collection Fund Account	....	953 12 6
Research Fellowship Fund Account	.	9,874 2 0
Historical Publication Fund Account	....	12,066 4 9
Rajasthani Fund Account	... ..	1,748 7 0
Provident Fund Account	......	15,613 0 4
Publication Fund Account	......	30,654 12 2
Discussion Meetings Fund Account	......	92 4 3
Personal Account—Sundry Liabilities	. .	2,685 6 0
		5,71,711 8 2

Sheet.   *1948*

December, 1948

ASSETS

	Rs. As. P.	Rs. As. P.
Oriental Publication Fund No. 2 Account		675 1 10
Building Repairs Fund Account	....	4,636 11 6
Advances Account ...	660 0 0	
Personal Account—Outstandings	23,998 12 2	
		24,658 12 8

Deposits :—

Savings Bank Deposit Account, Imperial Bank of India	3,753 0 4	
Fixed Deposit Account, Imperial Bank of India :—	Rs. As. P.	
General Fund	30,000 0 0	
Trust Funds	60,000 0 0	
	90,000 0 0	
		93,753 0 4

Investment Account :—

	Rs. As. P.	Rs. As. P.
General Fund	2,92,600 0 0	
Trust Funds ...	99,700 0 0	
		3,92,300 0 0

Cash Accounts :—

In hand	93 5 9	
With the Imperial Bank of India, on Current Account	55,594 3 6	
		55,687 9 8

...		6,71,711 3 2
...		

K. Biswas,
Honorary Treasurer.

APPENDIX V

Abstract Proceedings, Council 1948

ACCOMMODATION—Report giving permission on usual terms to a member, Dr. P. D. Halwasiya for the use of the Society's Hall for a general lecture on Sunday, the 4th January, from 3 to 5 P.M. Action approved. Council 6, 14-1-48.

Request for the use of the hall of the Society from Mining, Geological and Metallurgical Institute of India for their Annual Meeting on Friday, the 30th January at 10 A.M. Approved. Council 11(a), 20-2-48.

Request for the use of the hall of the Society on usual terms from Iran Society, Calcutta, for their Annual General Meeting on Sunday, the 22nd February at 11 A.M. Approved. Council 11(b), 20-2-48.

Request from the Indian Institute of Metals for the use of the Society's hall for their meetings on 29th and 30th December, 1948. Allow on the usual conditions. Council 14, 22-7-48.

Letter from the President (Dr. S. L. Hora) of the Indian Fisheries Society, Calcutta, requesting to waive the charges of using the Society's hall for a meeting of the Fisheries Society, held on 14-7-48. Regret. No waiving. Allow on the usual conditions. Council 15, 22-7-48.

Letter from the Honorary Secretary, Calcutta Art Society, requesting the use of the Members' room on the ground floor for a meeting of their Executive Committee on Thursday, the 29th July at 5-30 P.M. Allow for this occasion only. Council 18, 22-7-48.

Application from the Secretary, World Pacifist Meeting, Calcutta, dated the 13th August, for the use of the Society's hall for a Public Meeting on Wednesday, the 8th September, for two hours in the evening. Regret inability to lend the hall. Council 15, 18-8-48.

Consideration of a letter from the President, Indian Institute of Personnel Management, for the loan of the Society's hall, on usual conditions, for a lecture on "The Role of the Personnel Officer in Industrial Health and Hygiene", by Lt.-Col. Lakshmanan, Director of All India Institute of Hygiene & Public Health, on Tuesday, the 14th September, 1948, at 5-30 P.M. Allow. Council 2, 15-9-48.

Note of the President dated 2nd October, 1948:—At the last meeting of the Council it was decided to make necessary arrangements to reopen the Library after the Puja vacation. The President, the General Secretary, the Library Secretary and the Hony. Treasurer were authorised to take all steps including adequate provision for suitable safety measures in this connection. It is essential that: (1) The different members of the Staff working for the Library including the manuscript section should be placed under one unified control to ensure co-ordination resulting in better work economically. (2) The pre-existing arrangements for the work of the scholars, researchers and the Library Staff are not satisfactory. (3) The present accommodation for the Library including the Reading room

and facilities for cataloguers and research workers is wholly insufficient. Rearrangement of the office and the library without material and substantial structural alterations is possible. It is necessary, therefore, that the members of the Council and the Library and Finance Committees should meet and after a thorough discussion of possible alternatives come to a final decision on the points noted above before the holidays commence, so that all preliminaries might be completed during the vacation and the Library may begin to function normally under improved conditions as early as possible. Resolution: It is resolved by this Council that the General Secretary is hereby authorised to take all necessary steps for implementing the views of the Council about normal functioning of the Library under improved conditions just after the Pujas by the transfer of the office from the first floor to the ground floor so that the entire first floor or as much of it as is essential may be used for the purposes of the Library as reading room, etc. He may have the additions and alterations made by any responsible firm without calling for tenders if necessary in order to get the work done quickly and satisfactorily during the ensuing Puja holidays. He should, however, place a report about the steps taken by him about this resolution together with an estimate before the next Ordinary Meeting of the Council. Emerg. Council, 6-10-48.

AGENCIES—The question of appointing Messrs. Stechert-Hafner Inc. of 31st, East 10th Street, New York, 3, as one of the selling agents of the Society in U.S.A. To write to Stechert-Hafner if they would be one of our selling agents for the U.S.A. and, if so, what bank reference in Calcutta they can furnish. General Secretary to report about the work of the present agents Messrs. The Moore-Cottrell Subscription Agencies, New York, U.S.A., who have done nothing for the sale of our publication. Pub. Com. 6, 12-8-48. Contact the Indian Embassy at Washington. Swami Nikhilananda of Ramakrishna Mission in New York may also be contacted. Council 5, 18-8-48.

BIBLIOTHECA INDICA COMMITTEE—Letter from Dr. Ishaque regarding the printing of *Catalogue of Arabic MSS* and suggestions for issuing the 2nd Volume with total 233 pages of the Catalogue. Publish Vol. II as suggested by Dr. Ishaque. Bib. Ind. Com. 5, 9-3-48. Approve. Council 11, 16-3-48.

Letter from Dr. N. Dutt regarding the printing of *Catalogue on Indian Museum Collection* prepared by Pt. Nani Gopal Banerjee. Drop publication, but pay Pandit N. G. Banerjee the balance of 25% in full settlement. As for the printing of the *Jaina Ms. Catalogue*, experts be consulted with regard to the quality of the work. Bib. Ind. Com. 6, 9-3-48. Request Mr. S. K. Chatterji, Dr. J. B. Chowdhury, Mr. R. P. Mookerjee and General Secretary to report on the matter. Council 11, 16-3-48.

Letter from Ayodhya Nath Vyakaranacharya offering his services for editing certain books on *Panini Shastra*. Keep in abeyance, Bib. Ind. Com. 7, 9-3-48. Approve. Council 11, 16-3-48.

Letter from Prof. P. C. Sen Gupta suggesting preparation of a good manuscript copy of the *Garga Samhita*—the Fort William College Manuscript No. I-D-20, for the final publication of the work by the R.A.S.B. and recommending the name of Babuaji Misra Jyotisacharya of Calcutta

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University. Keep in abeyance. Bib. Ind. Com. 8, 9-3-48. Approve. Council 11, 16-3-48.

Letter from Prof. Satkari Mookerjee offering his services for editing (1) *Tattvacintamani* (2) *Nyayavarttika-tatparyaparisuddhi* and (3) *Kavikalpalata*. Request Prof. Mookerjee to supply further information about previous editions if any, and the size of the books which are proposed to be published. Bib. Ind. Com. 4, 15-7-48. Accept. Council 10, 22-7-48.

Letter from Pandit Vanamali Chakravarty suggesting names of Naiyayikas for editing several books of Bibliotheca Indica Series. Fuller detailed information be placed before the next meeting on the following points: re. incomplete books, how far printed, what portion requires to be published, names of Editors, whether their collaboration still available, if not, the special qualifications of the new Editors for the particular work to be submitted. Bib. Ind. Com. 3, 15-7-48. Accept. Council 10. 22-7-48.

The question of printing of (a) *Haft Iqlim* and (b) *Rawjatul Jannat*. Recommendation : A note on the points raised by Dr. Ishaque re: editors fees be placed before the next meeting when the question of printing will be considered along with editor's fees. The terms with late Prof. M. M. Huq about *Haft Iqlim* may also be put up. Bib. Ind. Com. 2, 15-7-48. Council 10, 22-7-48.

Letter from Pandit Vanamali Chakravarty suggesting names of Naiyayikas for editing several books of Bibliotheca Indica Series. Request Pt. Vanamali Chakravarti, Prof. Satkori Mookerjee and Pt. N. C. Vedantatirtha to meet the President and discuss the matter with him. Bib. Ind. Com. 2, 12-8-48. Accept. Council 6, 18-8-48.

Letter from Prof. Satkori Mookerjee offering his service to edit *Tattvacintamani* critically with Mathuranatha's and Rucidatta's commentaries. Request Pt. Vanamali Chakravarti, Prof. Satkori Mookerjee and Pt. N. C. Vedantatirtha to meet the President and discuss the matter with him. Bib. Ind. Com. 3, 12-8-48. Accept. Council 6, 18-8-48.

Letter from Sir Jadunath Sarkar regarding the printing and publication of the translation of remaining portion of "*Maasir-ul-Umara*" by Dr. Baini Prasad. Suggestions of Sir Jadunath Sarkar be accepted. Write to Dr. Hari Ram Gupta offering Rs. 500/- as his honorarium. Bib. Ind. Com. 2, 8-9-48. Accept. Council 8, 15-9-48.

Note from the President regarding completion and publication of certain books of Bibliotheca Indica Series. Recommendation: The suggestion be generally approved. Definite recommendation may be put up indicating (1) list of publication which may be completed early (2) list of incomplete books which need not be completed at this stage and suggesting (3) improved method for better and more regular work in Publication Department. Bib. Ind. Com. 3, 8-9-48. Accept. Council 8, 15-9-48.

Letter dated 7-7-48 from Edward Conze requesting as to whether it is possible to publish his English translation of *Asta-sahasrika-prajna-paramita* in the Bibliotheca Indica Series. Recommendation: Write to Mr. Conze to send the translation along with a note about his

qualifications. When received refer to Dr. Dutt for his perusal and opinion. Bib. Ind. Com. 4, 8-9-48. Accept. Council, 15-9-48.

Consideration of a letter from Pandit Iswar Chandra Sastri who is editing the 3rd Volume of *Vidhanaparijata* requesting extension of time up to the middle of January, 1949, for completion up to the 4th Stabaka. He says that in course of printing of the 4th Stabaka, the 5th will be ready. Permit. Bib. Ind. Com. 3, 23-11-48. Accept. Council 24, 24-11-49.

Consideration of a letter dated 18-11-48 from Prof. Satkori Mookerjee recommending the publication of the *Dhvanyaloka* of Anandavardhana-charya of Kashmir written in the 9th century A.D. as edited by Sri Vishnupada Bhattacharjee, M.A., P.R.S., Lecturer in the Central College, Calcutta. His critical studies on the *Dhvanyaloka* be published in our Journal first and then we shall consider publication of the book. Bib. Ind Com. 2, 23-11-48. Accept. Council 24, 24-11-48.

Consideration of a letter from Sir S. Radhakrishnan addressed to the President, regarding the publication of Mr. Edward Conze's translation of the *Astasahasrika-prajnaparamita* in the Bibliotheca Indica Series. In modification of the previous recommendation inform Dr. Conze that the translation may be revised and then one chapter sent here for final decision by the Society. Bib. Ind. Com. 3, 14-12-48. Accept. Council 9, 15-12-48.

• **COUNCIL**—Report nomination on the Council of Dr. S. K. Chatterji as Philological Secretary in place of Dr. S. K. De, and Mr. R. P. Mookerjee, as a member of Council, for 1948-49. Record. Council 2, 14-1-48.

Appointment of a Medical Secretary (under Rule 45) in place of Lt.-Col. C. L. Pasricha, who has taken up a post as Medical Adviser to the High Commissioner for India in London Order: Record with regret. Appoint Dr. A. C. Ukil. Council 20, 16-3-48.

Letter from Mr. K. P. Khaitan, dated the 10th March, resigning his office as Honorary Treasurer of the Society. Accept with regret. Appoint Mr. R. P. Mookerjee. Council 21, 16-3-48.

Letter from Dr. W. D. West dated the 1st May intimating his decision to resign his office as President of the Society and as a member of the Council. Though unanimously requested to withdraw his resignation, Dr. West regretted that he was unable to do so. His resignation as President was therefore accepted with regret. The Hon'ble Mr. Justice R. P. Mookerjee being proposed by Dr. West and duly seconded was selected to fill the vacancy. Dr. K. P. Biswas was selected to take his place as Hony. Treasurer. Dr. B. S. Guha was selected to take the place of Dr. Biswas as Natural History Secretary, and Dr. West as a Member of Council. Council 2, 13-5-48.

The question of filling up a vacancy on the Council caused by the resignation of Mr. K. P. Khaitan. Dr. N. Roy to be invited to fill the vacancy. Dr. Roy to take the place of Dr. Guha as Library Secretary. Council 3, 13-5-48.

Letter from Mr. C. C. Blagden dated 14-5-48 resigning his seat on the Council. Record with regret. Dr. M. Z. Siddiqi to fill up the vacancy, Dr. Saha's ruling in the last monthly meeting regarding the procedure to be followed when any of the office bearers of any other member of the Council tender resignation. Council 2, 17-6-48.

Question of filling up of the vacancy on the Council of Natural Science Secretary (Biology), vice Dr. K. P. Biswas who is officiating as such. Dr. J. L. Bhaduri selected as Natural Science Secretary. Sp. Council 5, 27-9-48.

Consideration of the composition of the Council for 1949-50. The following list of the names of persons be declared as candidates for election to next year's Council, and the list be printed and issued to the Resident Members as prescribed in Rule 44:—

The Hon'ble Mr. Justice R. P. Mookerjee, M.A., B.L., President.

Dr. S. K. Chatterji, M.A., D.Litt., F.R.A.S.B., Vice-President.

Dr. M. N. Saha, D. Sc., F.R.S., F.R.A.S.B., F.N.I., Vice-President.

Dr. M. Z. Siddiqi, M.A., B.L., Ph.D., Vice-President.

Dr. R. C. Majumdar, M.A., Ph.D., Vice-President.

Dr. K. N. Bagchi, B.Sc., M.B., D.T.M., F.R.I.C., F.N.I., General Secretary.

Dr. S. C. Law, M.A., B.L., Ph.D., F.N.I., F.Z.S., M.B.O.U., Treasurer.

Dr. N. Dutt, M.A., B.L., Ph.D., D.Litt., Philological Secretary. Secretary.

Dr. A. B. M. Habibullah, M.A., Ph.D., Dip.Lib., Jt. Phil.

Dr. J. L. Bhaduri, D.Sc., Natural Hist. Secretary (Biology).

Dr. S. K. Mitra, M.B.E., D.Sc., F.N.I., Nat. Hist. Secy. (Phys. Science).

Rev. Dr. W. G. Griffiths, M.A., B.Sc., B.D., Ph.D., Anthropological Secretary.

Dr. U. N. Ghoshal, M.A., Ph.D., F.R.A.S.B., Historical & Archaeological Secretary.

Dr. A. C. Ukil, M.B., M.S.P.E., F.S.M.F.B., F.N.I., Medical Secretary.

Dr. Niharranjan Roy, M.A., D.Lett., D.Phil., Dip.Lib., F.L.A., Library Secretary.

Mr. A. P. Benthall, F.L.S., Council Member.

Rai Bahadur J. M. Sen, M.Ed., B.Sc., T.D., Dip.Ed., F.R.G.S., F.N.I., Council Member.

Mr. K. P. Khaitan, M.A., B.L., Barrister-at-Law, Council Member.

Mr. H. Waddington, M.B.E., F.S.A., Council Member.

Dr. K. P. Biswas, M.A., D.Sc., F.R.S.E. Council Member.

Council 14, 15-12-49.

COMMITTEES—Dr. J. N. Banerjee. Re: Bicentenary celebrations of the birth of Sir William Jones. Order: The Council regrets that existing and other untoward events prevented the implementation of their programme and has decided to appoint a Committee consisting of the two Philological Secretaries, Dr. J. N. Banerjee (Convener), Dr. R. C. Majumdar, Dr. K. Nag, Dr. N. Roy and the ex-officio members, to suggest ways and means to implement the proposal. Council 19(f) (4) 13-5-48.

Consideration of a matter arising from the Ordinary Monthly Meeting of 3-5-48. Appointment of a Committee consisting of 12 members to "investigate into the affairs of the Journal and to recommend measures for its improvement, as a result of a motion by Mr. A. K. Majumdar." The following Committee was constituted by the meeting:—President, General Secretary, Hony. Treasurer, Mr. H. D. Bhattacharya, Dr. S. K. Chatterji, Dr. G. P. Majumdar, Dr. B. P. Neogy, Dr. J. N. Banerjee, Dr. M. N. Saha, Mr. B. Mukherjee, Mr. T. C. Das, Mr. A. K. Majumdar Order: Record. Council 9(b), 23-6-48.

SIR WILLIAM JONE'S BICENTENARY CELEBRATIONS — Consideration of ways and means for—(a) bringing out a critical edition of the first English translation of Sakuntala by Sir William Jones, along with the reprint of the original text of Sakuntala in Bengalee script from which the translation was made; (b) procuring a photostat copy of the edition of Sakuntala in Bengalee script utilised long ago by Prof. Chezy, now in the Collection of the Bibliothique Nationale of Paris; (c) preparing an index of all the articles on Letters and Science that were published in the Asiatick Researches, and (d) publishing a monograph on Fisher's Memoir on Education, by Prof. A. N. Bose, Recommendations for items 1(a), (b), (c) & (d)—Dr. Banerjee is requested to contact the scholars who were entrusted to contribute articles to the Commemoration Volume, and to submit a note stating what steps have been taken by them so far. The General Secretary to request Dr. S. K. Chatterji who is now in Paris, for arranging for a photostat copy of Sakukntala in Bengali. Committee for implementing the programme of Bicentenary Celebrations of Sir William Jones, 1., 22-7-48.

DONATION—Letter from Mr. Chhotelal Jain intimating his willingness to donate a sum for the institution of a medal for Peace, Humanities etc. as suggested by the Patron, H. E. Sri C. Rajagopalachari at the last Annual Meeting, Appoint a committee to report to the Council on the proposal. Members:—The three ex-officio members, Sir B. L. Mitter, Mr. P. N. Banerjee and Sir Jadunath Sarkar. The President to see His Excellency and to report to the next Council Meeting. Council 8, 16-3-48.

EXCHANGE—Letter from Dr. Arthur Upham Pope requesting presentation of a set of Society's publications. Comply as far as possible. Request Dr. Pope for his books as exchange (not being a condition precedent). Pub. Com. 7, 12-1-48. Accept Council 12. 14-1-48.

Request for exchange for the "University of Kansas Paleontological Contributions: Exchange with the "Science" section of our Journal. Lib. Com. 3, 12-1-48. Approve. Council 13, 14-1-48.

Request for exchange and review from the Secretary, Botanical Society of Bengal, for the Bulletin (Half-Yearly): Exchange with the Science Section of the Journal. No review. Lib. Com. 4, 12-1-48. Approve. Council 13, 14-1-48.

Request for exchange with the Journal of Scientific and Industrial Re-search. Exchange with the Science Section of the Journal only. Lib. Com. 6, 12-1-48. Approve. Council 13, 14-1-48.

Consideration of a letter from the Director of the Museum of Ethnology of Leipzig to present their Library with the publications of our Society issued during the war and post-war times and to establish exchange relation with their Year Books. Ask for a specimen copy. Lib. Com. 9, 12-1-48. Approve. Council 13, 14-1-48.

Request for exchange of "Marxian Way" with the Society's Journal. Recommendation: No. Lib. Com. 4, 9-3 48. Approve. Council 9, 16-3-48.

Request for exchange from the Universiteit te Gent for the publications of the Faculty of Letters of their University with the Society's publications in the Bibliotheca Indica Series, including the bulk of previous publications on either side, as far as still available. Approve. Lib. Com. 5, 9-3-48. Accept Council 9, 16-3-48.

Consideration of the question of subscribing the "Indian Forester" published by the Forest Research Institute, Dehra-Dun, (Annual subs. Rs. 15). It used to be supplied free of cost up to 1936. Try and get it on exchange with the Science part of the Society's Journal. Lib. Com. 14, 9-3-48. Approve. Council, 9, 16-3-48.

Request from Mr. B. M. Agarwalla (Member) to establish exchange relation in respect of the following publications:

(a) Proceedings and Committee Reports of the (i) Indian Parliament, Constituent Assembly, and Provincial legislatures of India, & (ii) American Congress. Recommendation: No.

(b) Journal of the Nagri Pracharini Sabha and their publications. Recommendation: Mr. Agarwalla may request them to write to us.

(c) Hansard. Recommendation: No.

(d) Proceedings of the Hindi Sahitya Sammelana (Allahabad), and publication thereof. Recommendation: They should write. Lib. Com. 16, 9-3-48. Approve. Council 9, 16-3-48.

Circular from the Curator, Government Oriental MSS. Library, Madras announcing the publication of a half-yearly multilingual journal of Oriental Research. Exchange with the current issue of Journal (Letters). Lib. Com. 5, 9-4-48. Accept. Council 11, 19-4-48.

Circular with a specimen copy of "Lingua", an International review of General Linguistics, published from Holland. Establish exchange relations for the current issue of the Journal (Letters) with its publishers, Nitgeverij J. H. Gottmer, Wilhelminapark 12, Haarlem, Holland. Lib. Com. 6, 9-4-48. Accept. Council 11, 19-4-48.

Request from Mr. B. M. Agarwalla to write to the Nagri Pracharini Sabha (Banares), and Hindi Sahitya Sammalana (Allahabad) to exchange their publications with the Society's publications, instead of asking them to write to the Society, as was decided in the last Library Committee Meeting. Recommendation: Refer to Mr. R. P. Mookerjee. Lib. Com. 9, 9-4-48. Accept. Council 11, 19-4-48.

Consideration of a letter from Dr. Ernst v. Nischer-Falkenhoff of Vienna offering a copy of his book, "Stilicho" and another book of Indian History which he is now writing in exchange for Beveridge's "Akbar Nama" (English Translation). Exchange for one copy of Vol. III. Lib. Com. 8, 9-6-48. Accept. Council 12, 17-6-48.

Consideration of letter from the Indian Dairy Association, Bangalore. for the establishment of Exchange relationship with the Society. Exchange with the Science part. Lib. Com. 4(a) 23-11-48. Accept. Council 10, 24-11-48.

Consideration of circular letter from the British Consul's Indian Representative: re. "Discovery", a monthly Scientific Journal. Exchange with the Science part. Lib. Com. 4(b), 23-11-48. Accept. Council 10, 24-1-48.

Consideration of a letter from the Hony. Secretary, Zoological Society of Bengal to exchange the Journal of the Society with their Proceedings. Exchange with the Journal (Science). Lib. Com. 9, 14-12-48. Accept. Council 11, 24.

Consideration of a circular letter from the Science Museum, South Kensington, London, S.W.7, for exchange of our Journal with their "Weekly List of Accessions", which is received in the Library. Exchange with the Journal (Science). Lib. Com. 8, 14-12-48. Accept. Council 7, 15-12-48.

Consideration of a letter from the Secretary, Kuppaswami Sastri Research Institute, Madras and Editor, Journal of the Music Academy Madras, to establish exchange relationship with the Society. Exchange with the Journal (Letters). Lib. Com. 7, 14-12-48 Accept. Council 7, 15-12-48.

Consideration of a letter from the Regional Representative FAO (Fisheries) enquiring whether the Society could possibly give them gratis all available publications on fisheries in anticipation of receiving in exchange publication of Indo-Pacific Fisheries Council. Exchange with the Journal (Science). Lib. Com. 6, 14-12-48. Accept. Council 7, 15-12-48.

EXHIBITS.—Circular letter from the Indian Historical Records Commission requesting to send some exhibits to be sent to the exhibition of historical Mss. to be held at Jaipur in February, 1948. No exhibits to be sent this year. Council 21, 14-1-48.

Consideration of a letter from the Ministry of Education, India, asking permission to exhibit the curiosities of our Society in U.S.A. which are now being exhibited in London: Agree, but request that they be insured before despatching to U.S.A. Lib. Com. 3, 9-3-48. Approve. Council 9, 16-3-48.

Letter from the Acting Consul-General for Czechoslovakia in India for co-operation with an Exhibition of Oriental Books in Prague, Czechoslovakia. Regret under present circumstances. Lib. Com. 12, 9-3-48. Approve. Council 9, 16-3-48.

Letter from the Secretary, Indian Historical Records Commission dated the 19th August, requesting the Society to send some of our valuable Persian Mss. in the Curzon Collection for exhibition at the Silver Jubilee Session of the I.H.R.C. to be held in Delhi in December 1948. Send under the usual conditions. Lib. Com. 11, 8-9-48. Accept. Council 9, 15-9-48.

FINANCE—Appointment of Auditors for auditing the accounts for 1948 so that the Auditors selected may commence auditing timely to enable printing of the abstract of the audited accounts before the Annual Meeting Order. Thorough audit required. If the old Auditors submit new terms, put up at the next meeting. Council 14, 24-11-48.

Report by the General Secretary in pursuance of the Council decision dated 6-10-48 was placed before the Council. The steps taken are approved. (General Secretary's Report in pursuance of the Council decision dated 6-10-48:—In accordance with the decision of ·the Council at its special meeting held on 6-10-48, I entrusted the necessary items of work to be done by the following well-known firms of Calcutta as there was no time to call for tenders from other firms:—

(1) Martin Burn, Ltd. ...	Rs.	4,060-3-0.
(2) India Collapsible Gate Co. ...		1,257-8-0.
(3) Electric Motor Co. (Rs. 34/4, Rs. 120/-, Rs. 335/8/- and Rs. 249/8/-). ...		739-4-0.
(4) Bungo (Rs. 500/- & Rs. 160/-). ...		660-0-0.
	Rs.	6,716-15-0

The bills of the firms (2) and (3) have been included in the Agenda of the Finance Committee to be held on 24-11-48 but the bills submitted by Messrs. Martin, Burn Ltd., and other firms could not be taken up to-day for consideration as the items of work could not be finally verified, because the bill was submitted very recently.

The entire office (General Section) has been shifted from the 1st floor to the ground floor, the first floor being fully reserved for the use by the Library. Arrangements have been made for having only one entry into and exit from the Library Reading Rooms and safety measures including fixing up expanded metal protections, grills, etc. have been completed. To effect all these improvements the total expenses come up to Rs. 6,716-15-0 only). Council 25, 24-11-48.

A note from the Hony. Treasurer. Request Hony. Treasurer to submit suggestions regarding the imprest cash and the desirability of separating the cash and accounts work. Fin. Com. 11, 16-4-48. Accept. Council 12, 19-4-48.

Consideration of a note from the President regarding Permanent Reserve Fund and Bank Accounts. Recommendations: The note from the President was considered. The following recommendations are made:—

    (a) Transfer the investments of the face value of Rs. 15,000/- (3% War Loan, 1951-54 for Rs. 5,000/- and 3% Defence Loan, 1953-55 for Rs. 10,000/-) from the Temporary Reserve to the Permanent Reserve, being the compounding fees received during the period January 1936 to July 1948.

    (b) The Honorary Treasurer to submit a report about the statutory obligation or any Council resolution regarding the transfer of admission fees to the Permanent Reserve and also references to Annual Reports about such transfer.

    (c) Separate Savings Bank Accounts be opened in the Imperial Bank of India for each of the Endowment Funds of the Society.

Fin. Com. 5, 8-9-48. Accept. Council 10, 15-9-48.

Presentation and final approval of the Accounts of September and October, 1948. Recommendation: 1. A note is to be put up at the next meeting for introducing new method of keeping accounts so that at the end of each month the cash balance in each of the separate Funds and the General accounts may be readily available. 2. Write to the bank about separate accounts. Fin. Com. 2, 24-11-48. Accept. Council 11, 24-11-48.

The Secretary was requested to prepare a note on the following points:—

    (i) What amount, if any, is lying to the credit of the International Catalogue of Scientific Literature Fund and whether the same is available for the continuation of the work.

    (ii) Re: Kemp's Catalogue Fund.

Board of Accounts Meeting 3, 16-9-48.

The following items were considered by the Board of Accounts of 16-9-48.

    (a) **Permanent Reserve Fund:** It was reported that under the orders of the Council Rs. 15,000/- had been directed to be transferred from the Temporary Reserve Fund to the Permanent Reserve Fund, to cover the amount of compounding fees realised from 1938 to 1948. It was also reported that the Council had directed a statement to be placed before them about the amount received as admission fee from 1937 onwards along with further particulars about reports and directions if any about investing the same.

Resolved that the reports made be recorded and no further action required to be taken by the Board.

    (b) **Permanent Library Fund:** The circumstances under which the Permanent Library Fund was started were placed before the meeting and the following extracts from the Annual Report of 1926 was brought to the notice of the Board:—

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"The greater attention given to the condition and needs of the Library led to a review of its problem by the Council during the year. The conclusion was that the Library with its hundred thousand printed volumes and twentyfive thousand manuscripts must need incur expenditure for maintenance which, being recurrent and not subject to diminution, cannot well be met out of current income. Dr. Hora, the Treasurer, following up a hint in this matter by Mr. Tipper given when taking up the Presidentship, gave a lead in the matter, and the Council resolved to initiate a permanent Library Endowment Fund of which alone the income should be made available for Library maintenance. Mr. G. H. Tipper, Sir Rajendra Nath Mookerjee and Dr. U. N. Brahmachari led off with substantial donations, other members of Council made further promises and an initial amount of nearly Rupees Three thousand collected or promised with which to start the fund. It was also decided to issue an appeal on the subject to the body of Members, which was sent but shortly after the close of the year."

The Secretary reported that: The balance in the Fund as at the end of 1947 was Rs. 19,966-5-8 of which Rs. 14,000/- was invested in 3% Conversion Loan 1946.

Resolved—The Secretary be requested to place further directions which might have been given from after 1926. It would be for consideration thereafter as to what action if any need be taken.

    (c) **Investment of Trust Fund:** It was reported that the G. P. Notes standing to the credit of the different Endowment Funds had been made income-tax free except in the case of S. C. Roy Fund for which the Bank as well as the Income-tax Department has been asked to take necessary steps. It was further reported that under the directions of the Council a separate Savings Bank Account would be opened in the Imperial Bank of India with effect from the 1st of January, 1949, in respect of each one of the Endowments.

Resolved—No further recommendation be required to be made by the Board.

Board of Accounts Meeting: 2, 16-9-48. Accepted. Council 13, 24-11-48.

GRANT—Letter from the Asst. Secretary, Govt. of India, Ministry of Education, dated 27-12-47, intimating sanction of Rs. 20,000/- as an additional Grant for the year 1947. Record. Send the bill to Government of India in usual form for payment. Fin. Com. 5, 13-1-48. Accept. Council 14, 14-1-48.

Letter to the Government of India for renewal of the Annual Grant of Rs. 20,000/- sanctioned for 3 years (this year being the third year). Order: President to take steps. Write to Government for larger grant. Council 21, 15-9-48.

INSURANCE—Report payment made to the Commercial Union Assurance Co., Ltd., of Rs. 750/- being the annual premium on two Fire Policies (Re. 3,00,000/- each) on the Society's premises and properties, for the period of 5th March 1948 to 5th March 1949. Approve. Enquire regarding present rates of insurance against riot, civil commotion and also against burglary. Fin. Com. 4, 10-3-48. Approve. Council 12, 16-3-48.

Letter from Mr. A. J. Elkins regarding Insurance of the Society's buildings and possessions. That the Society's building and possessions be revalued, and that the Secretary be asked to report regarding the agency·through which this should be done. Fin. Com. 12, 16-4-48. Accept. Council 12, 19-4-48.

Report from Mr. Noble of the Commercial Union Assurance Co., Ltd., regarding insuring the Society's properties against riots, burglary, etc. Recommendation: (i) Insurance of Building, Furniture and Office equipments to be effected immediately at the correct valuation against Fire, Riots and Civil Commotion. (ii) Insurance of Works of Art and Books should be considered by a sub-committee of the Council against all risks. (iii) Against burglary—Individual items of equipments are to be insured. Fin. Com. 3, 14-6-48. Postpone for further consideration. Contact Mr. Noble of Messrs Commercial Union Assurance Company for further elucidation of certain points in Mr. Elkin's note and for an estimate of the total cost of premium. Council 13, 17-6-48.

Sanction a sum of Rs. 1,000/- in the first instance to pay the salary of the temporary staff to be recruited for stock-taking; appoint a Committee consisting of the ex-officio members, the Library Secretary and Dr. N. Ray for selecting the personnel, and to take the necessary action. Council 11, 19-4-48.

The question of closing the Library and stack rooms for a month or more for stock-taking. Recommendation: The stock-taking of the entire collection of printed books and manuscripts be taken up; each of the three sections of the Library be checked independently; make special temporary appointments for the purpose, also utilising the services of the existing library staff. Consult and take advice from Dr. N. Ray with regard to the procedure to be followed for stock-taking. Recommend to the Council to have the work taken up immediately, and to make the necessary appointments. Lib. Com. 12, 9-4-48.

The Committee recommends the appointment of a trained Librarian for the Society. Lib. Com. 13, 9-4-48. Take steps to appoint a trained Librarian on a salary in the grade Rs. 300—25—600, and report to the Monthly Meeting. The Committee also consisting of the ex-officio members, the Library Secretary and Dr. N. Ray to draft the terms of his appointment for advertisement. Council 11, 19-4-48.

The Committee approved the recommendations of the Library Committee with regard to the stock-taking of the Library and the temporary appointments referred to therein. Fin. Com. 18, 16-4-48. Accept. Council 12, 19-4-48.

Consideration of the question of the cataloguing of the Society's Collection of coins. Nothing has been done so far notwithstanding various proposals made by the Council. Dr. S. K. Chatterji is requested to contact Dr. J. N. Banerjee with a view to select suitable persons for this purpose and to recommend necessary arrangement to be made at an early date. Council 10(f), 17-6-48.

The appended report from the Stock-taking Officer approved. Lib. Com. 7, 15-7-48. Reopen the Reading Room on Monday next, subject to the Regulations proposed. Council 11, 22-7-48.

Letter from the Registrar, Calcutta University, regarding the service conditions of Mr. Pramil Bose, Deputy Librarian of the University who is supervising the stock-taking of the Library of the Society. (Note: An extract of the minutes of the Syndicate deputing Mr. Pramil Bose was considered). Recommendation: Noted with thanks. Request for extension of his period of duties at the Society for another month. Fin. Com. 11, 16-8-48. Accept. Council 8, 18-8-48.

Question of the provision of an additional grant of Rs. 1,500/- on Book Purchase Account. (Note:—Budget allotment for 1948 is Rs. 2,700/-, of which Rs. 2,260/5/9 has already been spent (up to July, 1948), and bill for Rs. 1,000/- (approx.) is awaiting for payment. Some of the Books ordered in 1947 and 1946 are coming now). Allot Rs. 6,000/- to be transferred to Book Purchase Account from the Govt. of India grant under item "Secretary's Salary" Lib. Com. 6, 8-9-48. Accept. Council 9, 15-9-48.

Consideration of the question as to which method of preservation is to be adopted for the manuscript *"Jami'al Tawarikh"* which has been loaned to Dr. Basil Gray of the British Museum and is stated to be in a very bad condition requiring scientific treatment. Order: Write to Dr. Sen, Director, National Archives of India, for opinion and act as advised by him. Council 4, 15-9-48.

The Council is informed that the thefts which were suspected to have been taking place in the Society's Library have at last been detected. Two peons of the Library are now in the custody of the Police and a number of books stolen have been recovered from a second-hand bookshop of the city. Fuller report will be put up later. Sp. Council 13, 27-9-48.

Consideration of a letter from Mr. V. B. Trivedi resigning from the service of the Society and offering to prepare the descriptions of the remaining 100 Mss. of the Rajasthani Mss. during the months of May and June, 1949, as he has resigned from the appointment as Cataloguer of Rajasthani Mss. Allow him to resign with effect from 1-12-48, provided he hands over the manuscript of the Catalogue prepared by him together with all connected papers. Council 22, 24-11-48.

LIBRARY—Consideration of a letter from Mr. V. B. Trivedi requesting permission to take out books, Mss. etc. from the Library as laid down in Rule 14(e). Permit. Usual rules applicable to non-resident members will apply. Council 23, 24-11-48.

Consideration of the report of the Asst. Librarian re. cataloguing of books and Mss. of the Library of the Society. Approve as modified by Dr. N. Roy. Preparation of the card catalogue to be taken up at once. Appoint two temporary cataloguers for that purpose. Lib. Com. 3, 14-12-48. Accept. Council 7, 15-12-48.

Consideration of the draft Rules for the Reading Room of the Royal Asiatic Society of Bengal submitted by the Asst. Librarian and decision thereon. Recommendation: Accept. Circulate with monthly meeting notice and place before the monthly meeting. Lib. Com. 4, 14-12-48.

Report of Sri Pramil Bose, Dy. Librarian, Calcutta University, re. Stock-taking of the Library. Proposals to be put up for the completion of the

work. List of losses to be reported. Thanks to be conveyed to Sri P. C. Bose, Sri S. Chaudhuri and other members of the Library Staff. Lib. Com. 5, 14-12-48. Accept. Council 7, 15-12-48.

Consideration of steps for the full utilisation of the money ear-marked for the purchase of books in the Library for the year. (Note:—A sum of Rs. 6,000/- was transferred from the Secretary's pay for the year 1948 to the Book Purchase Fund in September, 1948, thus the amount available for the purchase of books comes up to Rs. 9,700/-, out of which Rs. 3,479/- have already been spent and bills are for Rs. 500/- is pending). Reappropriation may be made. Lib. Com. 13, 14-12-48. Accept. Council 10, 15-12-48.

LOAN OF MANUSCRIPTS—Report return of the Ms. "*Laghukala Chakratika*" by Dr. G. Tucci, which was lent to him in February, 1930. (Note: The Mss. contained 222 folio but the first 103 folio are found missing). General Secretary's action approved. Council 20, 14-1-48.

Request for loan of the Ms. "*Padavidhanaukramani of Saunaka*" for six months from the Director, The Adyar Library, The Theosophical Society, Madras. (N.B.—The Philological Secretary recommends the loan, on a bond not exceeding Rs. 50/- only). Lend on usual terms and conditions. Lib. Com. 6, 9-3-48. Approve. Council 9, 16-3-48.

Request for extension of the period of loan of the Ms. *Danasagara of Ballalasena* for three months more from Dr. S. K. Chatterji. Approve. Lib. Com. 7, Lib. Com. 7, 9-3-48. Approve. Council 9, 16-3-48.

Request from the Ganganath Jha Research Institute, Allahabad, for the loan of the MS., *Vishnu Sahasranama Bhasya*. (N.B.—The Philological Secretary recommends the loan on a bond of Rs. 350/- only). Accept the Philological Secretary's recommendation. Lib. Com. 2, 9-4-48. Accept. Council 11, 19-4-48.

Request from Sri Asoka Kumar Bhattacharyya, member, for extension of the period of loan of the Ms. "*Pratisthasara-samgraha*" by a month. (N.B.—The Ms. was lent to him on the 30th December, 1947). Extend as requested. Lib. Com. 3, 9-4-48. Accept. Council 11, 19-4-48.

Request for loan of the manuscript "*Kalamadhavalakshmi*" from the Principal, Sanskrit College, Calcutta. (Note:—The Philological Secretary recommends the loan on usual terms and conditions). Lend for 3 months under usual conditions, the value being assessed at Rs. 500/-. Lib. Com. 3 4-5-48. Accept. Council 17, 13-5-48.

Request from Dr. S. K. Chatterji for extension of the period of loan of the Ms. "*Danasagara of Ballalasena*", for 6 months more for the use of Pandit Bhavatosh Bhattacharji, who is editing the Ms. for the Society in the Bibliotheca Indica Series. (N. B.—The Ms. was lent to up to the 17th April, 1948). Extend for three months, and ask for a report on the progress made. Lib. Com. 4, 4-5-48. Accept. Council 17, 13-5-48.

Request from the Bhandarkar Oriental Research Institute for extension of the period of loan of the Mss., *"Goraksas Sataka"* by three months more. (N.B.—The Mss. were lent to the Institute on the 18th February, 1948). Extend. Lib. Com. 14, 4-5-48. Accept. Council 17, 13-5-48.

Request from Pandit Asoke Kumar Bhattacharyya for extension of the period of loan of the Ms., *"Pratisthasara-samgraha"*, for another month. (N.B. The MS. was lent to him on the 30th December, 1947, and an extension for a month was granted to him in the month of April, 1948). Extend. Lib. Com. 15, 4-5-48. Accept. Council 17, 13-5-48.

Letter from Dr. N. Dutt dated the 27th May, requesting the extension of the loan period of the two manuscripts *"Samadhirajasutra"* for further three months. Extend. Lib. Com. 4, 9-6-48. Accept. Council 12, 17-6-48.

Letter from Miss Jahan Ara Khatun dated 13-7-48 intimating hei inability to return the two books lent to her in October, 1946, i.e., "Cambridge History of India" (Vol. IV) and Voyages d'Ibn Batuta, Vol. III, or compensate their loss, as they were robbed during the partition period. (She was the Casey Research Scholar in 1946 and working under Dr. Ishaque). (Note:—These books were lent to her without any reference to the Council). Write off, and replace the two books. In future no books should be issued to non-member Research Scholars. Lib. Com. 2, 12-8-48. Accept. Council 7, 18-8-48.

Pandit Bhabatosh Bhattacharji requests the extension of the period of the loan of the Ms., *Danasagara of Ballalasena* (I.E. 73) for another three months, i.e., up to the 17th December, 1948. Extend as requested. Lib. Com. 12, 8-9-48. Accept. Council 9, 15-9-48.

Decision about the request from the Allahabad University Library for the loan of the Ms., "H. 32. *Padmavati*". Lend on usual terms and conditions. (Loan Bond for Rs. 250/-). Lib. Com 6(a), 23-11-48. Accept. Council 10, 24-11-48.

Decision about the request from the Bhandarkar Research Institute for the loan of the Ms., "I.A. 14—*Chandogyopanisad-Anandatirthakrta Madhavabhasya*". Lend on usual terms and conditions. (Loan Bond for Rs. 250/-). Lib. Com. 6(b), 23-11-48. Accept. Council 10, 24-11-48.

Consideration of the requests of (a) Prof. N. B. Roy, Research Assistant to Sir Jadunath Sarkar, and (b) Dr. M. Ghose who is translating the "Natyasastra" about being allowed to borrow books from the Library though they are not members. Allow as special cases. Lib. Com. 7, 23-11-48. Accept. Council 10, 24-11-48.

Request from the Maha-bodhi Society to lend them the following Mss. from our Library for exhibition: The Buddhist Mss.—4713—*Astasahasrikaprajnaparamita Bodicaryavatara.* 4732—*Kalacakravatara.* 4806—*Maittreya Vyakarana.* 4078—*Pancaraksasuttarani.* Loan allowed, provided the General Secretary is satisfied about the proper security of the manuscripts while on exhibit and about their safe and punctual return of the same. Lib. Com. 11, 14-12-48. Accept. Council 7, 15-12-48.

MANUSCRIPTS—A letter from Dr. S. L. Hora with regard to the transferring of the old Mss. in the Library of the India Office in London to

the Society. Refer to the Library Committee with the suggestion that such works of which copies are partly present in the Society's Library and partly in the Library of the India Office in London should be brought to this Library. Pub. Com. 3, 12-1-48. Accept. Council 12, 14-1-48.

Consideration of the purchase of a Sanskrit Lexicon in Bengali character, "*Ananda Sabdambudhi*". Offer Rs. 250/- and report to the next meeting if not accepted. Lib. Com. 5, 12-1-48. Approve. Council 13, 14-1-48.

Consideration of a recommendation from Dr. S. K. Chatterji for acquiring the Library of Srijut B. N. Chakravarti Thakur, M.A., B.L., in Chaupalli (Noakhali) consisting of about 300 Mss. and two almirahs of printed books on Indology. The cost of transit to bring down the presentations to Calcutta will be about Rs. 300/- only which is to be borne by the Society. Request the donor to write direct to the Society. Lib. Com. 10, 12-1-48. Approve. Council 13, 14-1-48.

Regarding the Society's Zoological Collections on loan with the Trustees of the Indian Museum. Recommendation. After considerable discussion and examination of relevant clauses of the Indian Museum Act pertaining to the Collections of the Royal Asiatic Society of Bengal, the Committee recommended:—(1) That the Director, Zoological Survey of India be informed that as the Society's Collections are on loan with the Trustees of the Indian Museum the matter of sale of the Society's Collections to the Government should be taken up through the Trustees of the Indian Museum, and that any further correspondence on the subject should be addressed to that body, (2) That in view of the unsatisfactory replies received so far from the Trustees of the Indian Museum with regard to the preservation and maintenance of the Society's Collections and the uncertainty of their existence in the original form in which they were handed-over to the Trustees, the question of sale of all the Collections belonging to the Society, valued at Rs. 2,50,000/- in 1873, should be taken up with the Trustees at this stage and all questions relating to the Collections thereby liquidated. Special Com., 13-1-48. Accept. Council 24, 14-1-48.

Consideration of getting a photostatic copy of a Ms., "*Charitamimansa.* (No. 12694)" from the Oriental Institute, Baroda, at any of the following cost:—

(i) Little less than the same size of the Ms.   ...   Rs. 318-8-0
(ii) Little less than the ¾th size of the Ms.   ...   Rs. 227-8-0
(iii) Little less than the ½ size of the Ms.   ...   Rs. 133-4-0

Recommendation: Request half size photostat copy of the manuscript at a cost of Rs. 133-4-0. Lib. Com. 11, 9-3-48. Approve. Council 9, 16-3-48.

Consideration of the price of the Ms. "*Ananda Sabdabudhi*" approved for purchase for the Society at Rs. 250/-, as the owner does not agree with the price fixed by the Library Committee. No higher offer than Rs. 250/- already offered. Lib. Com. 10. 9-3-48. Approve. Council 9, 16-3-48.

Letters from Dr. S. L. Hora and Sri M. N. Kunzru for claiming back the valuable books, and Mss. and other antiquities in the custody of the British Museum, Indian Office, and Bodleian Library. Send copy of the

correspondence to Dr. N. P. Chakravarti; and request him to do the best he can for the Society. Lib. Com. 13, 9-3-48. Approve. Council 9, 16-3-48.

Letter from Dr. Basil Gray, Keeper of the Department of Oriental Antiquities, British Museum, London, informing that the cost of repairs of the Ms., *"Jami'al Tawarikh"* will be from £50-60. Arrange to get it repaired at the British Museum through Dr. Gray. Lib. Com. 7, 9-4-48. Accept. Council 11, 19-4-48.

Request from Prof. D. C. Bhattacharji for getting a photographic copy of Ms. *Nayatattva-Chintamani-Prabha* (by Yajnapati Upadhyaya) from the Bibliotheque Nationale (Paris). (Note:—The Ms. is unique. It is written in Bengali script on palm leaves and is the earliest known commentary on the classical work of Gangesa. Approval of the Philological Secretary has been received). Recommendation: Ask the Cultural Attache, French Consulate, to obtain particulars of cost of reproduction, etc. Lib. Com. 8, 4-5-48.

Matters relating to the offer of Sri B. N. Chakravarti Thakur of presenting the Library of his father, consisting of books and manuscripts to the Society's Library. Society should arrange for its transport to Calcutta by contacting the Secretary to the Home Department, Government of West Bengal and the D.P.I., of Eastern Bengal (Eastern Pakistan). Lib. Com. 2, 9-6-48. Council 12, 17-6-48.

Consideration of the question whether microfilm and photostatic copies of the Mss. should be treated as Mss. or as books. To be treated as Mss. Lib. Com. 6, 15-7-48. Accept. Council 11, 22-7-48.

Letter from M. Claude Journot, Joint Cultural Adviser to France quoting charges for Photostatic reproduction of the Ms. *"Nayatattva-Chintamoni-Probha"* by the Bibliotheque Nationale, Paris. (Note:—The requisition is by Prof. D. C. Bhattacharyya. The Ms. is unique. Bengali script on palm leaves. Earliest known commentary on classical works of Gangesa. Cost Rs. 218/5/9. Recommended by the Library Committee dated 6-5-48. Accepted. Fin. Com. 7, 16-8-48. Accept. Council 8, 18-8-48.

MEDALS—Matter relating to the award of Sarat Chandra Roy Memorial Gold Medal (Note: The interest on Rs. 4,000/- in 3% Victory Loan realised every year (Rs. 82/-) will not be sufficient to award a gold medal every year in terms of the Regulations). Postpone award until income from the fund permits and draw attention of the donars to the Chandrakala Hora Medal revised Rules of the National Institute of Science of India, and ascertain if the donars are prepared to agree to a similar revision. Council 4, 14-1-48.

Letter from Dr. B. C. Law dated 1-3-48 that the Dr. B. C. Law Gold Medal be awarded biennially, instead of annually, as the interest accrued from the Fund is insufficient to meet the cost of a Gold Medal every year. Approve in principle and ask the General Secretary to examine the regulations and report to the next meeting of the Council. Council 7, 16-3-48.

Consideration of the proposal by His Excellency the Governor of West Bengal for the institution of a medal for Peace and Culture and

report of the President's interview with the Governor. In view of the importance likely to be given to the award of the medal, and of the desirability that the method of award be above all criticisms, it is recommended that the Swedish Consul be requested to obtain the Regulations governing the award of the Noble prizes to enable the Society to formulate its own rules to govern the award of a medal for Peace and Culture to be instituted by this Society. The statutes framed by Andhra University for the award of the C.R. Reddy National prize should also be considered. Members who are unable to attend the next meeting are requested to forward their views in writing. Peace and Culture Medal Com. Meeting, 5-5-48.

Letter from Dr. B. C. Law dated 1-4-48 suggesting that the Dr. B. C. Law Gold Medal be awarded biennially, instead of annually, and enclosing revised draft Regulations. Accept. Council 6, 13-5-48.

Appointment of Advisory Board for the award of the following medal at the Annual General Meeting in February, 1949. Annandale Memorial Medal for "Contributions to the study of Anthropology in Asia". Order: Constitute Advisory Board according to Regulations. Council 14(a), 15-9-48.

Appointmnnt of Advisory Board for the award of the Durga Prosad Khaitan Memorial Gold Medal at the Annual General Meeting in February 1949. Order: Send circular according to Clause 5 of the Regulations and take further steps. Council 14(b), 15-9-48.

Report on the award of the Elliot Prize for the year 1948. (Note: Only one candidate has applied). Order: The President to take steps according to Regulations. Council 15, 15-9-48.

Letter from the son of late Rai Bahadur S. C. Roy accepting the proposal to award the S. C. Roy Memorial Medal triennially in future. Order: Amend Regulations on the basis of the reply from the donors. Council 8, 24-11-48.

Consideration of the report regarding the award of the Elliot Prize for the year. Order: Accept. Council 5, 15-12-48.

Recommendation of the Annandale Memorial Advisory Board of 18-12-48. In view of the important and valuable research work done by Prof. N. K. Bose in the field of Indian Anthropology and Archaeology over a long period, we consider that he is the best qualified to be awarded the Annandale Memorial Medal and we propose therefore that he be chosen as the recipient of the same as a mark of recognition of his merits and scholarly contributions. Council's order: Approve the recommendation. The medal to be awarded to Prof. Nirmal Kumar Bose. Council 6, 15-12-48.

MESSAGE—Circular letter from Hony. Secretary, Indian Chemical Society, Calcutta, requesting a message of goodwill from the President of the Society on the occasion of its Silver Jubilee celebration to be held in the first week of January, 1949. President to send a message. Council 15, 24-11-48.

MISCELLANEOUS—The continuance of the conveyance allowance of Rs. 150/- to the General Secretary. Report to monthly meeting under Rule

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57(g) the sanction of the conveyance allowance made last year. Fin. Com. 10, 16-4-48. Accept. Council 12, 19-4-48.

Consideration of a letter from Dr. K. P. Biswas and Dr. N. R. Roy for an arrangement for serving tea at the expense of the members themselves in the Society during Council and Committee Meetings. The General Secretary to take necessary steps without involving Society to expenses in that connection. Council 5, 24-11-48.

Letter from Dr. M. Ishaque dated 16-4-48 requesting permission to incorporate some facsimiles of certain pages from the Arabic and Persian Mss. belonging to the Society, in connection with an illustrated article which he is contributing to the "Indo-Iranica" on the visit of H. E. Earl Mountbatten to the Society. Permission granted subject to due acknowledgment. Council 20, 19-4-48.

Report of a theft of a typewriter from the office of the Indian Science Congress Association, located on the ground floor of the Society. Order: In future no portion of the premises should be allowed to be used for holding a meeting on holidays without the previous permission of the Council, and on such cases special precautions should be taken. Council 13, 13-5-48.

Consideration of the report about an old microscope lying in the Society for some years past. Ask for estimate for repairs from Messrs. Adair Dutt & Co., Ltd., and James Murray & Co., Ltd. Request the Superintendent to prepare a stock of all belongings of the Society outside books and mss. He will require members of the office staff to render him assistance which he may think necessary. Special Council 3, 27-9-48.

To decide the question of disposal of the microscope (which is in good condition and does not require any repair) and the two old and obsolete types of projection apparatus (magic lanterns) discovered out of the scrap heaps by the General Secretary. Advertise for the sale of all the three items. Council 3, 24-11-48.

MONTHLY MEETING—Consideration of the question of revival of Monthly Bulletin, the publication of which has been suspended for some time past. Recommendation: Bulletin be discontinued, but monthly meeting notices be sent to both resident and non-resident members. Pub. Com. 10, 9-6-48. Accept. Council 11, 17-6-48.

PATRON—Consideration of the proposal of inviting H. E. Dr. K. N. Katju, Governor of West Bengal, to become the patron of the Society. Invite. Council 3, 15-9-48.

PORTRAIT—Consideration of a letter from Maharajkumar Raghubir Singh proposing a portrait for Sir Jadunath Sarkar. Order: The proposal of a portrait of Sir Jadunath Sarkar is approved if the proposer could secure a suitable portrait in oils and present to the Society. Council 8, 20-2-48.

The question of utilisation of the balance of Mr. Justice Edgley's Portrait Fund for the maintenance of Society's portraits. Accept the proposal and a separate fund be started called "Maintenance of Portraits Fund". Council 4, 22-7-48.

· Consideration of estimates from three different artists for the portrait of Dr. Rabindra Nath Tagore. Issue an appeal to members for funds (Rs. 2,700/-). Council 24, 15-9-48.

PRESENTATION—Presentation of books from:—(a) Sir B. L. Mitter, (b) Sir N. G. A. Edgley, (c) Visva-Bharati, (d) Sj. Omkar Shankar Gupta, (e) Prof. V. R. R. Dikshitar, (f) Dr. B. K. Ghosh. Recommendations: (a) Regret; (b) Regret; (c) Accept and ask for other works; (d), (e) & (f) Accept. Lib. Com. 15, 9-3-48. Approve. Council 9, 16-3-48.

Letter from the National Archives, Washington, informing the inclusion of the name of the Society in their free distribution list. Record and thanks. Lib. Com. 19, 9-3-48. Approve. Council 9, 16-3-48.

The Library of Congress, Washington, presents to the Society 323 Volumes of Proceedings of the learned Societies of U.S.A. (three cases). Accept with thanks. Lib. Com. 10, 9-4-48. Accept. Council 11, 19-4-48.

Circular letter from the Executive Secretary, National Roosevelt Library, Chungking, requesting a free gift of the Society's publications. Present copies of back numbers, except those of which the stock is less than the minimum. Ask them to arrange shipment through Chinese Consulate. Pub. Com. 2, 4-5-48. Accept. Council 15, 13-5-48.

Letter from the Govt. of India, Ministry of Education, requesting the Society for a donation of books to the Jogjakarta University in Indonesia. Present. and ask the Govt. of India to arrange shipment. Pub. Com. 3, 4-5-48. Accept. Council 15, 13-5-48.

Letter from the Chief Librarian, the National Library of Siam, Bangkok, requesting supply of our Journal (Letters & Science) free to the Damrang Library. Recommend free supply of Journals (Letters & Science). Pub. Com. 5(b), 23-11-48. Accept. Council 9, 24-11-48.

Consideration of a circular letter dated 26th October 1948 and a leaflet from the Director, the Science Museum, South Kensington, London, requesting us to present a copy of "Upper Atmosphere" by Dr. S. K. Mitra. Comply. Pub. Com. 5, 14-12-48. Accept. Council 8, 15-12-48.

PUBLICATION—Letter from Dr. B. C. Law regarding the printing of Introducing India, Part II. Art Press be entrusted with the work. Pub. Com. 4, 12-1-48. Accept. Council 12, 14-1-48.

The question of printing of the pamphlet re: the Bicentenary of Sir William Jones. To be included in Bicentenary Commemoration Volume provided its size tallies. Pub. Com. 6, 12-1-48. Accept. Council 12, 14-1-48.

Letter from Prof. S. K. Mitra regarding the binding of his book entitled "Upper Atmosphere". 250 copies of "Upper Atmosphere" to be cloth bound and the rest (750) to be paper bound like those of the Monograph Series. Pub. Com. 8, 12-1-48. Accept. Council 12, 14-1-48.

Letter from Brig. H. Bullock forwarding a copy of a Press note on the subject of the future conservation of British Cemeteries in India and Pakistan and requesting to have it published as a note in the Society's

Journal. Request Mr. H. Waddington to amplify the press note and publish in the Society's Journals (Letters). Pub. Com. 2, 9-3-48. Approve. Council 10, 16-3-48.

Report that Dr. B. C. Law has prepared indices for Journals (Science & Letters) and Year Books, Vol. XI, and Vol. XII which were in arrears. Print and convey thanks. Pub. Com. 4, 9-3-48. Approve. Council 10, 16-3-48.

Approval of the cover of "Bulletins" recently introduced by the Society. Approve; mottled grey cover paper to be used. Pub. Com. 5, 9-3-48. Approve. Council 10, 16-3-48.

Letters from the Secretary, Nikhil Bharat Banga Bhasa Prasar Samity suggesting to reprint Bhagvat Gita as translated into English by Mr. Charles Wilkins. Dr. S. K. Chatterji's opinion that it is not necessary to reprint Bhagvat Gita or its foreward written by Warren Hastings be accepted. Pub. Com. 8, 9-4-48. Accept. Council 9, 19-4-48.

Consideration of publication of "*Massir-ul-Umara.* Vol. II" by Dr. B. Prasad in the Bibliotheca Indica Series. Write to Dr. Prasad explaining the situation and giving him some idea of Sir Jadunath's remarks made thereon. Request the two Philological Secretaries and the Honorary Treasurer to draw up rules with regard to the publication of works in the Bibliotheca Indica. Bib. Ind. Com. 7, 9-4-48. Accept. Council 10, 19-4-48.

Letter from Baptist Mission Press submitting a revised estimate of cost of printing for Descriptive Catalogue of Sanskrit Mss. (Philosophy), Vol. XI. The General Secretary is requested to contact the Baptist Mission Press, and discuss the general question of increased rates, especially in the case of rates agreed upon for particular orders. Pub. Com. 4 (a), 4-5-48. Accept. Council 15, 13-5-48.

Consideration of the proposal to complete the publication of "*Kavikalpalata*". Stop further publication. Bib. Ind. Com. 3, 4-5-48. Accept. Council 16, 13-5-48.

Letter from Mr. P. Singh, a member, offering his services for collecting and translating into English German documents of general interest and of particular interest to India. (1) Ask the members of the two Advisory Boards if they can recommend that any books or papers should be translated into English. (2) Ask Mr. Singh to prepare a list of items in the Society's library which in his opinion should be translated. Lib. Com. 5, 4-5-48. Accept. Council No. 17, 13-5-48.

Consideration of the revised estimate from the B. M. Press for printing the Descriptive Catalogue (Sanskrit Mss.) Vol. XI, Philosophy. Recommendation: Accept. Pub. Com. 2, 9-6-48. Accept. Council 11, 17-6-48.

Letter from Prof. Sukumar Ray requesting honorarium for his book entitled "Humayun in Persia" to be published in the Monograph series. Pay him at the translation rate of Rs. 4/- per printed page. Pub. Com. 5, 9-6-48. Refer to Finance Committee. Council 11, 17-6-48.

Fixing the price of the book "Bhalesi Dialect" by Prof. S. Varma to be published in the Monograph series. Recommendation: Rs. 4/- per copy. Pub. Com. 6, 9-6-48. Accept. Council 11, 17-6-48.

Fixing the price of the book "Humayun in Persia" by Prof. Sukumar Ray to be published in the Monograph series. Recommendation: Rs. 5/- per copy. Pub. Com. 7, 9-6-48. Accept. Council 11, 17-6-48.

Consideration of the number of copies to be printed of the book Introducing India Part II. Recommendation: Print 500 copies and fix Rs. 5/- as price for a copy. Pub. Com. 8, 9-6-48. Accept. Council 11, 17-6-48.

Consideration of schemes for improvement of the publication of papers in Society's Journals. Recommendation: Mr. A. K. Majumdar be requested to send a note giving concrete cases of the points raised by him. Pub. Com. 9, 9-6-48. Accept. Council 11, 17-6-48.

Consideration of the question of paying the typing charges of Mss. prepared by our editors and translators. Actual typing cost be given to our editors and translators for preparing typescripts for the Press. Pub. Com. 14, 9-6-48. Accept. Council 11, 17-6-48.

Report the progress of printing of Dr. N. Dutt's book entitled *Saddharma Pundarika*. Recommendation: Dr. Dutt be officially requested to expedite the printing. Pub. Com. 13, 9-6-48. Accpet. Council 11, 17-6-48.

Circular letter from the Government of India enquiring if the Society could present suitable publications, both English and Sanskrit, to Sun Yat Sen University Library, Canton, China. Prepare a list of books to be presented and submit to the President for approval. Council 5, 22-7-48.

Letter from Prof. Sukumar Ray, requesting honorarium for his Monograph "*Humayun in Persia*". Only typing costs to be paid. The Committee regrets it cannot recommend payment as prayed for. Fin. Com. 3(b), 19-7-48. Accept. Council 12, 22-7-48.

Consideration of a letter from Dr. M. Ghose with regard to reading of the proofs of "*Natyashastra*" which is being edited by him. Enquire if the Press would read the proofs and submit clean and correct proofs for print order and, if so, what would they charge for the same. Pub. Com. 2, 12-8-48. Accept. Council 5, 18-8-48.

The proposal of Dr. S. K. Mitra of getting the remaining copies (750) of his "Upper Atmosphere" to be bound in cloth. Recommendation: Bind all in cloth. Pub. Com. 4, 12-8-48. Accept. Council 5, 18-8-48.

Letter dated 9-8-48 from Dr. S. K. Mitra requesting the printing of 1000 copies of an advertisement folder and considering other matters concerning his book entitled "The Upper Atmosphere". Recommendation: 10 copies to him as author's copies. Advertise in 'Nature' and 'Science & Culture' and prepare the draft of the advertisement in consultation with Dr. Mitra. General Secretary to print 1000 advertisement folders (in 4 pages) in consultation with Dr. Mitra. Pub. Com. 5, 12-8-48. Accept. Council 5, 18-8-48.

Question of printing title page, index and others of *Catalogue of Arabic Mss*. Vol. II. Print the following:—(1) Title page, (2) Table of contents, (3) System of transliteration, (4) Synopsis of contents, (5) Titles of works, (6) Names of persons, (7) Names of copyists (in two columns), (8) Errata

and corrigenda (in two columns). Pub. Com. 8, 8-9-48. Accept. Council 7, 15-9-48.

Consideration of the question of compiling the Year Books for 1946 and 1947. Order: Offer of Dr. A. K. Sen at the Monthly Meeting in May to complete the Year Book for 1946 accepted with thanks. Secretary to request him for early completion. For 1947 Year Book, Secretary to arrange with a suitable person or persons for doing the work on payment basis, subject to the approval of the details by the President. Council 16, 18-8-48.

Letter from East Punjab University Library, Simla, requesting refund of money paid by them on account of publications purchased. (Note.— The Library ordered several publications of the Society to be sent to them together with the bill of cost. Accordingly the publications were sent and payment received but subsequently they requested the Society to make a free gift of these books. The case was placed before the Publication Committee on 9-4-48 which decided to give the Library those publications free of cost. This was confirmed by the Council 19-4-48. The present letter is a request to refund Rs. 650/14/- already paid by them). Recommendation: Refund Rs. 650/14/- paid by the East Punjab University Library. Fin. Com. 3, 8-9-48. Accept. Council 10, 15-9-48.

Consideration of allotment of funds for advertisements for the sale of our new publications. Allot Rs. 300/- from the Publication Fund Account for advertisements during the remaining portion of the year. Fin. Com. 4, 8-9-48. Accept. Council 10, 15-9-48.

Letter from the Secretary, National Institute of Sciences of India, Delhi, sanctioning Rs. 500/- on certain conditions to meet the cost of printing scientific papers in its Journal. Order: Accept with thanks. Acknowledge in a particular number (Science) as requested by them. Write for a larger grant. Council 5, 15-9-48.

Consideration of the question of payment of typing charges to editors and others whose works are published by the Society. The Secretary to report if typing work for this purpose can be done in our office. Pay the Editor of *Natyasastra*, his bills for typing charges at -/4/- per page. For future bills the same rate to be applied. Council 11, 15-9-48.

Consideration of the proposal of the Baptist Mission Press regarding the increased rate of the printing of Society's Journal with effect from April, 1948. Order: Approve the rates offered by Baptist Mission Press. Council 12, 15-9-48.

Question of preparation of the final press copy of the Year Book for 1946. General Secretary is authorised to revise the portion returned by Dr. A. K. Sen and condense it further and have the mistakes corrected to make it ready for the Press as early as possible. Sp. Council 12, 27-9-48.

Letter from the Manager, Metropolitan Printing & Publishing House, Ltd., regarding reading of proof of "*Natyasastra*". Recommendation: Accept the additional rate of Rs. 2/- per page for proof-reading. Pub. Com. 5 (a), 23-11-48. Accept. Council 9, 24-11-48.

Consideration of a letter of Dr. W. Pachow, Ph. D., Head of the Department of Chinese, Allahabad University, with an endorsement by Dr. S. K. Chatterji, Philological Secretary. Refer to Dr. Nalinaksha Dutt for opinion. Pub. Com. 11, 23-11-48. Accept. Council 9, 24-11-48.

Proceedings of the 'Committee to investigate into the affairs of the Journal and to recommend measures for its improvement' held on 13.9.48.

(It was explained to the meeting that Mr. A. K. Majumdar on whose motion this Committee had been constituted was requested to furnish specific instances referred to in items A, B & C of the motion so that the office might keep ready the necessary papers relating to such specific instances. As no such list had yet been received, this meeting was therefore called under the orders of the President so that the Committee might consider the position.

Re: Item A of the motion by Mr. A. K. Majumdar moved in the Monthly Meeting dated 3-5-48.—

Mr. A. K. Majumdar stated that he had in view only one article of which 16 out of 34 printed pages had previously appeared in a paper by the same author in another Journal.

After discussion, the Committee resolved that the following working principle be adopted :—

> Ordinarily no article should be published in the Journal of the Society unless a substantial or important portion of which has not been previously published elsewhere. As to whether the portion previously published is more important than the portion which is added or altered, must depend on the facts of each particular case. Every writer should when submitting the paper intimate whether any portion of the paper has previously been published and if so, an indication of the originality and importance of the paper as proposed to be published in the Journal.

Re: Item B of the Motion.—

The only one particular instance was cited by Mr. Majumdar. The present procedure adopted by the Publication Committee of forwarding papers to referees and experts for assaying their fitness for publication in the Society's Journal was considered by the Committee as satisfactory. The Committee also discussed the procedure adopted for rejecting a particular article referred to and agreed that no objection could be raised on the action taken.

Re: Item C of the Motion.—

Mr. A. K. Majumdar informed the meeting that he had already withdrawn the item while moving the motion in the Monthly Meeting and that no further discussion was called for.

In answer to a query, Mr. Majumdar admitted that he had made general remarks in his motion only on one case in each of the two items? The Committee was of opinion that it would have been better if such

general remarks had not been made based upon only one alleged instance which also did not justify the remarks.

The only other point which Mr. Majumdar wanted to raise in connection with his motion was about the delay in the publication of the Journal during the last two years. The Secretary reported that the delay was unavoidable on account of riots, press strikes &c. and that by the end of the next week the last two numbers of the Journal for 1947 would be despatched to the members. He reported further that before the end of this year, the first two numbers for 1948 would also be published and the last two numbers for 1948 would be printed in early 1949. It was expected that the publication would be upto date and continue to be so for the middle of 1949. Mr. Majumdar stated that he had no further complaints to make, and the meeting terminated.) Order: As the charges have not been substantiated, the principles so long followed will stand. Council 12, 24-11-48.

Recommendations of the Committee "to investigate into the affairs of the Journal and to recommend measures for its improvement", held on 13.9.48 and 15.12.48. Order: Record. Council 17, 15-12-48.

ADVERTISEMENT—Consideration of the question of publishing advertisements in the Society's Journal and Proceedings. Need not publish advertisements. Pub. Com. 2, 14-12-48. Accept. Council 8, 15-12-48.

PAPERS—Consideration of a paper on "A Jaina Tale—its origin and developments" by Kalipada Mitra. Read and Journal after it is made ready for the press by the President. Pub. Com. 2, 12-1-48. Accept. Council 12, 14-1-48.

Consideration of a paper on "Sanskrit Names of Fish and their significance" by Dr. S. L. Hora. Read and Journal. Pub. Com. 9, 12-1-48 Accept. Council 12, 14-1-48.

Consideration of the paper on "Cecidozoa & Zoocecidia of India" by Prof. M. S. Mani. Read and Journal. Pub. Com. 6 (a), 9-3-48. Approve. Council 10, 16-3-48.

Consideration of the paper on "Knowledge of the Ancient Hindus concerning Fish and Fisheries of India" by Dr. S. L. Hora. Recommendation: Ask the author to amplify or re-write for publication, especially in view of the fact that further research is planned. Pub. Com. 6 (b), 9-3-48. Publish Dr. Hora's article. Council 10, 16-3-48.

Further notes on "Vakatakas" by Dr. Dinesh Chandra Sircar and Dr. R. C. Majumdar. Refer to Dr. S. K. Chatterji and conclude the controversy. Pub. Com. 6 (c), 9-3-48. Approve. Council 10, 16-3-48.

Consideration of the paper on "Two cases of atypical development in chick" by H. K. Mookerjee & S. Mookerjee. Read and Journal. Pub. Com. 7 (a), 9-3-48. Approve. Council 10, 16-3-48.

Consideration of the paper on "An Arabian Tale—its originals and parallels" by Prof. Kalipada Mitra. Refer to Dr. Elwin. Pub. Com. 7 (b), 9-3-48. Approve. Council 10, 16-3-48.

Consideration of the paper on "A Tale of Fez, its originals and parallels" by Prof. Kalipada Mitra. Refer to Dr. Elwin. Pub. Com. 7 (c), 9-3-48. Approve. Council 10, 16-3-48.

Papers on "An Arabian Tale—its originals & parallels" by Kalipada Mitra, and on "A Tale of Fez"—its originals & parallels" by Kalipada Mitra. Refer Dr. Elwin's opinion on these two papers to Dr. N. Dutt. Pub. Com. 2 and 3, 9-4-48. Accept. Council 9, 19-4-48.

Paper on "On a new Hermaphrodite Species of Microphthamus (Polychaeta-Hesionidae) from the Sandy Beach Madras" by K. H. Alikunhi. Read and publish in the Journal. Pub. Com. 11, 9-4-48. Accept. Council 9,

Consideration of the paper on "Ibahatiyas" by Dr. Riazul Islam. Publish in Journal. In future when papers are submitted for publication, the author should be required to certify that the paper has not been published elsewhere. Pub. Com. 4 (b), 4-5-48. Accept. Council 15, 13-5-48.

Matters relating to the publication of the paper entitled "A Psychological approach to the origin of Religion and the development of the concepts of Gods and Ghosts in Children" by Uma Bose published in Journal (Science) Vol. XIII, No. 1, 1947. Recommendation: Paper be referred to Dr. Suhrid Chandra Mitra with the note of Mr. T. C. Das, and ask his opinion with regard to suitability of the paper for publication in the Society's Journal. Pub. Com. 4, 9-6-48. Issue the Journal already printed. No further reference to any expert is necessary. Council 11, 17-6-48.

Consideration of the paper on "Two Stone Inscriptions" by Dr. D. C. Sircar. Recommendation: Read and Journal. Pub. Com. 11 (i), 9-6-48. Accept. Council 11, 17-6-48.

Consideration of the following paper on "Geometrical Interpretation of the Sun, Moon and the five planets as found in the Mathematical Systems of Ptolemy in the Hindu Astronomical Works" by Dr. (Mrs.) Bina Chatterjee. Read and Journal. Pub. Com. 11 (iii), 9-6-48. Accept. Council 11, 17-6-48.

Consideration of the following paper on "Four Medieval Saints" by Mr. S. M. Imamuddin. Refer to Dr. M. Z. Siddiqi with Dr. Chatterjee's opinion. Pub. Com. 11 (iv), 9-6-48. Accept. Council 11, 17-6-48.

Letter from Mr. P. Acharya, State Archaeologist, Mayurbhanj, requesting to be allowed to purchase the block of the facsimile of an inscription printed in his paper in the Society's Journal (Letters). Recommendation: Grant. Pub. Com. 12, 9-6-48. Accept. Council 11, 17-6-48.

Letter from the Assistant Editor "Samiksa" requesting permission to reprint the paper "A Psychological Approach to the origin of Religion and the Development of the Concepts of God and Ghost in Children" by Uma Bose in their Journal. Permit provided due acknowledgment is made and if the authoress has no objection. (Her opinion may be taken). Pub. Com. 3, 15-7-48. Accept. Council 9, 22-7-48.

Consideration of the paper on "Vedic India and the Middle East" by Mr. Harit Krishna Deb. Recommendation: Read and Journal. Pub. Com. 3 (a), 12-8-48. Accept. Council 5, 18-8-48.

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Consideration of the paper on "Kol Inscription of Sultan Altamash" by Dr. A. Halim. Accept Sir Jadunath Sarkar's opinion and return the paper to author for revision in the way suggested by Sir Jadunath Sarkar. Pub. Com. 3 (b), 12-8-48. Accept. Council 5, 18-8-48.

Consideration of the paper on a "A Stone Inscription in the Patna Museum" by Dr. Dines Chandra Sircar. Read and Journal. Pub. Com. 3, 8-9-48. Accept. Council 7, 15-9-48.

Consideration of the paper on 'Sine and Co-sine power series of Hindu Mathematics' by C. T. Rajagopal and A. Venkataraman. (Communicated by Prof. P. C. Sengupta). Pub. Com. 9, 8-9-48. Accept. Council 7, 15-9-48.

Consideration of the following papers for consideration:— (a) "Haemolysis by Bile Salts" by A. C. Roy. Recommendation: Publish. (b) "Two Pillar Inscriptions" by Dr. D. C. Sircar. Recommendation: Publish. (c) "Kol Inscription of Sultan Altamash" by Dr. A. Halim. Recommendation: Publish. (d) "Four Medieval Saints" by S. M. Imamuddin. Recommendation: Postpone till Dr. Ishaque and Dr. S. K. Chatterji meet and have a further discussion. Pub. Com. 3, 23-11-48. Accept. Council 9, 24-11-48.

Consideration of the following papers for publication:—(a) Paper on 'Eastern Rajputana in 18th century' by Hasrat Chaturbhuj Dass Chaturvedi. Recommendation: Reject. (b) Paper on 'Sirr-i-Akbar' by Dr. Bikrama Jit Hasrat, M.A., Ph.D. Recommendation: Read and Journal. Pub. Com. 3 (a) & 3 (b), 14-12-48. Accept. Council. 8, 15-12-48.

RESEARCH FELLOWSHIP—Letter from Miss Abeda Islam dated 11-3-48 in connection with the Casey Research Fellowship. Appoint her to the Casey Research Fellowship for one year in the first instance. Her work to be supervised by Dr. Ishaque, and quarterly progress reports submitted by her and placed before the Council. Council 18, 16-3-48.

Formation of Selection Committees for the appointment of the following vacancy for which applications have been received by advertisement:— A scholar for James Prinsep Fellowship (Numismatics). Order; The three ex-officio members, Dr. K. P. Biswas, Dr. M. Ishaque, Mr. Sivaramamurthy and Dr. J. N. Banerjee. Council 7 (c), 19-4-48.

Letter from Dr. M. Ishaque dated the 15th April with regard to Miss Abeda Islam who has been appointed as Casey Research Scholar. Order: (1) Confirm appointment of Miss Islam from 1st April 1948. Regulations for Research Scholarships should be framed. Two Philological Secretaries, General Secretary and Dr. S. L. Hora be authorised to frame the Regulations. Council 8, 13-5-48.

Proceedings of the Selection Committee for the appointment as James Prinsep Research Fellowship Scholar dated 27.9.48. Accept. Sri Sunil Chandra Ray is appointed as James Prinsep Research Fellowship Scholar on the following conditions:— (1) A Research Fellow on being selected shall be placed under a scholar, a member of the Royal Asiatic Society of Bengal, who would periodically supervise his work. (2) The Research Fellow should ordinarily work in the Library of the Royal Asiatic Society of Bengal. (3) He should submit through the scholar supervisor appointed by the Council a quarterly report of the progress of his work

to the Council of the Royal Asiatic Society of Bengal, and it should be countersigned and forwarded by his supervisor. (4) 75% of the remuneration of the Research Fellow, will be paid to him every month, 25% being ·kept in reserve which will be paid in one lump at the end of the period for which the scholar works on his showing satisfactory progress in his work. (5) The research work when completed should be made available for publication by the Royal Asiatic Society of Bengal. The copyright of the same shall be the property of the Society unless the Society makes a decision otherwise. The scholar must present to the Council the completed thesis embodying the results of his research at least one month before the termination of the period of the scholarship enjoyed by him. (6) The Council of the Royal Asiatic Society of Bengal reserve the right of continuing the Fellowship as long as they like. (7) The stipend attached to a Fellowship shall be Rs. 150/- per mensem tenable for the period for which a scholar is selected to work. The stipend shall be paid from the office of the Royal Asiatic Society of Bengal every month provided that such stipend may be discontinued at any time at the discretion of the Council if the Fellow's work in their opinion is unsatisfactory, or for other good cause. (8) During the tenure of the Fellowship, the Fellow shall not be permitted without the approval of the Council to take up any salaried appointment. (9) The scholar selected by the Council should bind himself in writing to abide by the rules in force for the time being and all other rules that may be promulgated from time to time. (10) The holder of a Research Fellowship shall not leave Calcutta without the permission of the Council and shall be termed "Research Scholar, Royal Asiatic Society of Bengal" Sp. Council 9, 27-9-48.

REPRESENTATION—Circular letter from the American Academy of Political and Social Sciences requesting to appoint two delegates to represent the Society at the forthcoming 52nd Annual Meeting of the Academy to be held at Philadelphia on 2nd and 3rd April, 1948. Send good wishes. Council 2, 16-3-48.

Nomination of a member to serve on the Selection Committee of the Calcutta University for recommending a person for the award of the Sarojini Basu Medal for 1948. Nominate Dr. S. K. Chatterji. Council 10, 13-5-48.

Representation of the Society at the 21st session of the International Congress of Orientalists to be held in Paris from the 23rd to 30th July, 1948. Dr. S. K. Chatterji, failing him Dr. S. Radhakrishnan or Mr. P. N. Banerjee. Council 3, 17-6-48.

Representation of the Society at the 3rd session of the International Congress of Anthropological and Ethnological Sciences to be held in Brussels and Tervuren in August, 1948. Dr. B. S. Guha, failing him Prof. K. P. Chattopadhyaya or Dr. S. K. Chatterji. Inform the Congress that Prof. K. P. Chattopadhyaya and Dr. S. K. Chatterji will also be attending. Council 4, 17-6-48.

Circular letter from the Local Secretary. All India Library Conference, Nagpur Session, 1948, requesting to send delegates for the Eighth Session of the Conference to be held in the month of October, 1948. Request a

member resident in Nagpur to represent the Society at the conference and intimate to the Local Secretary accordingly. Lib. Com. 9, 8-9-48. Accept. Council 9, 15-9-48.

Consideration of a circular letter from Hony. Secretary, Indian Pharmaceutical Association, Benares Hindu University, inviting a representative to the Ninth All-India Pharmaceutical Conference which is to be held at Allahabad from 2nd January to 5th January, 1949. Dr. K. N. Bagchi and Dr. K. P. Biswas to represent. Council 3, 15-12-48.

Consideration of a letter dated 23.11.48 from the Vice-Chancellor, Lucknow University, Lucknow, inviting delegates from this Society for the Special Jubilee Convocation to be held from 27th to 29th January, 1949. Dr. S. K. Chatterji and Dr. M. Z. Siddiqi to represent with a message of goodwill from the President. Council 2 15-12-48.

REVIEWS—Request for review for W. G. Archer's "Vertical Man". Mr. J. P. Mills's review accepted. Lib. Com. 8, 9-3-48. Approve. Council 9, 16-3-48.

Request for review from the Director, Deccan College, Poona, "Journal Delinquency and Destitute in Poona" by Ruttonsha. Refer to Dr. Guha for report. Lib. Com. 17, 9-3-48 Approve. Council 9, 16-3-48.

The question of the publication of a review of the book entitled "Hara-mani" by Md. Mansuruddin. Print. Pub. Com. 5, 9-4-48. Accept. Council 9, 19-4-48.

Request from Mr. Rama Varma for a review of the book, "Yuktibhasa (First Part-Pure Mathematics)", ed. by Mr. A. R. Akileswara Aiyar & Mr. Ram Varma, with a commentary in Malayalam. Request Prof. R. Vaidyanathswami of the Madras University to review the book or have it reviewed by an authority in mathematics. Lib. Com. 8, 9-4-48. Accept. Council 11, 19-4-48.

Request from the Registrar, Calcutta University, for a review of the book, "History of Sanskrit Literature", Vol. I, ed. by Dr. S. N. Das Gupta and Dr. S. K. De. Request Dr. K. Nag to review the book. Lib. Com. 6, 4-5-48. Accept. Council 17, 13-5-48.

Request from Mr. B. V. Krishna Rao for review of the book, "A History of the Early dynasties of Andhradesa", in the Journal of the Society. Request Dr. D. C. Sircar to review the book. Lib. Com. 16, 4-5-48. Accept. Council 17, 13-5-48.

. Letter from Dr. Verrier Elwin dated 19.8.48 on the question of printing "Book Reviews" in the Society's Journal. (This item was considered by the members of the Library and Publication Committees jointly). In future books for review should be placed before the Publication Committee for the selection of reviewers and the review should be circulated and then placed before this Committee prior to sending it to the Press. Pub. Com. 2, 8-9-48. Reviews not yet printed to be placed before the Publication Committee after circulation. Council 7, 15-9-48.

Selection of a reviewer for the book, "Tiruchendur" by J. M. Somasundaram Pillai (1948). Regret inability to review the book in Society's Journal. Mention under books received. Lib. Com. 5, 8-9-48. Accept. Council 9, 15-9-48.

Selection of a reviewer for the book entitled, "The French in India— First Establishment and Struggle" by S. P. Sen. Dr. Kalidas Nag may be requested to review. Pub. Com. 7, 23-11-48. Accept. Council 9, 24-11-48.

Selection of a reviewer for the book entitled "Mewar-ki-Kahabate" and "Rajasthan men Hindi Hastalikhita Grantho ki Khoj" by the Prachin Sahitya Hindi Vidyapitha. Select Pandit Vishweshwar Reu, Jodhpur (Marwar State) as reviewer for the two books as recommended by the Philological Secretary, Dr. S. K. Chatterji, who has seen both the books. Pub. Com. 9A, 23-11-48. Accept. Council 9, 24-11-48.

Consideration of the necessity or otherwise of printing the reviews of the following books:— (a) "The Vertical Man" reviewed by Mr. J. P. Mills. Recommendation: Publish. (b) "Sangitaraja of Kalasena" reviewed by Dr. J. N. Banerjee. Recommendation: Publish. (c) "Numismatic Parallels of Kalidasa" reviewed by Dr. J. N. Banerjee. Recommendation: Publish. (d) "Coins of Marwar" reviewed by Dr. J. N. Banerjee. Recommendation: Publish. (e) "Archaeology in Baroda, 1934-47" reviewed by Dr. J. N. Banerjee. Recomemndation: Publish. (f) "A History of the Early Dynasties of Andhradesa" reviewed by Dr. D. C. Sircar. Recommendation: Publish. (g) "Haramani" reviewed by Dr. S. K. Chatterji. Recommendation: Publish. (h) "Muria and their Ghotuls" reviewed by Prof. T. C. Das. Recommendation: Publish all the above items except (h), which be referred to the President. Pub. Com. 2, 23-11-48. Accept. Council 9, 24-11-48.

RULES—Whether the General Secretary of the R.A.S.B. who is receiving a travelling allowance, can exercise his right of voting, in terms of No. 73 of the Society's Rules? Order: Refer to our Solicitors whose attention shall be drawn to any opinion that may have been received in the past. Council 8, 14-1-48.

Opinion of the Solicitors, Messrs. B. N. Basu & Co., on Rule No. 73 (A question was raised at the Council meeting in January whether the General Secretary of the R.A.S.B. who is receiving a travelling allowance is entitled to exercise his right of voting at the meeting of the Society). Record the opinion that travelling allowance does not affect the General Secretary's right of voting. Council 3, 20-2-48.

Opinion of Solicitors with regard to the right of voting at meetings by Research Fellows who are members of the Society. Record. Council 5, 16-3-48.

The question of payment of conveyance allowance to the officiating General Secretary, during the absence of the permanent General Secretary. If the General Secretary is absent for more than 15 days at a time and if an acting arrangement is made during his absence, the officiating General Secretary will be entitled to draw the conveyance allowance, the amount being deducted from the former's allowance. Council 5, 17-6-48.

Consideration of the proposal that the "Sectional Secretaries", as stated in Section 22 of the Regulation No. 5 regarding the Library, and Section 4 of the Regulation No. 7 regarding Publications, be *ex-officio* members of the Library and Publication Committees. Order: The Council will further consider the question after Sir B. L. Mitter's opinion (given hereunder) is placed before the Scientific Advisory Board. (Opinion of Sir B. L. Mitter—'From a perusal of the Rules and Regulations, it appears that they contemplated sections for the consideration of special subjects and they also contemplated Secretaries of such sections. It is presumed that the appointment of such Secretaries rested with the respective Sections. The Sectional Secretaries mentioned in the Library Regulation No. 22 and in the Publication Regulation No. 4 are such Sectional Secretaries. The next question is whether the General Meeting can add such Sectional Secretaries to the Library or Publication Committees. Obviously it cannot, because the function of appointing Committees is vested in the Council, that is probably why the resolution of the Monthly Meeting uses the word "proposal" instead of "appointment". The Monthly Meeting can certainly make any proposal to the Council for its consideration. The Council has therefore got to consider the proposal whether Sectional Secretaries should be added to the Library and Publication Committees. It may be noted that Rule 61 contemplates Committees to be elected from among the members of the Council. The Council has also power "to appoint" experts to be members of such Committees It is now for the Council to decide whether Sectional Secretaries as such should be appointed to the Committees or each Sectional Secretary has to be considered separately by the test of his being an expert within the meaning of Rule 61 and any other relevant factor). Council 2, 22-7-48.

Interpretation of Rules 49 (c), 50 (b) and 52 as to the *ex-officio* membership of the President, Treasurer and General Secretary in different Specialist Sectional Committees and Boards. Considered in this connection the following opinion of Sir B. L. Mitter:— "Under Rule 49 (c), the President, Rule 50 (b), the General Secretary, and Rule 52, the Treasurer, are *ex-officio* members of all Committees appointed by the Council. I presume that the newly created Specialist Sectional Committees were constituted by the Council. If so, the officers mentioned above are *ex-officio* members of such Committees. If not, they would not be members *ex-officio*." The President, Treasurer and General Secretary are in terms of the relevant rules *ex-officio* members of all Boards and Specialist Sectional Committees as they are constituted by the Council. Council 2, 18-8-48.

Fixing a date for an Extraordinary General Meeting (postponed in last February) to be held in September or October for amendments to the Rules of the Society (under Rule 59). Order: It be reported to the next Monthly Meeting that as the question of revision of Rules is now before the Organisation Committee, the Council is of opinion that it would be convenient if all the proposals are considered by the Members at the same time; if there is delay the Extraordinary Meeting will be called after the Puja Holidays. Council 9, 18-8-48.

SALES—Letter from the Director of Archives, Government of India, New Delhi, requesting a concession of 25% on Society's publications

which he wants to purchase. Recommendation · Supply publications free since 1943. Grant a concession of 25% on books published before 1943: include his name in the free distribution list for all publications issued in and after 1943. Pub. Com. 6, 9-4-48. Accept. Council 9, 19-4-48.

Request from the Librarian, East Punjab University Library to allow them to purchase books for the University Library at a special discount. Present as a gift, except in cases of those books of which only a few copies remain. Pub. Com. 7, 9-4-48. Accept. Council 9, 19-4-48.

STAFF—Annual graded increment of the Staff who are in grades and to whom annual increment is due.

Name.	Designation	Present salary Rs.	Increment due Rs.
P. O. Matthai.	Offg. Asst. Secy.	310	20
N. Gupta.	Stock & Sales Clerk.	110	5
B. Mukherji.	Despatch Clerk.	85	5
S. N. Banerjee.	File Clerk.	75	·5
M. L. Sen Gupta.	Typist.	75	5
Jagannath.	Jamadar.	26	1
A. Wahid.	Dufftry.	26	1
Sk. Ebrahim.	,,	25	1
A. Razzak.	,,	24	1
Altaf Hossain.	,,	21	1
Azhar Ali.	,,	21	1
H. Rahman.	,,	21	1
Jagannath Tewari.	Peon.	18	1
Khedan.	,,	17	1
Manmatha.	Bearer.	17	1
Lakhan.	,,	17	1
Anath.	,,	17	1
Ram Ekbal.	,,	19	1
Ramlal.	,,	17	1
Rafiq.	,,	18	1
Kanu.	Mali.	17·	1
K asem Ali.	Dufftry.	20	1
M· A. Ibrahim.	,,	20	1
Ganga.	Sweeper.	17	1

Recommendation : Sanction as per above list. Increments services only.   Fin. Com. 7, 13-1-48. Accept. Council 14, 14-1-48.

Consideration of a resolution of the Council of 22nd September, 1947, appointing Mr. P. O. Matthai as Assistant Secretary till the first meeting of the new Council in February, 1948.   Order: Mr. P. O. Matthai to continue on special allowance of Rs. 50/- per month.   Council 7. 20-2-48.

Consideration of letters from the General Secretary of the Lower Grade Employees Union in Calcutta.   Order: A Sub-Committee be constituted consisting of the ex-officio members (President, General Secretary, Treasurer), Mr. R. P. Mookerjee and Dr. K. Biswas to look into the

matter and make recommendations to the Council. In the meantime write to the Union that each individual case is being dealt with on its merits. Council 9, 20-2-48.

Formation of Selection· Committees for the appointments of the following vacancies for which applications have been received by advertisements:— Typists and Despatcher. Order: The three ex-officio members, Dr. Biswas and Dr. M. Ishaque. Council 7 (b), 19-4-48.

The following application was considered:—Application from J. Steele, Steno-typist, for a loan of Rs. 100/- from the Society. That in view of precedents the loan be granted, but that in future no loan be granted to temporary employees. The amount should be deducted from his salary in five monthly instalments commencing from May, 1948. Fin. Com. 7 (a), 16-4-48. Accept. Council 12, 19-4-48.

Consideration of the application from N. Gupta, Sales Clerk, requesting promotion to a higher grade. Recommendation: That Mr. Gupta's work be carefully observed by the General Secretary during the next six months. If the standard of his work shows marked improvement, then the question of his promotion to the senior grade should again be reviewed, and if he be promoted his promotion should date from the 1st. January, 1948. Sp. Com. 2 (a), 24-3-48. Recommendation be considered along with the Committee's final recommendation when made, indicating the financial implications. Fin. Com. 8, 16-4-48. Accept. Council 12, 19-4-48.

Consideration of application from B. B. Mukherjee, Despatch Clerk, requesting transfer to the Library with a better scale of pay and grade. Recommendation: That the question of transfering him to the Library Section be postponed until the reorganisation of the Library is taken up. In the meantime, in view of his 18 years service and conscientious work, he may be given an extra increment of Rs. 5/- per mensem from the 1st. January, 1948. Sp. Com. 2 (b), 24-3-48. The recommendation be considered along with the Committee's final recommendation when, made, indicating the financial implications. Finance Committee 8, 16-4-48. Accept. Council 12, 19-4-48.

Consideration of application from the following temporary member of Staff for permanency:—(a) R. N. Banerjee, General Assistant. (b) J. G. Steele, Steno-typist. That they now be placed on the permanent cadre on probation for one year, and that they became eligible for their first increment two years from the date of his original appointment. Sp. Com. 3 (a), 24-3-48. The recommendation be considered along with the Committee's final recommendation When made indicating the financial implications. Finance Committee 8, 16-4-48. Accept. Council 12, 19-4-48.

Consideration of application from the following temporary member of Staff for permanency :—S. N. Banerjee, Filing Clerk. That the question of making the post permanent be postponed until the Special Committee has considered all the recommendations of the Bapat Committee. Sp. Com. 3 (c), 24-3-48. The recommendation be considered along with the Committee's final recommendation when made. Fin. Com. 8, 16-4-48. Accept. Council 12, 19-4-48.

Matters arising from the Monthly Meeting of 3.5.48. Regarding Mr. Matthai's appointment as Asst. Secretary and his additional allowance of Rs. 50/- per mensem which had not been confirmed at the Monthly Meeting. Mr. Matthai be paid an allowance of Rs. 50/- p.m. from the beginning of the financial year for the additional work that he is doing in the absence of a full time Secretary and Asst. Secretary. The question of appointing a full time Secretary should be brought up at the next Council Meeting. Council 4, 13-5-48.

Application from Ram Ekbal, Bearer, requesting permission to join the Provident Fund of the Society. Allow. Fin. Com. 5, 11-5-48. Accept. Council 18, 13-5-48.

Application from N. Gupta dated 3-3-48 for extra remuneration concerning work done in the Publication department in 1946 and 1947. Recommendation: Rs. 10/- per mensem be granted for the period (1946-47) to be recouped from Head No. 1 of Budget. Fin. Com. 9, 11-5-48. Accept. Council 18, 13-5-48.

The question of continuance of the services of two Night Guards who were appointed temporarily during the riot period in 1946. As appointed for abnormal riot situation the temporary posts be now abolished. Services to terminate with effect from 1-8-48. Fin. Com. 11, 11-5-48, Accept. Council 18, 13-5-48.

Letter of resignation from the Office Superintendent, dated the 31st May, 1948. Reaffirm the decision to appoint Mr. Matthai as Assistant Secretary. He was requested to withdraw his resignation for the time being. Council 7, 23-6-48.

Application from B. B. Mukherjee, Despatcher, praying a loan of Rs. 350/- from the Provident Fund Account. Grant loan at the usual rate of interest. The outstanding loan of Rs. 110/- should be deducted from this fresh loan. Fin. Com. 3 (c), 19-7-48. Accept. Council 12, 22-7-48.

Letter from Mr. P. O. Matthai dated the 10th August, requesting to be relieved from duty on or before the 31st of August, 1948. Order: Relieve him if not willing to stay on till the end of September. Such temporary arrangements as may be required, till appointment made after receipt of applications, may be made by the Secretary after obtaining approval of the President. Council 10, 18-8-48.

Consideration of the question of creating the post of Assistant Secretary for filling the vacancy of the post of Office Superintendent. (Note:—This matter was referred to the Finance Committee by the Council dated 22-7-48). Recommend: Advertise for a Superintendent within the prescribed Grade, starting salary to be in accordance with the experience and qualification of the candidate selected. Fin. Com. 10, 16-8-48. Advertise the post of Office Superintendent. A Selection Committee consisting of President, Secretary, Treasurer to interview the candidates and recommend to the Council. Persons already in service are eligible to apply. Council 8, 18-8-48.

Consideration of an application from the clerical Staff re. increase in D.A. (Referred by the Council to Finance Committee). Recommend for all persons now drawing D.A. except menials adoption of the

following Government of West Bengal Scale of Dearness Allowance with effect from 1st April, 1948, subject to approval at the next Ordinary Monthly Meeting:—

Basic Pay up to Rs. 150/-			D. A.	=40/-	
,,	,,	from 151-200	,,	=45/-	
,,	,,	,, 201-250	,,	=50/-	
,,	,,	,, 201-300	,,	=60/-	
,,	,,	,, 301-400	,,	=70/-	

For menials : Continue at the present rate until the question of basic pay is considered by the Council. Fin. Com. 3 (a), 27-9-48. Accept. Council 10, 15-9-48.

Consideration of an application dated 23.9.48 from N. Gupta, Sales Clerk, for a loan of Rs. 290/- from his Provident Fund. Recommendation: Grant loan of Rs. 280/- at 3% per annum. Deduct outstanding loan with accrued interest from the fresh loan. The new loan to be realised by monthly deductions of Rs. 15/-. Fin. Com. 6, 27-9-48. Accept. Council 10 15-9-48.

The Provident Fund Rules and the Rules for Leave, attendance, etc. as drawn up by the Lower Grade Staff Committee (consisting of Mr. Justice R. P. Mookerjee, President, Dr. K. Biswas, Treasurer, and Dr. K. N. Bagchi, Secretary) are approved. Fin. Com. 7, 27-9-48. Accept. Council 10, 15-9-48.

To report that Mr. Matthai worked up to 31st August, 1948, Re. his allowance. Mr. Matthai's resignation be accepted with effect from 1st September, 1948. His services are recorded with appreciation. Payment of allowance for extra work done by him due to the absence of a whole-time Secretary till 31.8.48 is approved. Fin. Com. 6, 8-9-48. Accept. Council 10, 15-9-48.

Recommendation of the Selection Committee of 14.9.48 appointed for the selection of Office Superintendent. Sri Rakhahari Chatterjee, M.A., B.L., appointed temporarily for 6 months on Rs. 300/- p.m. with the usual D.A. Council 16, 15-9-48.

Consideration of the application of Jagannath Missir, Jamadar, of the Society praying for a loan of Rs. 50/- from his Provident Fund Account. Allow Rs. 32/- on usual terms and conditions. Fin. Com. 6, 24-11-48. Accept. Council 11, 24-11-48.

Consideration of the representation of Sri B. B. Mukherjee for transfer of his services to the Library which is being re-organised. No transfer. He will work where he is now, Lib. Com. 16, 14-12-48. Accept. Council 7, 15-12-48.

LIBRARY—Letter from D.L. Banerjee, lately of the Library Dept., tendering resignation from the services of the Society and requesting payment to him of his Provident Fund Money and Gratuity, if sanctioned. Recommendation: Pay according to Provident Fund Regulations. No Gratuity. Fin. Com. 6, 13-1-48. Accept. Council 14, 14-1-48.

Formation of Selection Committees for the appointment of the follow ing vacancys for which applications have been received by advertise-

ments:— Cataloguer for the English Section.   Order: The ex-officio members (President, General Secretary and Treasurer), Dr. K. P. Biswas and Dr. M. Ishaque.   Council 7 (a), 19-4-48.

Application from G. N. Bhattacharya for a loan of Rs. 40/- from the Provident Fund A/c. Grant from the Provident Fund at the usual rate of interest, to be paid back at the rate of Rs. 2/- per month commencing from May, 1948. Fin. Com. 7 (b), 16-4-48. Accept. Council 12, 19-4-48.

Letter dated 28-4-48 from Mr. P. Sinha Roy, lately Assistant Librarian of the Society, intimating that his services were dispensed with before the expiry of the probationary period and claiming salary for the unexpired period.   Inform that services terminated on one months notice as per Council's direction.   His services terminated on 31-7-47. Fin. Com. 12, 11-5-48. Accept. Council 18, 19-5-48.

Letter from Dr. M. Ishaque dated the 15th April with regard to Moulvi Hashim, the Cataloguer of the Arabic Mss. who has been absenting from 16.2.48.   Terminate the services of Mr. Hashim with effect from 14.2.48 for absence without notice. Council 8, 13-5-48.

Application from Mr. S. M. Abbas dated 15.4.48 for the post of Cataloguer of Persian Manuscripts.   No appointment to be made until after the check of the books and Mss. of the Library has been made by the Special Library Committee.   Council 11, 13-5-48.

The question of continuance of the services of Pandits N. C. Vedantatirtha and P. B. Chakravarti as cataloguers of Sanskrit Manuscripts. Recommendation: Their services be retained for another year; refer the matter to the Organisation Committee appointed for the purpose. Lib. Com. 3, 9-6-48. The present arrangement to continue for 6 months. Council 12, 17-6-48.

Application from A. Razzak, Dufftry, Islamic Section, praying a loan of Rs. 75/- from the Provident Fund Account.   Grant loan at the usual rate of interest.   The outstanding loan of Rs. 34/- should be deducted from this fresh loan. Fin. Com. 3 (d), 19-7-48. Accept. Council 12, 22-7-48.

To report suspension of Manmatha Guchait, a Library bearer, for his arrest by the Police in connection with theft of books from the Society's Library. Pay full salary for the whole period from 1.9.48 including the period of suspension. In lieu of notice give him a month's salary, and give him notice that his services after 31.12.48 will not be required any more. Council 6, 24-11-48.

Consideration of the application of S. M. Ismail, Cataloguer, Arabic Section, to send his salary for October, 1948 by money order to Patna where he has fallen sick during the last Puja holidays. Allow as a special case 19 days earned leave and 4 days without pay. Question of further leave to be considered after he rejoins. Warn him that his application is neither in form nor was the intimation sent in proper time, so he should be asked to explain. Fin. Com. 4, 24-11-48. Accept. Council 11, 24-11-48.

Application from Sri S. Chaudhuri, Asst. Librarian, to allow him one month's leave from the month of January, 1949. Grant leave for 1 month from 1-2-49. Lib. Com. 19. 14-12-48. Accept. Council 7, 15-12-48.

Consideration of the applications received for the post of two Cataloguers of printed books in the European languages. President, General Secretary, Library Secretary, Treasurer, Dr. N. Ray and Dr. Habibullah to interview, select and send names to the Council. Lib. Com. 12, 14-12-48. Accept. Council 7, 15-12-48.

TEA PARTY:—Report of use of the Society's Hall for a Tea Party, given in honour of Dr. W. D. West by Mr. and Mrs. K. P. Khaitan. Record. Council 21, 13-5-48.

List of
Patrons,
Officers, Council Members, Members,
Fellows, and Medallists
of the
Royal Asiatic Society of Bengal,
as on the 31st December, 1948

OFFICERS AND MEMBERS OF COUNCIL OF THE ROYAL ASIATIC SOCIETY OF BENGAL DURING THE YEAR 1948

Elections Annual Meeting 1948

President.

Dr. W. D. West, C.I.E., M.A., Sc.D., F.N.I., F.R.A.S.B., (till 6-6-1948).
The Hon'ble Mr. Justice R P. Mookerjee, M.A., B.L., (from 7-6-1948).

Vice Presidents

Dr. B. C. Law, M.A., B.L., Ph.D., D.Litt., F.R.G.S., F.R.A.S.B.
Maharajadhiraja Bahadur Sir U. C. Mahtab, K.C.I.E., of Burdwan.
Dr. M. N. Saha, D.Sc., F.R.A.S.B., F.N.I., F.R.S.
Sir B. L. Mitter, K.C.S.I.

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Philological Secretary :—Dr. S. K. Chatterji, M.A., D.Lit., F.R.A.S.B.
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Other Members of Council

C. C. Blagden, Esq., M.A. (till 4-6-1948); Dr. M. Z. Siddiqi, M.A., B.L., Ph.D. (Cantab), (from 5-6-48).

H. F. Bensly, Esq.

Dr. A. H. Mohiyuddin, M.F., M.A., Litt. D.D. (Cairo).

Sir A. H. Ghuznavi, Kt.

Ramaprasad Mookerjee, Esq., M.A., B.L., (till 5-4-1948); Dr. N. R. Roy, M.A., D.Litt. & Phil. (Leiden), Dip.Lib. (London), F.L.A., (from 2-8-1948).

ORDINARY MEMBERS, 1948

Date of Election.		
3-3-47	R	ABDUL, Saiyed Md. Hai, B.A., Hons. (Cal.), M.A., (Dac.), *Assistant Manager*, Govt. Quinine Depot., Calcutta; 12A Col. Biswas Road, Calcutta.
6-9-48	R	ABU TYEB, Abu Jamal, *Professor of English, Islamia College;* 20 Colonel Biswas Road, Calcutta 19.
2-11-25	N	ACHARYA, Paramananda, B.Sc., *State Archaeologist,* Mayurbhanj State, P.O. Baripada.
2-12-46	F	ADAMS, Donald Sidney Austin, M.A., B.Sc., *Schoolmaster;* c/o The British Legation; Kabul, Afghanistan.
5-2-45	N	ADVANI, Mohanlal Gianchand, B.Sc., *Manager, Messrs. B. Lilaram & Sons*, 26, the Mall, Simla.
2-3-21	L	*AGHARKAR, Shankar Purushottam, M.A., Ph.D., F.L.S. F.N.I., 18 Godavani Chal, Shastri Hall, Grant Road, Bombay 7.
1-5-44	R	AGARWAL, Bhuramal, B.A., B.L., *Advocate, High Court.* c/o Messrs. Khaitan & Co., 1/B Old Post Office Street, Calcutta.
7-7-47	R	AGARWAL, Tarkanath, M.A., *Zemindar and Businessman*, 80 Dr. Suresh Sircar Road, Entally, Calcutta 14.
1-9-47	N	AHMAD, Ali, B.A., C.I.E., I.S.E. (Rtd.), *Chief Engineer and Secretary to the Govt. of Assam*, P. W. Department; The 'Firs', Shillong, Assam.
5-3-45	R	AHMAD, Amiruddin, M.B.E., M.A., B.L., *Advocate, Calcutta High Court and Federal Court of India, Deputy Legal Remembrancer, Bengal.* 34 Circus Avenue, Calcutta.
4-6-45	N	AHMAD, Nazir, M.Sc., Ph.D., *Assistant Director of Fisheries, East Bengal.* Comilla P.O., Tippera.
3-2-47	R	AHMAD, Qamar Uddin, *Chief Engineer*, Port Commissioners, Strand Road, Calcutta.
1-7-46	N	AHMAD, Habib, M.B., (Cal.), F.R.C.S. (Edin.), F.R.F.P.S. (Gl.), D.G.O. (Dublin), L.M., (Rotunda) *Professor of Midwifery*, Dacca Medical College, Dacca.

Date of Eletion.		
5-6-44	N	AHMAD, Jamil, B.Sc., LL.B., *Editorial Assistant, Office of the Consulting Engineer to the Government of India (Roads),* 9 Mahabat Khan Road, New Delhi.
2-8-43	N	AHUJA, Y.D.. M.A., M.O.L., *Head of the Department of Persian and Urdu. Douba College.* Jullunder City, E. Punjab.
6-6-17	N	AIYANGAR, K. V. Rangaswami, Rai Bahadur, M.A., 3 Asoka Road, New Delhi.
7-5-45	R	AJMERA, Ranchordas, *Businessman,* c/o. H. D. Ajmera & Co., 22 Canning Street, First Floor, Calcutta.
2-11-42	R	AKBAR, M. (Nedvi), M.A., *Lecturer, Calcutta University,* 22 Nilmadhab Sen Lane, Calcutta.
1-9-48	F	AKHTAR, S. Ali. *Professor of Zoology,* Faculty of Science, Kabul.
4-2-46	R	ALAVI, Mazhar Ali. *Advocate, High Court,* 42 Circus Avenue, Park Circus, Calcutta.
1-4-46	R	ALI, Ahmed, *Professor of English in the B.S.E.S.,* Presidency College, Calcutta.
1-4-46	R	ALI, Ahmed, B.A., LL.B., *Barrister-at-Law,* 18/1A Dilkusha Street, Calcutta.
1-7-46	R	ALI, The Hon'ble Mr. Mohammed, Khan Bahadur, M.L.A., *Zamindar,* 19 Mayfair, Ballygunge. Calcutta.
5-6-39	R	ALI, S. Shamser, *Insurance Underwriter.* 3 Bright Street, Ballygunge, Calcutta.
1-6-42	R	ALIMUDDIN, M. S., *Mutwalli to the Wakf Estate, Khan Sahib M.S. Azizuddin, Landlord,* 23 Zakaria Street. Post Box No. 6777, Calcutta.
2-12-46	F	ANAS, Mohammad, D.Sc., *General Director of Instructino,* Ministry of Public Instruction, Kabul, Afghanistan.
4-3-46	R	ANSARI, Mohammad Abdul Aziz. *Insurance Official,* c/o The Eastern Federal Union Insurance Co., Ld., 9 Clive Street, Calcutta.
-5-45	N	ARCHER, William George, M.A. (Cantab), I.C.S. *Editor, 'Man in India', Deputy Commissioner,* S.P. Dumka. Bihar.
3-3-30	L	ASHTON, Hubert Shorrock, *Merchant,* Trueloves, Ingatestone, Essex, England.
3-9-34	R	AUDEN, John Bicknell, M.A. (Cantab), Sc.D., F.G.S., F.N.I., *Assistant Superintendent, Geological Survey of India,* 27 Chowringhee, Calcutta.
3-8-14	L	*BACOT, J., F.R.A.S.B. Boulevard Saint-Antoine, 61 Versailles Seine-et-Oise, France.

Date of Election		
6-8-45	R	BAGCHI, Hiranmoy, B.Sc., R.A., *Auditor & Registered Accountant* 7-E Mysore Road, Kalighat, Calcutta.
7-9-36	R	BAGCHI, K. N., Rai Bahadur, B.Sc., M B. (CAL), F.R.I.C., (LONDON). F.N.I., D.T.M. (CAL. & L'POOL), *Chemical Examiner to the Government of Bengal and Chief Bio-chemist, Medical College Hospitals.* 5 Ballygunge Place, Calcutta.
1-11-26	F	*BAGCHI, Probodh Chandra, M.A., DR-ES-LETTRES (PARIS), F.R.A.S.B., *Member of the A.S. of Paris; Director of Research Studies, Visva-Bharati*, Santiniketan, West Bengal.
4-6-45	N	BAGCHEE, Krishnadas, D.Sc,. (LONDON.) F.N.I., *Forest Botanist and Mycologist, Forest Research Institute & College, New Forest.* Dehra Dun.
3-6-46	R	BAGRI, Braj Mohan, *Businessman*, 42 Garden Reach Road, Calcutta.
2-4-24	N	*BAHL, K.N., D.Sc., D.Phil., F.N.I., F.R.A.S.B., *Professor of Zoology, Lucknow University.* Badshabagh, Lucknow.
3-3-47	R	BAJORIA, Bhagwati Prasad, *Merchant and Landlord*, 212 Cornwallis Street, Calcutta.
3-8-42	R	BAKE, Arnold Adrisan, M.A. (Oxon.), D.Litt. (Present address not known).
7-4-41	F	BAKER, Ernest Brain Hindley, O.B.E., I.C.S., Pine Trees Cold Ash, Newbury, England.
7-2-44	N	BALVALLY, Ramarao Dattatraya, *Financial Adviser, Government of Assam.* Secretariat, Shillong.
3-4-44	A	BAND, Edward, M.A. (CAMBRIDGE), *Late of the British Ministry of Information.* 7 Endsleigh Gardens, London, W.C.1.
2-12-46	R	BANERJEE. Anil Chandra, M.A., P.R.S., *Lecturer, Calcutta University;* 2 College Square, Calcutta 12.
4-2-46	R	BANERJEE, Baidyanath, *Merchant*, 58 Jatindas Road, Calcutta.
5-4-43	R	BANERJEE, Binayakanath, M.A., B.L., *Advocate, Calcutta High Court*, 6/1 Williams Lane, Calcutta.
1-8-38	R	BANERJEE. J. N., M.A., Ph.D., *Lecturer, Calcutta University.* 28 Manoharpukur Road, Calcutta.
6-5-46	R	BANERJEE, Prabodh Chandra, Lt.-Col., I.M.S. (retd.), F.R.F.P.S., F.A.C.S., F.R.S.S., 145A Lansdowne Road, Calcutta,
3-6-46	R	BANERJEE, Pramatha Nath, M.A., B.L., *Barrister-at-Law, Vice-Chancellor, Calcutta University*, Senate House, Calcutta.

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Date of Election.		
1-7-46	N	BANERJEE, *R., D.I.G. of Police,* Burdwan Range, Chinsura.
7-12-36	N	BANERJEE S., *C.I.E., I.C.S. Commissioner's House,* Chinsura.
3-6-46	R	BANERJEE, Sachindra Nath, *Master & Official Referee,* 'Maidan End', 3A St. George Terrace, Calcutta.
3-6-46	R	BANERJEE, Sitaram, M.A., B.L., *Advocate,* High Court; 6 Gobinda Ghosal Lane, Bhawanipore, Calcutta.
1-1-45	R	BANERJI-SHASTRI, Anantaprasad, M.B.E., M.A. (CAL.), D.PHIL. (Oxon), VIDYA BHUSHANA, VACHASPATI *Special Officer-in-Charge of Primary Girls' Education, Patna Secretariat, Patna.*
5-3-45	R	BANERJI, Biswanath, B.Sc., M.B., *Medical Practitioner.* Bangur Building, 161/1C Harrison Road, Calcutta.
1-12-47	N	BANERJI, Eric Amulyaratan, M.Sc., Dip. Agri. (CANTAB), *Govt. Agricultural Farm,* Chinsurah, Dist. Hooghly.
2-12-46	R	BANERJI, Jitendra Nath, *Manufacturer and Merchant,* 3 Khelat Babu Lane, Tala, 2 *Cossipore, Calcutta.*
6-9-48	N	BANERJI, Jyotirmoy, B.Sc., B.Com., Dip. For. (Dehra Dun), I.F.S., *Project Officer, Soil Conservation, Central Waterpower, Irrigation & Navigation Commission,* 17 Safdarjung Road, New Delhi.
1-4-46	R	BANERJI, Kamini Kumar, M.A., B.L., *Bihar Civil Service* (retired), 26 Southern Avenue, Calcutta.
4-2-46	R	BANERJI, Nripendra Nath, B.A., *Deputy Postmaster-General, Bengal and Assam,* 1 Council House Street, Calcutta.
4-2-46	R	BANERJI, Sankar Das, *Barrister-at-Law,* 222 Lower Circular Road, Calcutta.
1-9-41	N	BANERJI, Sures Chandra, M.A., *Zemindar,* (Present address not known).
6-5-46	R	BANYARD, Peter, *Assistant, C/o. Messrs. Carritt Moran & Co. Ltd.,* 9, Mission Row, Calcutta.
21-3-45	R	BAPAT, Shriram Balkrishna, B.A. (Cantab), B·Sc. *Barrister-at-Law,* I.C.S., *Jt. Secretary, Home Dept., Govt. of West Bengal,* 2, Lee Road, Calcutta. (Present address not known.)
5-8-46	R	BARDHAN, Pramatha Nath, Major, I.M.S., M.R.C.P. (Edin.), D.P.H. (Eng.), D.R.C.O.G., M.M.S.A., *Officer-in-Charge, Department of Pathology, Armed Forces,* Medical College, Poona.
3-2-47	R	BARUA, Dwijendralal, M.A., *Lecturer,* Calcutta University, 4A Bowbazar Orphange Lane, Calcutta.
2-12-46	R	BARUYA, Nirmal Chandra, M.A., *Lecturer,* City College; 1-A Dover Lane, Ballygunge, Calcutta.

**Date of
Election.**

3-12-23	R	BARWELL, N. F., M.C., M.A., Lt.-Col. (retd.). *Barrister-at-Law*, Temple Chambers, 6 Old Post Office Street, Calcutta and Aylmerton House, Aylmerton, Norfolk, England.
2-12-46	R	BASAK, Sambhunath, M.A., *Secretary*, Dominion Insurance Co. Ld., 15 Clive Street, Calcutta.
5-5-47	R	BASIL, S. A., *Messrs. Talbot & Co.*, Tower House, Chowringhee Square, Calcutta.
2-10-39	N	BASTIN, Reginald Walter, I.C.S. Magistrate's House, Noakhali.
1-4-46	R	BASU, Ajoy Kumar, B.A., (Hons.), *Barrister-at-Law*, 10 Ashu Biswas Road, Bhawanipore, Calcutta.
4-2-45	R	BASU, Arun Kumar, *Ceramic Engineer Assistant*, Burn & Co. Ltd., 9 Park Lane, Calcutta.
3-2-46	R	BASU, Arunendra Mohan, *Barrister-at-Law*, 232 Lower Circular Road, Calcutta.
6-2-39	R	BASU, Jnanendra Nath, VIDYALANKAR, *Member, Benares Hindu University Court; Fellow, Theosophical Society; Landholder; Director, Messrs. Thacker Spink & Co.* 9 Park Lane, Calcutta.
1-4-46	R	BASU, Kalyan Kumar, *Barrister-at-Law*, 50 Turf Road, Calcutta.
2-4-45	R	BASU, Kumud B, *Coalmine Owner, Past Chairman, Indian Mining Federation*, 7 Judges' Court Row, Alipore, Calcutta.
5-2-40	R	BASU, Mriganka Mauli, I.C.S., *Commissioner, Commercial Trades, Bengal.* Pollock House, 28/B Pollock Street, Calcutta.
1-3-26	R	BASU, Narendra Kumar. *Advocate, High Court.* 12 Ashu Biswas Road, Bhawanipore, Calcutta.
5-3-45	R	BASU, S. M., *Government Solicitor.* c/o Messrs. C. C. Basu & Co., 9 Old Post Office Street, Calcutta.
3-5-48	R	BASU, Satyendra Kumar, M.Sc., *Dy. Conservator of Forests (Retd.)*, P-304, Lake Terrace, Calcutta 29.
5-7-48	R	BASU, Subodh, M.A., B.L., Author, P-58 Lansdowne Road Extension, Calcutta 29.
6-8-45	R	BASU, Sib Kumar, *Dairy Expert and Refrigeration Engineer (Denmark)*, 47/2 Harrison Road, Calcutta.
2-4-45	R	BASU, Sikhar Kumar, M.A., B.L., *Barrister-at-Law.* 23/1/2 Guruprasad Chaudhuri Lane, Calcutta.
3-5-48	R	BASU, Suchendu, M.A., LL.B., 4 Clive Row, Calcutta.
1-9-47	R	BASU, U.P., D.Sc., F.NI., *Chemist*, 153 Dhurrumtallah Street, Calcutta 13.
2-10-44	L	BATIA, Chandmull, *Businessman*, 7 Canning Street, Calcutta.

Date of Election.		
7-7-09	N	BAZAZ, Rangnath Khemraj, Rao Sahib, *Proprietor, Shri Venkateshwar Press*, 7th Khetwadi, Bombay 4.
4-3-40	N	BELL, Frank Owen, B.A. (Cantab.), I.C.S., Magistrate's House, 1 Thackeray Road, Calcutta 27.
5-6-44	R	BENTHALL, Arthur Paul, *Partner, Messrs. Bird & Co.* Chartered Bank Buildings, Clive Street, Calcutta.
4-3-25	N	BENTHALL, The Hon'ble Sir Edward C., Kt., K.C.S.I., *Bird & Co., Calcutta.*
7-4-09	L	*BENTLEY, Charles A., C.I.E., M.B., D.PH., D.T.M. & H., F.R.A.S.B., *Professor of Hygiene.* University of Egypt. Cairo.
4-2-46	R	BENTLEY, Harold, A.M.I.Mech.E., A.S.Mech.E., *Fuel Technologist and Engineer, General Manager, Keymer Bagshawe & Co. Ld.*, 22 Strand Road, Calcutta.
2-10-44	R	BERNHARDT, Eric, *Engineer*, F.I.T. (Zurich)., c/o Messrs. Volkart Bros., P.O.B. 385, Delhi.
5-3-45	R	BEZBORUAH, Krishna Kamal, Present address unknown.
4-2-46	R	BHABRA, Abirchand, M.A., B.L., *Advocate, High Court*; 42 Vivekananda Road, Calcutta.
1-4-46	L	BHADANI, Arjun Lal, c/o Messrs. Bhadanni Bros. Ltd., 15 Clive Street, Calcutta.
4-6-28	N	BHADRA, Satyendra Nath, Rai Bahadur, M.A., *Formerly Principal, Jagannath Intermediate College.* 5 Nayabazar, Dacca.
2-7-45	N	BHADRA, Woopendra Chandra, B.A., *Agent, The Pioneer Bank Ld.* Sylhet, Assam.
7-6-48	R	BHADURI, Jyoti Sankar, M.A., Kavyatirtha, *Secretary, Sonapur Tea Estate*, 51/D Sambhunath Pundit Street, Calcutta.
1-3-48	R	BHADURI, Jnanendra Lal, D.Sc. (Edin.), *Lecturer in Zoology, University of Calcutta.* 10/2, Abinash Mitra Lane, Calcutta 6.
1-12-47	R	BHADURI, Sisir Kumar, M.A., 2A Raja Rajkissen Street, Calcutta 6.
1-1-4	N	BHAGAT, Prahladrai, *Merchant.* 26 Burtolla Street, Calcutta.
2-11-45	R	BHAGAT, Phoolchand, *Mill-owner and Merchant.* Bhagat Villa, Grand Trunk Road, Konnagar, Dt. Hooghly.
1-1-45	N	BHALWALA, Debi Dutt, *Merchant.* 1 Doyehatta Street. Calcutta.
6-5-46	R	BHAN, Jagdish Narayan, *Merchant*, 85/86 Stephen House, Dalhousie Square East, Calcutta.

Date of Election.		
1-8-17	R	*BHANDARKAR, Devadatta Ramkrishna, M.A., Ph.D., F.R.A.S.B., 2/1 Lovelock Street, Ballygunge, Calcutta.
7-6-48	R	BHANSALI, Balwant Raj S., B.Com., LL.B., *Labour Officer, Hastings Mill Ltd., Messrs. M. Bangur Bros. Ltd.*, 9 Netaji Subhas Road, Calcutta 1.
5-3-45	R	BHARTI, Nanak Chand. c/o Messrs. Hardware & Metal Industries, 30 Clive Street, Calcutta.
4-6-45	R	BHARTIA, Mahabir Prasad, *Merchant, Director of the Indian Ice and Cold Storage Co. Ld., International Industries Ld* P23/24 *Radhabazar Street*, Calcutta.
6-5-40	N	BHARUCHA, Farrokh E., *Merchant.* Canada Building, Hornby, Road, Bombay.
3-1-44	R	BHATTACHARJEE, Abani Kanta, *Barrister-at-Law.* 84 Mahim Haldar Street, P.O. Kalikhat, Calcutta.
7-5-45	L	BHATTACHARJEE, Sachindra Mohan, *Banker & Insuranceman.* P. 4 Ekdalia Road, Ballygunge, Calcutta.
1-2-43	N	BHATTACHARJEE, Mrs. Serapia, 3/B Davis Road. Lahore.
2-8-48	N	BHATTACHARYA, Amullya Ratan, M.B.B.S., (Bombay), *Physician..* Naya Bazar, Ajmer Rajputana.
5-7-48	R	BHATTACHARYA, Ashutosh, M.A., *Research Associate of the Department of Anthropology, Indian Museum.* Calcutta.
2-10-44	R	BHATTACHARYA, Kamakhya Charan, *Jyotirbhusan*, 16 Anath Deb Lane, P.O. Beadon Street, Calcutta.
2-12-46	R	BHATTACHARYA, Radha Mohan, B.L., Journalist, 8/5-A Russa Road, P.O. Kalighat, Calcutta.
7-2-44	R	BHATTACHARYA, Sukumar M.A., *Professor of History, Asutosh College,* 16 Basanta Bose Road, Kalighat, Calcutta.
3-12-45	R	BHATTACHARYA, Susil Chandra, M.A., *Businessman.* 60/3 Dhurrumtollah Street, Calcutta.
3-12-45	R	BHATTACHARYA, Viswa Nath, M.A., LL.B., *Businessman.* 60/3 Dhurrumtollah Street, Calcutta.
3-2-47	R	BHATTACHARYA. Asoke Kumar, M.A., B.L., Kavya-Puranatirtha, *Professor of Sanskrit and Bengali,* Ram Saday College, Amta, Howrah.
1-11-48	R	BHATTACHARYYA, Bhupendranath, M.A., Vyakarana-tirtha, Samkyatirtha. 102 Surendranath Banerjee Road, Calcutta.
7-7-24	L	BHATTACHARYYA, Binoytosh, M.A., Ph.D. Rajaratna *General Editor, Gaekwad's Oriental Series, and Librarian, Oriental Collections,* Baroda State, Baroda.

Date of Election		
4-6-45	N	BHATTACHARYYA, Dinesh Chandra, M.A., *Professor of Sanskrit* (Retd.), Hooghly Mohsin College, P.O. Chinsura, Hooghly.
2-12-46	R	BHATTACHARYYA, Durgamohan, M.A., Kavyya-samkhya-puranatirtha, *Professor and Head of the Department of Sanskrit,* Scottish Church College; 25 Nilmani Mitra Road, Tala, Calcutta.
2-4-47	N	BHATTACHARYYA, Haridas, M.A., B.L., *formerly Head of the Department of Philosophy and Provost, Dacca University,* 103, Rash Bihari Avenue, Calcutta 21.
1-4-46	R	BHATTACHARYYA, Nirmal Chandra, M.A., B.L., *Senior Professor of Economics and Political Science, Scottish Church College,* and *Lecturer, Calcutta University:* 18 Aswini Dutt Road, Calcutta.
21-9-45	N	BHATNAGAR, Brij Kishore, M.A., LL.B. Mahalla Katra Banda (C.P.).
1-7-46	R	BHIMANEE, G.C., *Merchant, Proprietor, Messrs. G. C. Bhimanee & Co.,* 6 & 7 Clive Street, Calcutta.
3-2-47	A	BILIMORIA, Rustom, *Sales Manager,* Messrs. Walford Transport Ltd., Calcutta.
1-7-46	R	BINANI, Bithaldas, B.A., *Metal Merchant and Banker,* 43 Strand Road, Calcutta.
3-7-44	R	BIRLA, B. Kumar, *Merchant.* 8 Royal Exchange Place, Calcutta.
3-7-44	R	BIRLA, G. Prasad, *Merchant.* 8 Royal Exchange Place, Calcutta.
6-3-44	L	BIRLA, G. D. Birla Park, Ballgunge, Calcutta.
3-7-44	R	BIRLA, Krishna Kumar, *Businessman.* 8 Royal Exchange Place, Calcutta.
4-9-44	R	BIRLA, Lakshmi Nivas, *Merchant.* 3/1 Raja Santosh Road, Alipore, Calcutta.
5-3-48	R	BISWAS, The Hon'ble Mr. Justice Charu Chandra, C.I.E., M.A. B.L., *Judge, High Court.* 58 Puddopukur Road, P. O. Elgin Road, Calcutta.
1-8-23	L	BISWAS, Kalipada, M.A., D.Sc., (EDIN.), F.R.S.E., *Superintendent Royal Botanic Garden.* P.O. Royal Botanic Garden, Howrah.
6-12-48	R	BISWAS, Sudhish Ranjan, M.A., *Secretary, Bengal National Chamber of Commerce,* 9/2 Dover Lane, Calcutta 29.
3-1-27	N	BIVAR, Hugh Godfrey Stuart, I.C.S., Judge's House, Gauhati, Assam.
2-4-45	R	BLAGDEN, Cyprian Claude, M.A., *Publisher,* c/o Messrs. Longmans Green & Co., 17 Chittaranjan Avenue, Calcutta.

Date of Election.		
6-5-46.	N	BLOMFIELD, F. B., F.R.I.B.A., *Architect, Labour Dept. Government of India,* 4 Prithviraj Road, New Delhi.
3-11-47	A	BLOODWORTH, Thomas Stuart (Jr.), *American Vice-Consul,* 9, Esplanade Mansions, Calcutta 1.
4-11-46	R	BOND, Clinton Lucius, *Manager, Standard-Vacuum Oil Company,* c/o 6 Church Lane, Calcutta.
6-12-43	R	BONNERJEE, Miss Sadhona, *Research Scholar.* 66 Lansdowne Road, Calcutta.
4-11-35	F	BOR, N. L. M.A., D.Sc., F.L.S., I.F.S., c/o Messrs. Lloyds Bank (Cox & Kings Branch), 6 Pall Mall, London.
2-4-45	A	BORN, Henry, A.R.P.S., *General Secretary, Art in Industry Exhibition,* Hongkong House, Dalhousie Sq. 4 Sunny Park, Ballygunge, Calcutta.
1-5-46	R	BOSE, Atul, *Artist,* 47, Bondel Road, Calcutta 19.
4-12-39	R	BOSE, Debendra Mohan, M.A., Ph.D., F.N.I., *Director, Bose Research Institute,* 93 Upper Circular Road, Calcutta.
7-8-39	R	BOSE, Girindrashekhar, M.B., D.Sc., F.N.I. *Professor of Psychology and Head of the Department of Psychology, Calcutta University,* 14 Parsi Bagan Lane, P.O. Amherst Calcutta.
4-11-46	R	BOSE, Harish Chandra, *Textile Representative* 1/10 Paikpara Row, Calcutta 37.
4-3-46	R	BOSE, Himansu Kumar, M.A., B.L., *Barrister-at-Law,* High Court, Calcutta, and *Advocate,* Federal Court of India; Bose Park, 84 Harish Mukherjee Road, Bhawanipore, Calcutta.
2-8-43	N	BOSE, Jogesh Chandra, 'Vasudham', P.O. Contai, Dt. Midnapore.
1-12-47	R	BOSE, Jyotsnakanta, M.A., B.L., Ph.D., (LOND.), F.R.A.I., 46/7A Ballygunge Place, Calcutta.
4-11-46	R	BOSE, Mani Mohan, *All-India Manager, Messrs Herts Pharmaceuticals, Ltd.,* c/o Messrs, Gillanders Arbuthnot & Co. Ltd., 8 Clive Street (20 Paikpara Row, P.O. Belgachia). Calcutta.
4-9-44	R	BOSE, Manindra Lal, M.A., B.L., *Barrister-at-Law.* 75E Russa Road (1st floor), Calcutta 26.
4-11-46	R	BOSE, Madhu, *Film Producer,* 3 Theatre Road, (top flat) Calcutta.
2-12-46	R	BOSE, Phani Bhusan, *Asst. Accounts officer, Dept. of Industries and Supplies, Govt. of India;* 27-A Baloram Ghosh Street, Calcutta.

Date of Election.		
5-3-45	R	Bose, Sir S. M. Kt., *Barrister-at-Law, Advocate-General, Bengal.* 22/1 Ballygunge Circular Road, Calcutta.
4-3-46	R	Bose, Sarat Chandra, *Barrister-at-Law*, 1 Woodburn Park, Calcutta.
5-3-45	R	Bose, Sri Bhusan. *Solicitor.* c/o Messrs. Orr Dignam & Co., 32 Dalhousie Square, Calcutta.
2-3-31	N	Bose, Sudhansu Kumar, B.Sc., (CAL.), A.R.S.M., B.Sc (MINING) (LONDON), *Professor of Mining and Surveying.* Indian School of Mines, Dhanbad.
2-1-39	R	Bose, Sudhansu Mohan, M.A., LL.B., (CANTAB), *Barrister-at-Law.* 3 Federation Road, P.O. Amherst Street, Calcutta.
2-11-36	N	Bothra, Subhkaran Singh, *Banker.* Kundigar Bhairon, Jaipur City.
5-5-45	N	Bourne, His Excellency Mr. Frederick Chalmers, C.S.I C.I.E., Governor of East Bengal Govt. House, Dacca.
1-5-44	F	Boultbee, H. L. *Major, Indian Armoured Corps.* The Army & Navy Club Pall Mall, London.
2-4-45	N	Bullivant, Lindsay Frank, CAPT. R.E., F.R.I.B.A., F.S.A., (SCOT.), 'E' Branch, Advance H.Q. Allied Land Forces, South East Asia (Present address not known).
1-1-45	R	Burman, Debajyoti, M.A., M.Com., B.L., *Assistant Editor, Modern Review.* P. 436/1 Kabir Road. Calcutta.
4-2-46	N	Butler, Rev. John Francis, M.A., (OXON), A.M., (HARVARD), Ph.D., (MANCHESTER), *Editorial Secretary,* Cristian Literature Society, P.O. Box 501, Park Town, Madras.
7-8-44	E	Bradley, Gerand Anthony, 22 Endsleigh Road, Waterloo, Liverpool, England.
7-5-45	R	Bradshaw, Eric Jean, B.A., B.A.I., (DUBLIN), M.Sc., (CALIFORNIA), *Superintending Geologist, Geological Survey of India.* 27 Chowringhee, Calcutta.
3-12-24	R	Brahmachari, Phanindra Nath, M.Sc., M.D., 19 Loudon Street. Calcutta.
1-1-45	R	Brinkley, John R., *Captain, P.W. Division* (Present address not known).
2-8-48	R	Brocke, Alfred George, Dr. Phil. Nat (JENA), *Scientia Adviser Capco Ltd.,* 9 Clive Street, Calcutta.
3-7-07	L	*Brown, John Coggin, O.B.E., D.Sc., F.G.S., M.I.M.E. M.INST. M.M., M.I.E., F.R.A.S,B, 'Anandale', Broxbourne, Herts, England

Date of Election.		
6-10:09	A	*BROWN, Percy, M.B.E., A.R.C.A·, F.R.A.S.B., c/o H. B. Katherine Srinagar, Kashmir.
7-6-48	N	BRYAN, Denzil Arnold, B.A. (Cantab.), *U. K. Trade Commissioner for South India*, Rutland Gate, Nangambakkam, Madras.
1-7-46	R	BRYDEN, William Donald, *Assistant Secretary, Bengal Chamber of Commerce*, 2 Clive Street, Calcutta.
2-8-48	R	BUJAKOWSKA, Mrs, Halina-Danuta, B.Com., l'universite de Grenoble (France), *Writer* 11 Hungerford Street, Calcutta.
6-5-46	R	CAMERON, A. L., *Director, Messrs. Andrew Yule & Co. Ltd.*, 8 Clive Row, Calcutta.
5-5-47	R	CARBONE, Dr. A., *Consulting Architect*, 11 Kyd Street, Calcutta 16.
2-4-45	R	CARPENTER, Francis William Alan, M.INST.F., M.INST MET., M.I. & S.INST., M.M. & G.S., F.RBA, F.R.A.S., *Messrs. Bird & Co., Chartered Bank Buildings*. 6 Middleton Mansion, 9/1 Middleton Street, Calcutta.
2-12-46	F	CASPANI, Egidio, Rev. Fr., *Chaplain of the Italian Legation*, Kabul, Afghanistan.
4-3-46	R	CATTO, William Ewan, *Director, Messrs. Andrew Yule and Co. Ld.*, 8 Clive Row, Calcutta.
3-12-45	L	CHAKRAVARTI, Bankim Chandra, B.A., *Manager, Dhalbhum Raj Estate*, Ghatsila, Singhbhum.
4-7-27	L	CHAKRAVARTI, Chintaharan, M.A., KAVYATIRTHA, *Professor of Bengali*. Krishnagar College, Krishnagar.
2-7-45	R	CHAKRAVARTI, J. S. Narasimhacharya, B.A., (Punjab), LL.B. (Allahabad) *Vakil*. Dindigul, Madras Presidency.
3-1-27	N	CHAKRAVARTI, Niranjanprasad, O.B.E., M.A., Ph.D., (Cantab) F.R.A.S.B. *Director-General, Archaeological Survey of India*. Curzon Road, New Delhi.
2-12-46	R	CHAKRAVARTI, P. K. B.Com., *Commercial Tax Officer, Govt. of Bengal;* 26 Townshend Road, Bhawanipore, Calcutta.
7-1-46	R	CHAKRAVARTI, The Hon'ble Mr. Justice Phanibhusan, M.A., B·L., *Judge, High Court*, P512 Aswini Dutt Road, Calcutta 29.
6-9-48	N	CHAKRAVARTI, Mani Mohan, M.B., Capt., ex I.M.S., *Assistant Medical Officer*, Royal Calcutta Turf Club, 130 Raja Rajendra Lal Mitter Road, Calcutta 10.
6-2-39	N	CHAKRAVARTI, Rash Mohan, Ph.D., Puranrattna, Vidyavinode, *Superintendent, Rammala Library and Museum*. P.O. Comilla, Dt. Tipperah.

Date of Eletion.		
7-5-45	L	CHAKRAVARTI, Shrish Chadra M.L.C., *Solicitor, High Court* 2 Marquis Street, Calcutta.
3-3-47	N	CHAKRAVARTI, Venay Chandra, *Headmaster, H. E. School*, Bogra Town. Harinakunda, Jessore.
2-12-46	R	CHAKRAVARTY, Nirendra Nath, B.E., *Assistant Engineer, Public Health Engineering, Govt. of Bengal;* 61-A. Lansdowne Road, Calcutta.
5-5-47	R	CHAKRAVARTI, Pulin Behari, M.A., Samkhya-Vyakaranatirtha, 119 Vivekananda Road, Calcutta.
2-8-48	R	CHAKRAVARTY, Pramatha Kumar, M.A., B.L., *Advocate,* High Court. 1/2A Hazra Road, Kalighat, Calcutta.
2-12-46	R	CHAKRAVARTY, S. N., M.A., B.L., *Advocate, Calcutta High Court*, 15 Jatin Das Road, Calcutta.
6-1-47	R	CHAKRAVARTY, Uma Prosad, *Businessman* 160/1 Bowbazar Street, Calcutta.
3-5-48	R	CHALIHA, Jadavaprosad, B.Sc., P21 Golf Club Road, Tollygunge, Calcutta.
3-6-46	R	CHAMBERS, John, C.I.E., O.B.E., M.C., *Chief Engineer W. & B. Bengal*, Writers Buildings, Calcutta
1-5-44	R	CHANDA, Apurva Kumar, M.A., I.E.S., 32/1/A Nandan Road, Calcutta 25.
1-4-46	N	CHAORA, Purushottam M, *Managing Director, Messrs. Shree Jeenagora Coal Ltd., Pure Jeenagora Colliery., P.O. Jharia* Dt. Manbhum.
3-1-06	L	CHAPMAN, John Alexander. 32 Lavington Road, West Ealing, London, W. 3.
1-7-40	R	CHATTERJEE, A. B., M.A., *General Manager, Metropolitan Printing and Publishing House Ltd.* 4-B Council House Street, Calcutta.
7-2-27	N	CHATTERJEE, Ashoke, B.A., (CAL.), B.A., (CANTAB), *Labour Welfare Officer.* Burnpur, via Assansol.
3-2-47	N	CHATTERJEE, Bajra Kumar, M.Sc., (Cal.), D.Sc., (Paris) *Assistant Superintendent, Anthropological Survey of India* 64 Cantonment Road, Benares.
2-8-48	R	CHATTERJEE, Kaliranjan, B.Sc., L.M.P., *Medical Practitioner*, 32, Gobra Road, Calcutta 14.
2-12-46	R	CHATTERJEE, Mrs. Kamala, B.T., *Secretary and Head Mistress, Presidency School for Girls;* 2 Fern Road, Ballygunge, Calcutta.
2-3-36	R	CHATTERJEE, Manomohan, B.Sc., (Cal.) Ph.D. (London) A.R.C.S., D.I.C., *Professor of Geology, Presidency College.* 71C Hindusthan Park, Calcutta 29.
1-10-20	R	CHATTERJEE, Nirmal Chandra, *Barrister-at-Law,* 8 Theatre Road, Calcutta.

Date of Election.		
4-7-27	R	CHATTERJEE, Patitpabon. M.A., B.L., *Vakil, High Court*. 84 Harrison Road, Calcutta.
3-5-43	R	CHATTERJEE, Paresh Chandra. 6 Mission Row, Calcutta.
4-6-45	R	CHATTERJEE, Phulla Coomer, M.A., *Solicitor, Calcutta High Court.* 6 Old Post Office Street, Temple Chambers, Ground floor, Calcutta.
5-4-22	R	CHATTERJEE, Rakha Hari, M.A., B.L., *Superintendent, Royal Asiatic Society of Bengal*, 1 Park Street, Calcutta 16.
5-3-45	R	CHATTERJEE, Satyendranath, *B.Sc.*, (ECON.), (London) *Barrister-at-Law*. 2/1 Chandra Madhab Road. Elgin Road, Calcutta.
7-8-44	R	CHATTERJEE, Siva Prosad, M.B., (CAL.) *Medical Practitioner, House Surgeon In-charge of Veneral Dept., Carmichael Hospital.* Laurels, 56 Gariahat Road, Ballygunge, Calcutta.
4-2-46	R	CHATTERJEE, Subimal Chandra, *Landholder,* 33 Linton Street, Entally, Calcutta.
2-9-40	R	CHATTERJI, Bankim Chandra, M.Sc., *Department of Pure Mathematics Calcutta University.* 31-B,W. C. Bonnerjee Street, Calcutta.
3-3-47	R	CHATTERJI, Mrs. Bani, Doc.Mus, Sangeeta-bharati, c/o Dr. S. K. Chatterjee, Chemical Department, Medical College, Calcutta.
5-1-31	N	CHATTERJI, Durgacharan, M.A., *Lecturer in Sanskrit,* Chittagong College, Chittagong.
7-6-11	N	CHATTERJI, Karuna Kumar, M.B.E., Lt.-Col., I.T.F., M.C., V.H.A.S., Sailasram, Kanke Road, Ranchi.
7-5-28	R	CHATTERJI, Kedar Nath, B.Sc., (LONDON), A.E.C.S. (LONDON), c/o Probasi Office, 120/2 Upper Circular Road, Calcutta.
3-3-47	R	CHATTERJI, Sachi Kumar, M.B., D.T.M., Ph.D *Chemical Examiner to Government of Bengal,* Chemical Department, Medical College, Calcutta.
6-8-24	R	*CHATTERJI, Suniti Kumar, M.A., (CAL.), D.Litt. (LONDON). F.R.A.S.B., *Kumar Guruprasad Singh Professor of Indian Linguistics and Phonetics, Calcutta University.* 'Sudharma', 16 Hindustan Park Ballygunge, Calcutta.
2-3-36	R	CHATTERJI, Mrs. Tuhinika, M.A., KAVYATIRTHA, *Research Scholar Examiner, Calcutta University.* 5, Wood Street., Calcutta.
5-11-24	R	CHATTOPADHYAYA, K. P. M.Sc., *Professor and Head of the Department of Anthropology,* Calcutta University. 35 Ballygunge Circular Road, Calcutta.

Date of Election.		
2-11-25	N	CHATTOPADHYAYA, Kshetresa Chandra, M.A., *Lecturer in Sanskrit.* Allahabad University, Allahabad.
7-1-46	N	CHATURVEDI, Radhalal, Rai Bahadur, *Commerce & Industries Minister,* Rewa C. P.
4-2-46	N	CHHABRA, Dr. Bahadur Chand, *Government Epigraphist for India,* Ootacamund, Nilgiris, S. India.
3-5-43	N	CHOKHANY, Ram Dev, Rai Bahadur. 2 Royal Exchange Place, Top Floor, Calcutta.
5-2-45	R	CHAUDHURI, A. N., *Barrister-at-Law.* 42 Jhowtolla Road, Calcutta.
3-3-47	R	CHAUDHURI, Bhupati Nath, B.E., A.M.I.E., M.R.San. I. (Lond.), *Hony. Secy., Institution of Engineers Ind.* 69 Jatin Das Road, Calcutta.
2-12-46	R	CHAUDHURI, Deb Narain, M.Sc., *Manager. International General Electric Co. (India) Ld.,* 7 Wellesley Place, Calcutta.
3-6-46	R	CHAUDHURI, J. B. Ph.D., (Lond.), F.R.A.S., (Lond.) *Bengal Educational Service,* 3 Federation Street, Calcutta.
7-1-46	R	CHAUDHURI, Kobad Ahmad, *Zemindar & Businessman.* 159 Park Street, Calcutta 16.
4-4-38	R	CHAUDHURI, Mrs. Roma, M.A., D.PHIL. (Oxon), *Professor of Logic, Lady Brabourne College.* 3 Federation Street, Calcutta.
4-11-35	R	CHAUDHURI, S. N. 52 Ballygunge Circular Road, Cal. Ballygunge Circular Road, Calcutta.
2-4-45	R	CHAUDHURI, Sachindranath, *Barrister-at-Law,* 52/5 Ballygunge Circular Road, Calcutta.
21.9-45	R	CHAUDHURI, Miss Uma. 26 Beltala Road, P.O. Bhowanipore, Calcutta.
2-8-48	R	CHAUDHURI, Sunil Kumar, M.A., *Professor, Charu Chandra College,* Sarat Chatterjee Avenue, Calcutta 29.
5-12-23	L	CHOPRA, B. N., D.Sc., F.N.I., F.L.S., *Deputy Fisheries' Adviser to Govt. of India,* New Delhi.
1-11-48	R	CHOPRA, Hiralall, M.A., 2 Ram Lochan Mullick Street, Calcutta.
1-2-22	L	*CHOPRA, Sir R. N., K.T., C.I.E., M.A., Sc.D., M.D, (CANTAB), F.R.C.P., F. N. I., F.R.A.S.B., BREVET COL. I.M.S., *Drug Research Laboratory, Jammu and Kashmir State.* Srinagar, Kashmir.
5-8-46	R	CHUNDER, The Hon'ble Mr. Justice Kamal Chunder, M.A., (OXON), I.C.S., *Barrister-at-Law, Judge High Court;* 82, Lansdowne Road, Kalighat P.O. Calcutta.

Date of Election.		
2-10-44	R	CHUNDER, Pratap Chandra, M.A., B.L., *Research Student in Indian History.* 23 Wellington Street.
4-11-46	R	CHOWDHURI, A. C., B.Com., B.L., Pleader, P.O. Dhakuria, 24-Parganas.
1-1-45	R	CHOWDHURI, Abul Bashar Muhammad Sultan-ul-Alam, M.A., *Lecturer in the Department of Arabic and Persian, Calcutta University,* 45 Gorachand Road, Calcutta.
2-4-28	R	CHOWDHURI, Rai Jatindranath, *Zemindar,* 36 Russa Road, Tollygunge, Calcutta.
2-12-46	N	COOPER, Vincent John Cochran, Major, R.A., 14 Palta Ichapur, Nawabganj, Bengal.
5-3-45	R	CURLENDER, A., *Merchant.* 9 Theatre Road, Calcutta.
6-1-47	F	CURIEL, Raoul, Licencie es Letters, Licencie en Droit (Universite de Paris), *Member of the Delegation Archaeologique Francaise en Afghanistan,* Kabul, Afghanistan.
1-4-46	R	D'ABREW, P.A., M.B.E., *Deputy Register,* High Court, Appellate Side; 7 Royd Street, Calcutta.
4-11-46	N	DAS, Achyutananda, M.A., Kavyatirtha, *Lecturer in Sanskrit,* c/o. Pareshnath Bose, Asst, Registrar, Co-operative Socities Chaumatha, P.O. Chinsura, Hooghly.
5-3-45	R	DAS, Banamali, *Barrister-at-Law.* 3 Valmeek Street, Kalighat, Calcutta.
5-3-45	R	DAS, Dhruba Ranjan, *Barrister-at-Law.* 10 Old Post Office Street, Calcutta.
2-9-46	N	DAS, G. N., M.A., LL.B., *Research Scholar, Deccan College Post-Graduate and Research Institute.* Poona 4.
6-12-43	R	DAS, Jyotirindra Nath, Rai Sahib, B.Sc., *Retd. Deputy Conservator of Forests,* 13 Ballygunge Place, Calcutta 19.
3-2-47	R	DAS, J. C. B.Sc , *Managing Director, Bengal Central Bank,* 4 Tilak Road, Calcutta.
5-3-45	R	DAS, The Hon'ble Mr. Justice S. R., *Calcutta High Court,* 129 Regent Park, Tollygunge, Calcutta.
2-12-46	R	DAS, Sudhir Ranjan, M.A., *Research Assistant, Calcutta University;* 135-B Vivekananda Road, Calcutta.
2-9-46	R	DAS, Sures Chandra, M.A., *Managing Director, General Printers and Publishers,* Ld., 119 Dhurrumtollah Street, Calcutta.
3-3-47	R	DAS, Tarak Chandra, M.A., *Lecturer, Calcutta University;* 93 Ballygunge Place, Calcutta.

Date of Election.		
3-2-47	N	DAS, Varma, Abanindra Lal, A.I.S.M., *Geologist and Mining Engineer, Geologist-in-Charge and Chief Mining Manager;* c/o R. B. Shivratan G. Mohatta, Nayabazar, Ajmer.
5-12-39	N	DAS-GUPTA, C. C., M.A., Ph.D. (CAL. and CANTAB), *Professor of History, Presidency College,* 130 Landowne Road, Calcutta.
3-5-48	R	DAS-GUPTA, Jitendra Nath, B.A., B.E., M.I.E. (Ind.), M. R. San. I (Lond.), Retd.) *Chief Engineer. Town Planning Gort of West Bengal,* 27 Lansdowne Terrace, Calcutta 29.
5-3-45	N	DAS-GUPTA, K. C., M.A. (CANTAB), I.C.S, *Barrister-at-Law, Register.* High Court, Calcutta.
1-7-46	R	DAS-GUPTA, Pradhir Chandra, M.A.S.F., Vaidya Siromoni, Kaviraj, Rahamatgunge. Chittagong.
5-3-45	R	DAS-GUPTA, Subodh Ranjan, *Barrister-at-Law.* 23 Hindusthan Park, Ballygunge, Calcutta.
3-3-47	R	DAS-GUPTA, Tamonash Ch., M.A., Ph.D., *Post-Graduate Lecturer in Modern Indian Languages,* Calcutta University; 54A Amherst Street, Calcutta 2.
2-8-48	R	DATTA, Gita, B.A. (Hons.). Vedatirtha c/o Dr. J. K. Datta, 88 Chowringhee, Calcutta
6-5-46	L	DAVIDSON, D.A.G., I.F.S., U.S. Club. Calcutta.
6-8-24	L	DAVIES, L. M., LT.-COL., M.A., F.R.S.E., F.R.A.I., F.G.S. 8 Garscube Terrace, Murrayfield, Edinburgh., 12, Scotland.
1-4-46	R	DAVIS, Philip, *Master Stevedore,* Messrs. P. E. Davis & Co., 6 Commercial Buildings, Clive Street, Calcutta.
2-12-46	R	DE, Gokul Das, M.A., *Lecturer, Calcuta University;* 6 Shamlal Street, Calcutta.
1-4-46	R	DE, Niren, *Barrister-at-Law,* Bar Library, High Court, Calcutta.
1-3-48	R	DE Sushil Kumar, M.A., B.L., D.Litt. (Lond.) F.R.A.S., *Formerly Professor and Head of the Dept. of Sanskrit, Dacca University,* 19-A, Chaudhuri Lane, Calcutta 4.
5-3-45	R	DEB, Rabindra Krishna, *Solicitor* c/o Messrs. Dutt & Son, 6 Old Post Office Street, Calcutta.
6-5-46	L	DEB, Raja Kshitindra, Rai Mahasai of Bansberia Raj, *Zemindar* 21E Rani Sankari Lane, Kalighat, Calcutta.
5-12-27	L	DECHHEN, H.H. Maharani Kunzang, *Maharani of Sikkim.* Gangtok, Sikkim.

Date of Election.		
1-5-44	R	DEMETRIUS, St. John, C. A., *Proprietor, Messrs.* George *Read & Co.* 1 Avenue House, Chowringhee Square, Calcutta.
3-11-47	R	DEO, Kumar S. G., 21/1A Puddapukur Square, Kidderpore, Calcutta.
5-5-30	N	DEO, Sir Pratap Chandra Bhanj, K.C.I.E., *Maharajah, Ruler of Mayurbhanj State.* P.O. Baripada Mayurbhanj, B.N.R.
3-6-46	R	DESAI, Chhotubhai Lallubhai, *Merchant and Director of the Metal Corporation of India*, Ld, Rampuria Chamber, 10 Clive Row, Calcutta.
7-8-44	N	DEWSBURY, Gelsen Thomas, *Flying Officer, R.A.F.* Messrs. Lloyds Bank Ltd., New Delhi. (Present address not known).
4-2-46	R	DEY, Abani Kumar, B.Sc., Ph.D. D.I.C., *Geologist, Geological Survey of India:* 17 Lake Temple Road, Ballygunge, Calcutta.
4-2-10	L	DHAVLE, Shankar Balaji, B.A., I.C.S. (retd.), *Formerly Judge, Patna High Court.* The Bai Jerbai Wadia Library, Fergusson College, P.O. Deccan Gymkhana, Poona.
2-11-42	L	DHIMAN, Mehar Chand, *Merchant.* Tulsi Niwas, 115 Benares Road, Salkia, Howrah.
5-3-45	R	DICKINSON, Eric Charles, M.A.(HONS. OXON), *offg. Principal, Government College, Lahore.* 12 Kacheri Road, Lahore.
5-1-48	R	DODS, William Kane, *Agent, Hongkong and Shanghai Banking Corporation.* 6 Minto Park, Alipur, Calcutta.
6-5-46	N	DOMANOWICZ, Hersz, M.D., *Medical Officer*, Dwarband P.O., Cachar.
5-3-45	R	DOSSANI, G.A., Khan Bahadur, *Merchant.* 234/5 Lower Circular Road, Calcutta.
2-7-02	L	DOXEY, Frederick, 'Ballygunge', Cooden Drive, Bexhill-on-Sea, Sussex, England.
7-11-32	R	DRIVER, Darab Cursetji, M.A. (CANTAB.), *Barrister-at-Law: Constituted Attorney to Messrs. Tata & Sons, Ld.: Managing Agents for the Tata Iron & Steel Co. Ld.* Flat No. 1, 2-A Lord Sinha Road, Calcutta.
6-6-38	N	DUDHORIA, Naba Kumar Sing, *Zemindar and Banker.* Azimganj, Dt. Murshidabad.
2-4-45	A	DUNDERDALE, David Platt, *Solicitor and Notary Public, Sandersons and Morgans.* 26 Dalhousie Square, Calcutta.

Date of Election.		
2-1-33	N	DUTCH, Robert Austen, O.B.E., B.A. (CANTAB.), I.C.S., Point clear, Jalapahar P.O., West Bengal.
1-7-46	N	DUTT, Debkumar, M.A., B.T., Kavyatirtha, *Professor, Krishnagar College;* Golapati Road, Krishnagar, Dt. Nadia.
4-3-46	R	DUTT, Dhirendra Krishna, *Partner, Messrs. Sreekissen Dutt & Co.,* 128 Middle Road, P.O. Entally, Calcutta.
30-9-35	R	DUTT, Mohendra Nath, L.E., I.S.E. (retd.), *Consulting Engineer,* 12 Kailas Bose Lane, Howrah.
5-12-32	R	DUTT, Nalinaksha, M.A., B.L., Ph.D., D.LITT. (LOND.), *Calcutta University,* 39 Badur Bagan Row, P.O Amherst Street, Calcutta.
1-7-46	R	DUTT, R. C., I.C.S., *Dy. Secretary to the Government of Bengal,* 22 Alipore Road, Calcutta.
1-1-45	R	DUTT, Sudhindra Krishna, M.A. (OXON), *Barrister-at-Law, Asst. Registrar, Calcutta University.* 7 Raja Gurudas Street, Calcutta.
1-7-40	R	DUTT, Sudhir Chunder, Major, M.B., A.I.R.O., *Ophthalmic Surgeon, Mayo Hospital.* 214/2 Lower Circular Road, Calcutta.
4-2-46	R	DUTT, Surendra Nath, *Barrister-at-Law,* 4 Harish Mukherjee Road, P.O. Elgin Road, Calcutta.
5-3-45	L	DUTTA, Dwijendra C., F.R.A.S., F.R.S.A., *Assistant Private Secretary to H.H. The Maharaja Manikya Bahadur of Tipperah.* P.O. Agartala, Tripura State.
7-4-47	R	DUTTA, (Capt.) Narendranath, M.B., Medicalman, 153, Dharamtala Street, Calcutta.
5-4-48	R	DUTTA ROY, R.K., M.Sc., Dr. Ing., F.N.I., Chemist Geological Survey of India, 27 Chowringhee, Calcutta.
1-4-46	R	DUTTA ROY, B. N., *Barrister-at-Law, Advocate,* P. 307 Jatin Das Road, Kalighat, Calcutta.
5-6-44	N	DUTTON, Neville Charles, *Asst. Commissioner of Commercial Taxes.* 14 Janki Mansions, 77B Park Street, Calcutta 16.
2-12-40	R	EDGLEY, The Hon'ble Mr. Justice Norman George Armstrong, M.A. (OXON), *Barrister-at-Law,* I.C.S., *Judge, Calcutta High Court.* 9/1 Middleton Street, Calcutta. (Present address not known).
4-3-46	R	ELKINS, Anthony Joseph, C.B.E., *Senior Partner, Messrs. Gillanders Arbuthnot & Co. Ld.,* Gillander House, Alipore, Calcutta.

Date of Election.		
3-3-47	R	ELLIS, Norman Arthur, Missionary, *Superintendent, Baptist Mission Press*, 41A Lower Circular Road, Calcutta.
7-8-44	L	ELMHIRST, Leonard Knight, M.A. (CANTAB.), B.Sc. (AGRI.). *Cornell, Special Officer, Dept. of Agriculture, Bengal.* England. (Present address not known).
1-5-44	L	ELWIN, Verrier, D.Sc. (OXON), F.N.I., F.R.A.I., *Dy. Director, Anthropological Survey of India*, Serango P.O., Ganjam Dist, Orissa.
2-12-46	N	EMERY, (Rev.) Ralph Vyvyan, M.A. (OXON), B.D. (LOND.), *Missionary. Baptist Mission, Rangamati*, Chittagong Hill Tracts.
6-5-46	N	ENGINEER, Sir Noshirwan, *Advocate-General of India*, 1 Race Course Road. New Delhi.
7-5-45	R	EUTHYMOPULO, George, *Manager, Messrs. Ralli Bros., Ltd.* 16 Hare Street Calcutta.
5-1-31	L	EVANS, Percy, B.A. (CANTAB), F.G.S., *Geologist* c/o The Burmah Oil Co , Digboi, Assam.
2-9-46	L	FARID, Shaikh, M.A., *Persian Teacher, R. H. School*, Loharmandi, Burhanpur.
2-5-38	R	FAROQUI, Nawab Sir K. G. M., KT., of Ratanpur, 10 Rowland Road, Ballygunge, Calcutta.
7-4-47	N	FARUQUE, Ghulam, Khan Bahadur, C.I.E., O.B.E., *Secretary to the Govt. of Pakistan, Ministry of Industries*, Karachi.
2-12-29	R	FAWCUS, Louis Reginald, C.S.I., C.I.E., B.A. (CANTAB.), I.C.S., United Service Club, Calcutta.
3-1-44	N	FELDMAN, Henry Herbert Sidney, *Major, R.A.* c/o Messrs. Grindlay & Co. Ld., New Delhi.
5-3-45	A	FERGIE, Kenneth Rishton, *Assistant, Messrs. George Henderson & Co. Ld.*, 101/1 Clive Street, Calcutta. (Present address not known).
3-8-04	L	*FERMOR, Sir Lewis Leigh, KT., O.B.E., M.INST.M.M., D.Sc., A.R.S.M., F.G.S., F.R.S., F.N.I., F.R.A.S.B., 24 Durdham Park, Bristol 6 England.
1-4-46	R	FERNANDES, Rt. Rev. Mgr. J., *Vicar-General*, Archdiocese of Calcutta, 32 Park Street, Calcutta.
4-1-26	F	FLEMING, Andrew. Tigh-Na-Bruaich, 3 Campbell Road, Parktown West, Johnnesburg, S. Africa.
4-3-40	R	FOSTER, Albert Ridgeley, B.Sc., A.I.C., *Agricultural Chemist and Agricultural Expert.* c/o Imperial Chemical Industries (India) Ltd., 18 Strand Road, Calcutta.

Date of Election.		
2-4-45	R	FOSTER, Reginald, O.B.E., *Chairman, Messrs, Turner, Morrison & Co., Ltd.* 6 Lyons Range, Calcutta.
1-4-46	A	FOUCHET, Christian, *Consul-General for France*, 26 Park Mansions, Park Street, Calcutta 16. (Present address not known).
5-11-13	L	*FOX, Sir Cyrill S., KT., D.Sc., (BIRM.), M.I.M.E., F.G.S., F.N.I., F.R.A.S.B. *Formerly Director, Geological Survey of India* 5 Loudon Court, Moira Street, Calcutta.
2-9-46	R	FUNNELL, C. E., Major, R.E., D.C.E., Bengal Fort William, Calcutta.
2-4-45	R	GAHAN, Patrick Joseph, *Indian Stores Dept.* (retd), U.S. Club, Calcutta.
5-11-28	R	GALSTAUN, John Carapiet, O.B.E., *Merchant and Landholder.* 227/1 Lower Circular Road, Calcutta.
7-5-45	R	GANGULI, Anil Chandra, *Barrister-at-Law.* 47/2 Gariahat Road, Calcutta.
2-12-46	R	GANGULI, Kalyan Kumar, M.A., 2-H Gopal Chandra Bose Lane, Calcutta.
1-7-46	R	GANGULI, Suprokash, *Curator of Baroda State Museum and Picture Gallery (retd.),* 12 P. C. Tagore Street, Calcutta.
1-7-46	R	GANGULY, Bifulla Prokash, 12 P. C. Tagore Street, Calcutta.
2-4-45	R	GANGULY, Gopaldas, *Accounts Officer-in-Charge, Messrs. Dosh Mohammed Estate, Ltd.* 25/D Sahanagar Road, Kalighat, Calcutta.
6-10-09	R	*GANGULY, Ordhendra Coomar, B.A., F.R.A.S.B. 84-B Shambhunath Pundit Street, Elgin Road, Calcutta.
1-5-44	N	GANGULY, Sarat Kumar, *Member of the International Educational Council, Haron, U.S.A., Asst. Teacher. II C.H.E. School.* Abu Saleh Road, Gaya.
2-6-47	R	GARDENER, W. A. B., M.A. (OXON), *Additional Deputy Commissioner of Police,* Security Control; 3-1 Pretoria Street, Calcutta.
1-9-47	R	GARG, Kamala Devi, M.A., *Lecturer, Ashutosh College,* 40C Nimtalla Ghat Street, Calcutta.
6-5-46	R	GEMMEL, George William, *Merchant, Messrs. Balmer Lawrie & Co. Ld.,* 103 Clive Street Calcutta.
2-4-45	N	GEORGE, Frank, I.C.S. c/o Messrs. Lloyds Bank, Darjeeling. (Present address not known).
5-6-44	N	GHANI, Osman, M.A. (HIST. & ENG.), D.P.I., *East Bengal Government.* Chandanpara, Chittagong.

Date of Election.		
2-4-45	R	GHATAK, Ajit Kumar, B.A., *Managing Director, Calcutta Union Bank Ltd.* 71 Clive Street, Calcutta. (Present address not known).
5-2-40	N	GHATAK, Indu Bhushan, B.A. (Cal.), C.T.E. (Dac.), M.ED. (Amb.), DIP. LIB. (B.L.A.). *Headmaster, Paligunj High School*, Paligunj, Patna.
6-2-33	L	GHATAK, Jyotish Chandra, M.A. (TRIPLE), SAHITYA SARASWATI, JYOTISH-SAGARA, *Professor, Calcutta University*. 4 Boloram Bose Ghat Road, Bhawanipore, Calcutta.
1-4-46	R	GHATAK, Narendra Nath. M.B.E., *Barrister-at-Law, Master and Official Referee, Original Side, High Court*; 81 Shambhu Nath Pandit Street, Calcutta.
4-2-46	R	GHOSE, Bidyut Kumar, *Barrister-at-Law*, 27/1 Harish Mukherjee Road, Bhawanipore, Calcutta.
5-8-43	R	GHOSE, Debes Chandra, *Merchant and Tea Estate Agent*. P.O. Box. No. 632; 'Mission Court', P. 12 Mission Row Extension, Calcutta.
1-11-43	R	GHOSE, Gobinda Prosad, M.A., B.L., *Landholder*. 43 Rashbehari Avenue, Calcutta.
4-6-45	R	GHOSE, Kshetrapal Das, M.A. (OXON), *Liaison Officer, Home (Defence) Department*. 30 Mahanirvan Road, Calcutta.
5-3-45	R	GHOSE, Manindra Nath, *Barrister-at-Law and Professor*. 11 Dover Lane, P.O. Rashbehari Avenue, Calcutta.
1-6-42	R	GHOSE, Rabindra Chandra *Barrister-at-Law*. 10 Debendra Ghose Road, Bhawanipore, Calcutta.
3-2-47	R	GHOSE, S. N., *Merchant*. 10 Hastings Street, Calcutta.
3-12-24	R	GHOSE, Sushil Chandra, B.A., *Deputy Magistrate*, 1 Sikdarbagan Street, Calcutta.
6-3-44	R	GHOSH, Susil Kumar, M.A., B.L., *Solicitor, Temple Chambers*. 6 Old Post Office Street, Calcutta.
4-2-46	N	GHOSH, A. K., I.C.S., *Government House*, Port Blair, Andaman Islands.
5-2-45	R	GHOSH, Baidya Nath, *Director, Educational Film Corporation*. Windsor House, Mission Row Extn., Calcutta.
5-8-46	R	GHOSH, Bata Krishna, D.Phil. (Munich), D.Litt. (Paris), *Lecturer, Calcutta University*, 70 Upper Circular Road, Calcutta.
4-12-45	R	GHOSH, Deva Prasad, M.A., *Curator, Asutosh Museum of Indian Art, and Lecturer, Calcutta University*. 29/1, Ballygunge Place, Calcutta.
3-12-45	R	GHOSH, Guruprasad, M.Sc., B.L., Vyakaranatirtha, *Advocate High Court*, 2 Madan Mohan Dutt Lane, Nimtollah, Calcutta.

Date of Election.		
5-3-45	R	GHOSH, Haricharan, M.A., B.L., P.R.S., F.R.E.S. (LONDON), *Vice-Principal, Bangabasi College and Lecturer, Calcutta University* 45/1 Mudiali Road, Kalighat, Calcutta.
4-9-39	N	*GHOSH, Sir J. C., KT., D.Sc., F.N.I., F.R.A.S.B., *Director-General, Industries and Supplies, Govt. of India*, New Delhi.
2-4-24	R	GHOSH, K., D.T.M., D.P.H. (CANTAB), L.M.S., *Medical Practitioner* 45 Creek Row, Calcutta.
4-2-46	R	GHOSH, Kamal Kumar, Eden Hindu Hostel, Presidency College. Calcutta.
4-2-46	R	GHOSH, Nibaran Chandra, Rai Bahadur, O.B.E., M.Inst.T. (London), "Niranjana", 44 Gariahata Road (South), Dhakuria, Calcutta 31.
1-6-42	R	GHOSH, Prakrity Kumar, M.Sc., Ph.D., D.Sc., D.I.C., F.N.I., *Geologist. Geological Survey of India.* 27 Chowringhee, Calcutta.
2-12-46	R	GHOSH, Protap Kumar, M.A., B.L., *Professor of Economics, City College*, 2 Shampukur Lane, Calcutta 4.
5-3-45	R	GHOSH, S.K., M.A., B.L., *Solicitor.* c/o Messrs. B. N. Basu & Co. Temple Chambers, 6 Old Post Office Street, Calcutta.
1-3-48	R	GHOSH, Subodh Kumar, M.Sc., (Cal.), Joint Financial Adviser Department of Civil Supplies, 5-P-14Q Middle Road Entally, Calcutta.
4-11-46	R	GHOSH. Sudhir Kumar. *Businessman*, 67 Rash Bihari Avenue, Calcutta.
2-12-46	R	GHOSH, CHAUDHURI. H.S., I.P., Dy. Inspector General of Police, Central Range, Anderson House Alipore, Calcutta.
7-5-28	R	*GHOSHAL, Upendra Nath, M.A., Ph.D., F.R.A.S.R., *Formerly Professor of History, Presidency College.* 35 Badur Bagan Road, Calcutta.
1-2-26	R	GHUZNAVI, Sir Abdul Halim, K2., M.L.A. *Zemindar.* 18 Canal Street, Entally, Calcutta.
6-8-28	N	GHUZNAVI, Iskander S. K., *Zemindar.* 21 Syed Amir Ali Avenue Circus P.O. Calcutta (*and*) Dilduar, Mymensingh.
4-12-44	F	GIFFORD, Frederick Richard, O.B.E., LT.-COL., I.A., *Formerly Adviser in the Languages and Secretary, Board of ExaminersH* c/o 214, Loop Street, Pietermaritzburg, Natal, S. Africa.
7-1-46	R	GINWALA, Lady F., 1 Lower Rawdon Street, Calcutta.

Date of Election.		
7-1-46	R	GINWALA, Peston Padamji, *Barrister-at-Law*, 1 Lower Rawdon Street, Calcutta.
3-6-46	N	GODDARD, Leslie James, M.A., (Cantab), *Rector*, St. Paul's School. P.O. Jalapahar, Darjeeling.
5-3-45	R	GOENKA, Sir Badridas, KT., C.I.E. 145 Muktaram Babu Street, Calcutta.
1-5-44	N	GOETZ, Hermann, Ph.D., *Art Historian, Curator, Baroda State Museum and Picture Gallery, Baroda.*
5-8-45	N	GOKHALE, N. G., B.Sc., (LONDON). *Toklai Experimental Station*, P.O. Cinnamara, Assam.
5-8-43	R	GOMES, Polycarp Joseph, *Secretary, European Group, Calcutta Corporation.* 2/A Haralal Das Street, Calcutta.
5-2-45	R	GOODWYN, Harold Peter, B.A., (CANTAB), I.C.S... *Deputy Secretary to the Governor of Bengal.* 5 Wellesly Place, Calcutta.
3-6-46	R	GOSWAMI, Shiw Prasad, Kaviraj, *Bhusan*, 5-A Kalakar Street, Calcutta.
7-9-10	F	"GRAVELY, Frederic Henry, D.Sc., F.N.I., F.R.A.S.B. 52 London Road, Reading, England.
7-12-42	N	GRIFFITHS, G.B., MAJOR, *Frontier Force Rifles.* c/o Messrs. Grindlay & Co., Ld., Bombay.
6-5-40	R	GRIFFITHS, Rev. Walter Geraldson, B.Sc., (CALIF.), B.D. (DREW), M.A., (NEW YORK), Ph.D. (DREW), Missionary. 13 Wellington Square, Calcutta.
4-2-45	R	*GUHA, B. S., M.A., Pt.D., (HARVARD), F.N.I., F.R.A.S.B., *Director Anthropological Survey o, India.* Chowringhee, Calcutta.
2-12-46	N	GUHA, Devaprasad, M.A., 64, Pagan Road, Rangoon University, Rangoon, Burma.
2-6-46	R	GUHA, Dinesh Chandra, M.A. (Double), Kavya-Nyaya-Tarka (Double), Vedantatirtha, *Professor*, P43/44 Manoharpur Road, Calcutta 29.
2-12-46	R	GUHA, Praphulla Kumar, *Offg. Principal*, Ripon College and Post-Graduate Lecturer in English, Calcutta University; 139-B Rashbehari Avenue, Calcutta.
7-4-47	R	GUPTA, Abani Bandhu, *Chartered Accountant*, 18/1, Dover Lane, Ballygunge, Calcutta 29.
5-7-48	N	GUPTA, Miss Bani, M.A., B.T., Teacher Lady Irwin School. Canning Road, New Delhi.
2-6-47	N	GUPTA, Birjesh, Capt., I.A., M.I.L.O. (Assam), C/o Shillong Indep. Sub-Area, Shillong.

Date of Election.		
5-7-43	N	GUPTA, Harish Chandra, M.Sc., (ALLAHABAD), I.C.S., (Present address not known.)
3-2-47	R	GUPTA, Himansu Kumar. B.A., *Inspector of Police,* Calcutta, Bhowanipur P.S.
4-3-46	R	GUPTA, Jogesh Chandra, *Barrister-at-Law,* 23 Circus Avenue, Calcutta.
2-12-46	R	GUPTA, Mukul, M.A., *Controller of Production, Dept. of Industries and Supplies, Govt. of India,* 50/1 Hindusthan Road, Calcutta.
1-4-46	R	GUPTA, N. N., M.A., (Oxon), *Barrister-at-Law,* 25 Park Lane, Calcutta,
7-7-47	R	GUPTA, Omkar Shanker. B.A., *Director Sukhani Farm and Industries, Ld.,* Azad Hind Land Development Co., Ld., etc., 22 Muktaram Babu Street, Calcutta 7.
2-12-46	R	GUPTA, Probodh Ranjan, M.A., F.C.I.I. (Lond.), *Life Manager Ruby General Insurance Co., Ld.;* 24 Lansdowne Terrace, Rashbehari Avenue P.O. Calcutta.
2-11-42	R	GUPTA, Pratul Chandra, M.A., Ph.D., *Lecturer, Calcutta University.* 125 Rashbehari Avenue, Calcutta.
1-4-46	R	GUPTA, S. K., M.A., (OXON). D.Litt. (OXON), M.A.. B.L., Ph.D., *Barrister-at-Law,* 11/1 Manoharpukur Road, Calcutta.
2-8-43	N	GURUNATH, Marti Mannariah, M.A., *Salt Merchant,* 93 Great Cotton Road, Tuticorin, S. India.
5-8-15	A	GURNER, Cyril Walter, B.A. (Oxon.), C.S.I., I.C.S., *Formerly Chairman Improvement Trust,* Calcutta. (Present address not known).
1-2-43	R	HABIBULLAH, A. B. M., M.A., Ph.D., (LONDON), Dip Lib. (LONDON). *Lecturer, Department of History and Islamic History and Culture, Calcutta University.* 4 Tarak Dutta Road, Ballygunge, Calcutta.
5-6-44	N	HALDAR, Balaram, M.A., B.Sc., B.L., *Rector M. E. School.* English Bazar, Puratuli, Malda.
5-2-34	R	HALDAR, Bharati Vikas, M.A., B.L., *Advocate, High Court.* 47 Haldarpara Road, Kalighat, Calcutta.
3-5-48	R	HALDAR, Mayataru, M.A.. B.L., Rai Bahadur, *Dist. Session Judge* (Retd.), 78, Ballygunge Place, Calcutta.
5-9-37	N	HALIM, Dr. Abdul, M.A., *Lecturer in History, Muslim University.* Fida Manzil, Aligarh.
1-11-43	R	HALWASIYA, Purushotham Dass, *Merchant and Zemindar.* 47 Muktaram Babu Street, Calcutta.

Date of
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1-4-46.	R	HOOD, Sir Hugh, K.C.I.E., C.S.I., *Adviser to the Co-operative Department, Government of Bengal,* 6 Wellesley Place, Calcutta.
2-12-46	R	HAQ, M. M., Merchant and Landlord; *Hony. Magistrate, First Class and Councillor, Calcutta Corporation;* 11 Balu Hakak Lane, Park Circus, Calcutta 17.
1-2-26	F	HARRIS, H. G. Gunnespory Avenue, Ealing, London.
1-9-47	R	HARRISON, Frederick Maddison William, c/o Boots Pure Drug Co. (India), Ld., Mercantile Building, 10 Lall Bazar, Calcutta.
4 -3-40	N	HARSHE, Ramkrishna Ganesh, B.A., (TILAK), D.LIT. (PARIS), *Register, Deccan College Post-Graduate and Research Institute.* Poona.
7-6-43	N	HASAN SHARIB, Zahur-ul. M.A. Ph.D., LL.B., *Advocate, High Court.* 'Gul Afshan', Moradabad, U.P.
2-11-42	R	HAWES, Robert Martin. 18 Ballygunge Circular Road, Calcutta.
1-4-46	R	HAYWARD, Eric, F.R.I.C., Merchant and Distiller, Konnagar, Bengal.
6-8-28	N	*HERON, A. M., D.Sc., (EDIN.), F.G.S., F.R.G.S., F.N.I., F.R·S.B., *Geological Survey of Pakistan* Quetta, Pakistan.
6-8-45	R	HIMATSINGKA, Madanlal, *Merchant and Manufacturer.* 25 Burtolla Street, Calcutta.
4-11-35	R	HIRTZEL, Michael Arthur Frederick, O.B.E., M.A., (Oxon), *Mercantile Assistant, Macneill & Co.* 2 Fairlie Place, Calcutta.
1-4-25	L	HOBBS, Henry, Major, V.D. 21 Old Court House Street, Calcutta.
3-6-46	R	HOLLAND, G. W., Lt.Col., c/o United Service Club, Calcutta.
5-3-45	R	HOLMES, Charles Herbert. Bengal Club, Calcutta.
3-7-44	N	HO'LOWAY, John E., *Technical Sergent, U. S. Army.* New Delhi.
4-6-45	N	HOPE, Charles Adrian, LIEUT., R.A., *Probationer, R.I.B.A.,* 12 Ind. L.A.A. Regiment, 12 A.B.P.O. (23 Ann Street, Edinburgh, 4).
2-4-45	F	HOPKINSON, Arthur John, C.I.E., I.C.S., Ballawray, Aurbleside, West Morland England. *The Presidency, Gangtok, Sikkim.*
2-11-21		*HORA, Sunder Lal, Rai Bahadur, D.Sc., F.Z. S., F.R.S·E., F.N.I., F.R.A.S.B. *Director, Zoological, Survey of India, Kaiser Castle,* Banaras.
5-2-45	R	HOSAIN, Musharruff, *Nawab, Zemindar, Khan Bahadur.* 6 Rawdon Street, Calcutta 16.

Date of Election.		
7-6-43	N	HOSAIN, Syed Mozaffar, *Office of C.M.E.S.*, East Pakistan, P.O. Ramna, Dacca.
5-7-48	N	HOULTON, Sir John, C.S.I., C.I.E., B.A. (Cantab), I.C.S. (on leave). Doranda, Ranchi, B. N. Rly.
7-3-32	N	HUGHES, Arthur, B.A., (MANCHESTER), I.C.S., *Director of Personnel, The Tata Iron and Steel Company Ltd.*, Jamshedpur.
4-11-46	R	HUGHES, Herbert Gray, *Managing Director, Messrs. Armco (India), Ld.* 21 Esplanade Mansions, Calcutta.
4-11-46	F	HUPPERTS, Albert, *Minister des Affaires Etrangerese* 8 Rue de la Loi, Brussels, Belgium.
1-5-44	R	HUSAIN, Mahdi, M.A., Ph.D., D.Litt., *Lecturer, Calcutta University.* 2 Store Road, Calcutta 19.
6-8-34	N	HUSAIN, Syed Ata, M.A. (CAL.), C.E. (ROORKEE), *Retired Superintending Engineer, Hyderabad State.* Mohalla Lingumpally, Hyderabad, Deccan.
5-6-44	A	HUTCHINSON, Edward Walter, M.A. (CANTAB). c/o Union Bank of Australia, Hobart, Tasmania, Australia.
5-11-45	L	HUTCHINSON, William, *Chartered Accountant, Partner, Ford, Rhodes Thornton & Co.* 24 Esplanade Mansions, Calcutta.
5-4-48	R	IMAMUDDIN, Syed Muhammad, M.A., Lecturer, Islamia College. 22 Daftar Bagh, Belgachia, Calcutta.
1-2-11	L	INSCH, James. 18 Beechwood Avenue, Boscombe, Hants, England.
5-6-44	A	IRWIN, John Conran, Capt. Persia
2-12-40	A	ISCH-WALL, Claude, LICENCIE-ES-SCIENCE (MATHEMATIQUES ET PHYSIQUES), *Lieutenant, British Army,* Grand Hotel, Calcutta.
5-11-42	R	ISHAQUE, Mohammed, M.A., B.Sc., Ph.D. (LOND.), *Lecturer, Calcutta University.* 159/B Dhurrumtollah Street, Calcutta.
2-8-48	R	ISMAIL, Mohammad, *Professor of Arabic & Persian* (offg.), Presidency College. 5 Phulbagan Road, Calcutta 14.
2-5-38	R	JACOB, J. R., *Director, Messrs. B. N. Elias & Co., Merchant and Landholder. Norton Buildings,* Old Court House Corner, Calcutta.
1-9-47	R	JACOB, K., D.Sc., *Assistant Geologist, Geological Survey of India,* 27 Chowringhee, Calcutta.
1-7-46	R	JAFFER, G. R., *Merchantile Assistant, Messrs. Adamjee Jute Mills, Ld.* Dalhousie Square, Calcutta.
6-6-27	L	JAIN, Baldeodas, *Merchant and Banker.* 21 Armenian Street, Calcutta.

Date of Election		
2-2-21	R	JAIN, Chhote Lal, M.R.A.S. 244 Chittaranjan Avenue, Calcutta.
4-2-46	R	JAIN, Kashinath, M.A., LL.B., *Businessman.* 34/12 Ballygunj Circular Road, Calcutta-19.
3-6-46	N	JAIPURIA, Sita Ram, Merchant, Swadeshi House, Civil Lines. Cawnpore.
4-2-46	R	JAJODIA, Champalal, *Businessman.* 209 Chittaranjan Avenue, Calcutta.
2-12-40	R	JALAN, Mohanlal, *Landlord.* c/o Seth Soorajmall Jalan Smriti Bhawan. 186 Chittaranjan Avenue, Calcutta.
7-5-45	R	JALAN, Nand Kishore, *Merchant.* 26 Amherst Street, Calcutta.
2-4-45	R	JALAN, Iswar Deo, M.A., B.L., *Attorney-at-Law*, M.L.A. (BENGAL), *Solicitor.* c/o Messrs. Khaitan & Co. 1 Old Post Office Street, Calcutta.
2-4-45	R	JALAN, Radhakrishna, Rai Bahadur, *Businessman.* Quila House, Patna City.
1-4-46	R	JALAN, Shew Lal, *Merchant.* 124 Harrison Road, Calcutta.
7-8-44	N	JAN, Agha Muhammad, F.T.S., *Member of G.W.C.S. League, (London).* Gulzarbagh, Patna.
2-9-46	F	JANES, Alfred Herbert, B.Sc. (LONDON), Penhurst, Kent, England.
1-4-46	R	JAQUB, Sheikh Muhammad, *Preventive Officer, First Class, Calcutta Customs. No.* 1 Lower Range, Park Circus, Calcutta.
1-4-46	R	JARVIE, James Kennedy, 18/4 Ballygunge Circular Road, Calcutta.
1-11-38	R	JATIA, Kanai Lall Messrs Onkarmull Kanailall & Co. 11 Clive Street, Calcutta.
3-12-45	N	JAYASWAL, B.P., M.Sc. (Allahabad), *General Manager*, Ranchi Distillery, Ranchi.
4-2-29	A	JENKINS, Walter Allen, C.I.E., D.Sc., (SHEFFIELD), I.ES., *Formerly Director of Public Instruction, Bengal.* United Service Club, Calcutta.
1-12-47	R	JENNINGS, Bruce Randel, Dental Surgeon. 39 Chowringhee Road, Calcutta.
2-4-45	R	JHAJHARIA, N. K., *Businessman.* 160 Cross Street, Calcutta.
4-6-45	N	JOB, Thitapilli Joseph, D.Sc., *Chief Research Officer (Inland), Central Inland Fisheries Research Station.* 2B Outram Street, Calcutta 16.

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Date of Election		
3-5-48	R	JOURNOT, Claude, *Jt. Cultural Adviser for France in India*, 24 Park Mansions, Park Street, Calcutta 16.
2-12-46	N	KAHLON, Sirdar Gyan Singh, I.C.S., Chief Secretary, East Punjab Government, Simla.
1-11-11	L	KAMALUDDIN, Ahmad, Shamsu'ul-'Ulama, M.A., I.E.S (retd.). 3 Nawab Abdur Rahman Street, Calcutta.
3-3-47	R	KANTISAGAR, Muni, Jain-Sadhu, Jain Bhawan Pandal, Kalakar Street, Near Satyanarayan Park, Burrabazar, Calcutta.
3-6-46	R	KARKOON, Annada Charan, Offg. *Principal, University Law College.* 24/1 Beadon Street, Calcutta.
1-9-47	R	KARNAWAT, Sohanlall, *Banker, Landlord and Merchant.* 42 Vivekananda Road, Calcutta.
1-1-46	R	KELLAS, Rev. J., *Principal, Scottish Church College*, 3 & 4 Cornwallis Street, Calcutta.
3-7-44	N	KEJRIWAL, Rameshwar, B.A., *Merchant.* P.O. Jasidih, S.P., Bihar.
4-6-45	R	KHAITAN, Bhagawati Prosad, *Attorney-at-Law, and Notary Public.* c/o Messrs. Khaitan & Co., 1-B Old Post Office Street, Calcutta.
5-3-45	R	KHAITAN, Gajanand. 43 Zakaria Street, Burrabazar, Calcutta.
4-9-44	R	KHAITAN, Mrs. K. P. 6 South End Park, P.O. Rashbehari Avenue, Calcutta.
3-4-43	R	KHAITAN, Kali Prasad, M.A., B.L., *Barrister-at-Law.* 6 South End Park, Rashbehari Avenue, Calcutta.
3-6-46	R	KHAITAN, Matadin, *Stock and Share Broker.* 9 Jagmohan Mallik Lane, Calcutta.
3-6-46	N	KHAITAN, Tulsi Prasad, *Secretary,* Messrs. Amrit Banaspati, Ld. Ghaziabad.
2-4-45	R	KHAN, Aurelius David, B.A., (CANTAB), I.C.S., *Additional Deputy Secretary, Home Department, Govt. of Bengal.* 20 Loudon Street, Calcutta.
6-3-01	L	*KHAN, H. M. Habibur Rahman, Nawab Sadr Yar Jung Bahadur, D.T.H. (ALIG.), F.R.A.S.B., *Rais.* Habibganj, District Aligarh.
1-12-20	N	KHAN, Major Nawab Sir Mohammed Akbar, K.B.E., C.I.E., LT.-COL., I.A., *Khan of Hoti.* Hoti N.W.F.P.
1-4-46	R	KHAN, Sahibzada Abdul Wajid, M.A. (Alig.), Ph.D. (Economics), London, 13-A Palit Street, Ballygunge, Calcutta.
6-3-44	R	KHAN, Mohibbul-Hasan, *Lecturer in History, Calcutta University.* Flat No. 4, 5/C Sandel Street, Calcutta.

Date of Election		
1-4-46	N	KHANNA, Ved Paul, 'Vimal', M.A., *Professor of Sanskrit, M.R. College*. Fazilka, Punjab.
3-7-44	R	KHEMKA, Madanlal, *President, Marwari Chamber of Commerce, Councillor, Calcutta Corporation*. 63 College Street, Calcutta.
6-5-46	R	KHEMKA, Gopi Krishna, B.A., B.L., *Merchant, Chairman of Associated Industrial Development Co., Ld.*, Khemka Building, P. 58 Chittaranjan Avenue, Calcutta.
2-8-26	R	KHETTRY, Benimadho, *Proprietor, Messrs. Gouri Shanker Khettry, Landholders, Bankers and Merchants*. 15 Paggiyapatti, Barabazar, Calcutta.
7-12-42	N	KHOSLA, A. N., B.A., *Writer of Books*. Post Box No. 239, Lahore. (Present address not known).
3-3-47	N	KHUDA, Muhammad Qudrat-i, *Director of Public Instruction, Government of East Bengal*. Chittagong.
1-12-47	R	KOLB-BERNARD, Rene, *Consul-General for France*. 26 Park Mansions, Park Street, Calcutta 16.
5-8-46	R	KOTWAL, Lalita (Mrs. I. D.), *Free-cance journalist*. 3-3 Palace Court, Kyd Street, Calcutta.
1-3-26	R	KRAMRISCH, Stella (Mrs.) Ph.D., *Lecturer in Ancient Indian History (Fine Arts), Calcutta University*. 5, Mordecai Lane, off Baghjala Road, Dum Dum P.O., 24-Perganas.
4-3-46	R	KITCHING, Hugh David, *Solicitor, Notary Public*. Messrs. Orr Dignam & Co., 32 Dalhousie Square; 4 Rainey Park, Ballygunge, Calcutta.
6-12-48	R	KOUSIK, Sharad Chandra, M.A., *Author*, c/o Jagannath Bros., 2 Ghusuri Road, Salkia (Howrah).
6-12-48	N	KUNDU, Balai Chand, M.A., Ph.D., F.N.I., *Director, Jute Agricultural Research Institute*, Hooghly.
3-3-47	N	KURUP, Pokiarath Chencheri Krishna, L.C.P.S. (Bombay), *Medical Practitioner*. Nadapuram P.O., North Malabar (M.P.).
5-3-45	R	LACAMP, Adrian, *Survey of India*. U.S. Club, Calcutta.
7-5-45	N	LACOMBE, Olivier, *Professor 'agrege' of Philisophy*, D.LITT. (PARIS), *French Cultural Adviser for India*. French Embassy, New Delhi.
4-2-35	R	LAL, Ram Bihari, M.B.B.S., D.P.H., D.T.M. & H., D.B., F.N.I., *Professor of Vital Statistics and Epidemiology, All-India-Institute of Hygiene and Public Health*. 110 Chittaranjan Avenue, Calcutta.
3-11-45	R	LAHIRI, S. K. F.R.G.S. (LONDON). F.R.S.G.S. (Edin), F.R.E.S. (Lond.), 65/3 Harrison Road, Calcutta.

Date of Election		
1-11-48	R	LAHIRI, Rai Bahadur Sachchidananda, Retd. Dy. Accountant General Bengal. 58/A/1 Lake View Road, 2nd Floor Calcutta 29.
5-3-45	R	LAHOTY, Bihari Lall, c/o Messrs. Krishna Behari Tea Co. Ld., 161/1 Harrison Road, Calcutta.
7-6-48	R	LAL, Avadh Bihari, Sahityacharya, M.A., B.L., Preacher, Arya Samaj. 214 Chittaranjan Avenue, Calcutta.
5-11-45	R	LALL, Madan Mohan, C/o. Mr. Nand Lall, *Barrister-at-Law*, Montgomery Lahore, (Present address not known).
2-4-45	F	LAMBERT, Eric Thomas Drummond, O.B.E., F.R.G.S., F.R.A.I., c/o Lloyds Bank Ld., 6 Pall Mall London S. W.
2-4-45	R	LATH, Babulal, *Proprietor, Lath Brothers.* 90, Muktaram Babu Street, Calcutta.
4-3-46	R	LATIFI, Kamran Komair Alma, M.A. (CANTAB), *Mercantile Assistant.* Messrs. Andrew Yule & Co. Ld., 8 Clive Row, Calcutta.
5-2-40	R	LAW, Ananta Churn, *Attorney-at-Law.* 37 Badur Bagan Row, P.O. Amherst Street, Calcutta.
5-8-14	L	*LAW, Bimala Churn, M.A., B.L., Ph.D., D.Litt., F.R.G.S., F.R.A.S.B., F.R.A.S. (Hony.). 43 Kailas Bose Street, Calcutta.
1-2-11	R	*LAW, Narendra Nath, M.A., B.L., Ph.D., F.R.A.S.B. 96 Amherst Street, Calcutta.
5-3-45	L	LAW, Nirmal Chandra, M.Sc., *Honorory Presidency Magistrate.* 50 Kailas Bose Street, Calcutta.
4-2-35	R	LAW, Parbutty Churn. 223 Cornwallis Street, Calcutta.
1-7-14	R	LAW, Satya Churn, M.A., B.L., Ph.D., F.N.I., F.Z.S., M.B.O.U., 50 Kailas Bose Street, Calcutta.
4-3-46	R	LAW, Uma Charan, *Barrister-at-Law*, 69/2 Nimtollah Ghat Street, Calcutta.
4-9-44	R	LEGGETT, Trevor Pryce, B.L., (LONDON). 6 Hungerford Street, Calcutta. (Present address not known).
6-5-46	N	LEICESTER, Mervyn Terence, 4 Kalmia Street, *Ellersler*, S.E. 6 Auckland, New Zealand.
7-6-26	R	LEMMON, Richard Dennis, *Merchant.* c/o Messrs. Martin & Harris, Ld. Mercantile Buildings, Lall Bazar, Calcutta.
5-3-45	R	LETHBRIDGE, Montagu Henry Bowaler, I.C.S., Asst. Legal Adviser for the High Commissioner for the U.K., c/o U. S. Club. 29 Chowringhee, Calcutta.

Date of Election		
6-3-39	N	LEWIS, Mrs. Sally, M.A. c/o Capt. J. M. Lewis, I.M.S., No. 8, I. B.G.H. (I.T.), c/o 23 A.B.P.O., India.
2-9-46	R	LEWIS, Walter Alan Scott, O.B.E., I.C.S., U.S. Club, Calcutta.
5-3-45	R	LIDDLE, George William Umpleby, *Assistant Tea Comtroller, Messrs. J. Thomas & Co.* 1 Council House Street, Calcutta.
3-3-47	R	LINDER, Mrs. Barbara (*wife of Cortland D. Linder, Managing Director, Clegg Cruickshank & Co.*); 9 Clive Street, Calcutta.
2-4-45	R	LLEWELLYN, John Lister, O.B.E., M.A., (CANTAB), I.C.S. 1/A, Mayfair Ballygunge, Calcutta.
1-4-46	R	LOCKHART, Allan Robert Elliott, C.I.E., *Merchant, Partner, Gladstone Wyllie Co.*, 4 Fairlie Place, Calcutta.
5-11-45	R	LODHA, Kalyan Mal, M.A., *Lecturer in Hindi, Calcutta University.* 42 Vivekananda Road, Calcutta.
1-6-31	L	LORT-WILLIAMS, Sir John, Kt., K.C., *Barrister-at-Law, formerly offg. Chief Justice, High Court, Calcutta.* 2/1 Lansdowne Road, Calcutta.
5-3-45	R	LOYALKA, Ghanshyamdas. 9 Royal Exchange Place, Calcutta.
2-4-45	R	MACGREGOR, Robert A., C.I.E., M.I.MECH.E., *Consulting Metallurgist and Metallurgical Engineer, Chief Metallurgist to the Govt. of India (Retd).* 45/A Galstaun Mansions, Calcutta.
3-6-46	R	MACKAY-TALLACK, H., Lt.-Col., Messrs. Macneill & Co., 2 Fairlie Place, Calcutta.
7-4-47	R	MACKENZIE, (Mrs.) Phyllis E., Artist-Painter, Office of U.K. Trade Commissioner Rutland Gate, Nungumbaukum, Madras 6.
2-4-45	L	MACKIE, James, LT.-COL., *Indian Service of Engineers.* U. S. Club. Calcutta.
11-1-93	L	*MACLAGAN, Sir Edward Douglas, K.C.S.I., K.C.I.E., F.R.A.S.B., *formerly Governor of the Punjab.* 39 Egerton Terrace, London, S. W. 3.
7-6-16	L	MAHAJAN, Surya Prasad, Murarpur, Gaya, E.I.R.
3-3-20	R	MAHALANOBIS, P. C., M.A., B.Sc., F.N.I., F.S.S., I.E.S. F.R.S. 210 Cornwallis Street, Calcutta.
4-6-45	N	MAHAPATRA, Kedarnath, B.A., (HONS.), DIP-IN-ED., *Archaeologist, Press Publicity Officer, Kalahandi State.* P.O. Bhowanipatna, E. S. Agency.
2-5-38	R	MAHATAB, Maharaj Kumar A. C. Aspab Villa, 14/1 Burdwan Road, Alipore, Calcutta.

Date of Election		
3-2-30	R	MAIITAB, Sir Uday Chand. K.C.I.E., *Maharajadhiraja Bahadur of Burdwan*. 2 Judges Court Road, Alipore, Calcutta ,
4-2-46	R	MAHUDAVALA, Jehangir Jamshedji, Landlord and Businessman. Calcutta Club, 241 Lower Circular Road, Calcutta.
3-6-46	R	MAITLAND, Frank, *Merchant, Director, Andrew Yule & Co., Ltd.* 8 Clive Row, Calcutta.
2-4-45	R	MAITRA, B. K., *Proprietor, Begonia West Colliery.* 50 Ezra Street, Calcutta..
4-11-46	R	MAJID, Abdul, M.A., B.L., *Translator to the Government of Bengal*, Writers Buildings, Calcutta.
2-12-46	R	MAJUMDER, Asoke Kumar, M.A., *Director, Hindusthan Drug House and Director, Ramkrishna Combine, Ltd.*, 4 Bepin Pal Road, Calcutta.
4-11-46	R	MAJUMDAR, B. C., B.Sc., *Managing Director, National Chamois Works, Ltd.* 84/3, Beltola Road, Bhowanipur, Calcutta.
6-12-48	N	MAJUMDAR, Chunilal, M.A., Principal Shri Ganesh Intermediate College Kasganj, Dist Etah U.P.
1-12-41	N	MAJUMDAR, Dhirendra Nath, M.A., Ph.D., (CANTAB.), F.R.A.I. F.N.I. *Reader in Anthropology*, Anthropology Laboratory, Lucknow University, Lucknow.
3-12-46	R	MAJUMDAR. Girija Prasanna, M.Sc., Ph.D., F.A.Sc., F.N.I., *Professor, Presidency College and Lecturer, Calcutta University;* 19 Ekdalia Place, Ballygunge, Calcutta.
2-12-46	R	MAJUMDAR, Haridas, M.L.C. (Bengal), *Advocate,* High Court. 166 Lansdowne Road, Calcutta 29.
4-2-46	R	MAJUMDAR, Hem Chandra, *Barrister-at-Law,* 23 Ray Street, Elgin Road, Calcutta.
5-2-45	R	MAJUMDAR, J. N., *Barrister-at-Law, Standing Counsel,* High Court 63/1/2 Lansdowne Road, Calcutta.
3-7-39	R	MAJUMDAR, Jatindra Mohan, M.A., *Deputy Dock Superintendent Calcutta Port Commissioners.* 1 Chowringhee Terrace, Calcutta.
2-2-16	N	MAJUMDAR, Narendra Kumar, M.A., Suri, Birbhum.
3-2-47	R	MAJUMDAR, Prabhas Chandra, M.A., Sutra-Visarada, *Professor of Pali, Maharaja Manindra Chandra College, Calcutta;* 45 Amherst Row, Calcutta 9.
4-6-13	R	MAJUMDAR, Ramesh Chandra, M.A., Ph.D., F.R.A.S.B., *Formerly Vice-Chancellor, Dacca University.* 4 Bepin Pal Road, Kalighat, Calcutta.

Date of Election		
6-5-46	R	MAJUMDAR, Sailendra Mohan, *Barrister-at-Law*. 123A Rashbehari Avenue. Ballygunge, Calcutta.
5-2-45	N	MALL, Thakur Jamuna, *Zemindar*. Village Lakhnapur, P.O. Rampur, Dt. Azamgarh.
4-11-29	N	MALLYA, Bantwal Ganapathy, F.R.C.S., M.D., M.R.-C.S., LT.-COL., I.M.S., 2 Minto Park, Calcutta 27.
2-4-45	R	MANASSEH, Aslam, *Director, Messrs. Moran & Co., Ltd.* C/5 Clive Buildings (Post Box No. 72), Calcutta.
4-2-46	R	MANDAL, Sudhir Kumar, M.A., B.L., *Solicitor*, 12 Old Post Office Street, Calcutta.
5-6-01	E	MANN, Harold Hart, D.Sc., M.Sc., F.I.C., F.L.S. Woburn Experimental Station. Aspley Guise, Bedfordshire, England.
5-2-45	R	MARTIN, Martyrose, Businessman. 34 Free School Street, Calcutta.
2-4-45	A	MARTIN, Olavs Macleod, C.I.E., I.C.S., *Commissioner, Post-War Reconstruction, Bengal*. U. S. Club, Cal.
4-9-44	N	MARWOOD, Sidney Lionel, C.I.E., I.C.S., *Adviser to the Governor of Orissa*. Cuttack.
5-11-45	R	MATTHAI, Duleep C., *Covenanted Assistant, Messrs, McLeod & Co. Ltd.* 28 Dalhousie Square West Cal.
1-4-46	R	MATTHEWS, Bernard, F.R.I.B.A., F.S.I., M.T.P.I., Architect. Wellesley House, Wellesley Place, Cal.
4-3-40	N	MAZUMDAR, Dwijendra Lal, B.A., (CANTAB.) M.A. (CAL.) I.C.S., *Dy. Secretary to the Government of India, Department of Labour* Imperial Secretariat, New Delhi.
3-3-47	R	MAZUMDAR, Nimai Chandra, M.Sc., *Professor of Mathematics* Ramsaday College, P.O. Amta, Dt. Howrah.
2-8-05	L	*McCAY, David, LT.-COL., I.M.S., M.D., B.CH., B.A.O. M.R.C.P., F.R.A.S.B. c/o The Standard Bank of S. Africa, Hanover, Cape Province, S. Africa.
2-10-44	R	McCABE, Joseph, *Translator*. 6 Hungerford Street, Cal.
7-1-46	N	MEHTA, Bel Chand, c/o, The Astrological Bureau, Beawar, Rajputana.
1-12-47	R	MEHTA, Shri Chand, B.A., *Freelance Journalist*, 37 Armenian Street, Calcutta.
1-12-47	R	MENON, P. M. G., B.Sc., *Research Scholar*, 2 Elgin Road, Calcutta.
1-4-46	R	MEYER, Ellis Raymond, *Barrister-at-Law*, 11 Sudder Street, Calcutta.

Date of Election		
21-9-45	F	MILES, George C., M.A., Ph.D., *Commander, U. S. Navy Reserve, U.S. Naval Liaison Officer.* 6 Church Lane, Calcutta. (Present not address known).
4-1-43	F	MILLAR, Guy Denny Lawrence, F.R.G.S., F.I.S.A. c/o Mrs. J. H. C. Millar, Tronis House, Padstow, Cornwall, England.
1-2-26	N	*MILLS, JAMES PHILIP, C.I.E., I.C.S., M.A. (OXON), J.P., F.N.I., F.R.A.S.B. 4 Wilton Street, Grosvenor Place, London S.W.1.
4-2-46	R	MIRZA, Prince Yousuf, 23 Debendra Ghosh Road, Bhawanipore, Calcutta.
1-7-46	R	MISRA, Sir L. P., *General Manager, Messrs. Hindusthan Motors Ltd.,* 8 Royal Exchange Place, Calcutta. Residence: 12 Alipore Park Road, Calcutta.
1-9-47	R	MISRA, Raghunandan, M.A., *Research Scholar,* 9 Saha Lane, Calcutta 7.
2-9-44	N	MISRA, Ram Kripal, 'SUSHIL', M.A., *Sahityaratna Lecturer in Hindi, National Int. College.* P.O. Barhalgunj, Gorukhpur (U.P.).
1-4-46	R	MITCHELL, Frederick Shelbourne, *Chartered Engineer.* c/o Messrs. Bird & Co., Chartered Bank Buildings, Clive Street, Calcutta.
5-3-45	R	MITRA, Anil Chandra, *Barrister-at-Law.* 94/A Lansdowne Road, Calcutta.
2-11-42	N	MITRA, Major Bhupendra Nath, D.Sc. (DACCA), Ph.D. (MINNESOTA), F.R.I.C., SIGMA XI. *Superintendent, Proof & Experiments,* Balasore.
5-11-45	R	MITRA, Miss Eva, M.A., *Lecturer in Botany, Victoria Institution.* 14 Chowringhee Terrace, Calcutta.
5-2-45	R	MITRA, Nalini Nath, *Zemindar and Businessman.* 94 Bakul Bagan Road, Bhowanipore, Calcutta.
1-7-46	R	MITRA, Praphulla Kumar, *Attorney-at-Law, Senior Partner, Messrs. Mitra & Ganguli, Solicitors,* 10 Old Post Office Street, Calcutta.
3-3-41	A	MITRA, Miss Priti, M.A., *Research Student.* 14 Chowringhee Terrace, Calcutta.
5-6-44	R	MITRA, Prokash Chandra, B.E., A.M.I.E (IND.), F.R.A.S. (Great Britain and Ireland) *Consulting Engineer, Proprietor, P. C. Mitter, & Co.* 37 Netaji Subhas Road, Calcutta. 73 Paikpara Row, Belgachia.
7-2-44	R	MITRA, Rohinindralala, *Solicitor.* 143 Raja Rajendralala Mitra Road, Beleghata, Calcutta.
2-7-45	N	MITRA, S. K., M.B.E., D.Sc., *Professor of Physics, Calcutta University.* 92 Upper Circular Road, Calcutta.

Date of Election.		
3-6-46	R	MITRA, Tripureswar, M.Sc., B.L., *Technical Assistant in Directorate-General Ordnance Factories*, 68/R Durga Charan Doctor Road, P.O. Entally, Calcutta.
5-3-45	R	MITRA, Sailendra Nath, B.Sc., B.Com. (LOND.), A.C.A., *Auditor*. 3 Rustomji Parsee Road, Calcutta..
5-3-24	N	MITTER, Sir B. L., K.C.S.I., M.A., B.L., *Dewan, Baroda State*. Baroda.
6-5-46	R	MITTER, Bhaskar, *Merchant*, Calcutta Club, 241 Lower Circular Road, Calcutta.
5-3-45	R	MITTER, Gopendra Krishna, *Barrister-at-Law*. c/o Bar Library, High Court, Calcutta.
5-2-45	R	MITTER, J. K., *Sheriff of Calcutta, High Court.* 1 Raja Rajballav Street, Calcutta.
4-2-46	R	MITTER, The Hon'ble Mr. Justice Jyoti Prakash, B.A., (Oxon), *Barrister-at-Law,* 8 Mandeville Gardens, Ballygunge, Calcutta.
3-4-26	R	MITTER, Khagendra Nath, Rai Bahadur, M.A., *Ramtanu Lahiri Professor of Bengali Language and Literature, Calcutta University.* 6 Ballygunge Place, Calcutta.
4-2-46	R	MITTER, Prafulla Chandra, M.A. (Cal.), Ph.D. (Berlin), F.N.I., *Palit Professor and Head of the Department of Chemistry, Calcutta University;* 22 Garpar Road, P.O. Amherst Street, Calcutta.
5-3-45	R	MITTER, THE HON'BLE Mr. Justice Rupendra Coomar. *Judge, Calcutta High Court.* P. 24-25 Sch. VIII-J. Chittaranjan Avenue, P.O. Hatkhola, Calcutta.
30-9-45	R	MITTER, Sudhir Chunder, *Barrister-at-Law*. 19 Camac Street, Calcutta.
5-3-34	R	MODI, Jehangir Jeevanji Jamshedji, *Merchant.* 183 Dhurrumtollah Street, Calcutta.
6-9-48	R	MOHIUDDIN, G., Curator, Royal Botanic Garden, P.O. Botanic Garden, Howrah.
3-6-46	R	MOHIUDDIN, A. H. M., M.F. (Cal.), M.A., M.Litt., D.D. (Cairo). *Lecturer, P.G., Department, Calcutta University;* 5 Blochmann Street, Calcutta 14.
1-1-45	R	MOLGAARD, V. B., M.A., C.T.H. (COPENHAGEN), CAPT. c/o *The Danish Consulate*, 5 Fairlie Place, Cal.
2-4-45	R	MONTGOMERY, Alexander Thomson, C. A., *Accountant to Messrs. Balmer Lowrie & Co., Ltd.* Clive Street, Calcutta.
5-11-24	L	MOOKERJEE, Sir B. N. Kt., B.A. (CANTAB), *Partner, Martin & Co.* 12 Mission Row, Calcutta.

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Date of Election.		
5-3-45	R	MOOKERJEE, Benode Gopal, *Zemindar, Bakulia House,* 2 Bishu Babu's Lane, Kidderpur, Calcutta.
2-12-46	R	MOOKERJEE, Monotosh, B.A., Research Scholar, 77 Asutosh Mookerjee Road, Bhawanipore, Calcutta.
1-7-46	R	MOOKERJEE, Naresh Nath, *Deputy Mayor, Calcutta Corporation* c/o Messrs. N. Mookerjee & Son, 6 Clive Row, Calcutta.
7-2-44	R	MOOKERJEE, Satkori, M.A., Ph.D., *Head of the Department of Sanskrit, Calcutta University.* 4-B Ramcharan Ghosh Lane, Calcutta.
2-7-24	R	MOOKERJEE, Syamaprasad, M.A., B.L., LL.D., D.Litt., *Barrister-at-Law.* 77 Asutosh Mookerjee Road, Cal.
3-2-47	R	MOOKERJEE, Uma Prasad, M.A., B.L., *Advocate, Calcutta High Court; At present Secretary and Law Officer, Bengal Textiles Association;* 77 Asutosh Mookerjee Road, Bhawanipur, Calcutta.
6-8-45	R	MOOKHARJEE, Juanda Prasad, *Barrister-at-Law.* 39/1 Girish Mukherjee Road, Bhawanipur, Calcutta.
5-3-45	R	MOOKERJEE, Radha Kumud, M.A., Ph.D. 39 Ekdalia Road, Ballygunge, Calcutta.
4-2-46	R	MOORE, C. T., A.G. and O.T. Bengal, Suite 9, **No. 10** Wood Street, Calcutta.
1-1-45	R	MORE, Seth Chand Prasad, P. 5 Chitpur Spur, Cal.
6-5-46	R	MORSHEAD, John *Director, Messrs. Turner Morrison &* Co., Ld., 6 Lyons Range, Calcutta.
4-2-46	R	MORSMAN, Hendrik Willem, *Assistant, E.L.M.Y.,* 4/2 Middleton Street, Calcutta.
2-4-45	N	MORTIMER-WHEELER, Robert Eric, C.I.E., M.C., Litt.D., F.S.A., *Professor of the Roman Province of Archaeology,* Institute of Archaeology, Inner Circle Regent's Park, London N.W.1 (England).
3-6-46	R	MUAYIDZADE, Qomar Sultan, M.A., 12 Circus Avenue, Calcutta.
1-12-47	R	MUKHERJEE, Jyotish Chandra, 28 Camac Street, Calcutta (Present address not known).
1-12-47	R	MUKHERJEE, Bankim, M.M.F. (Beng.), L.D.S., R.C.S. (Eng.) 3 Waterloo Street, Calcutta.
4-12-39	R	MUKHERJEA, Abani Bhusan, c/o Messrs. Bird & Co., Calcutta.
7-1-46	N	MUKHERJEA, Charu Lal, M.A., B.L., *Headmaster, Chinsurah Deshbandhu High School,* Chinsurah, Hughly.
2-4-45	R	MUKHERJEE, Bijay Bihari, Rai Bahadur, *Advocate, High Court (Director of Land Records and Surveys, Retd.),* 4 Gokhale Road, Elgin Road, P.O., Cal.

Date of Eletion.		
1-4-46	R	MUKHERJEE, Jayanta Kumar, M.A., B.L., *Pleader*, 32 Govinda Ghosal Lane, Bhawanipur, Calcutta.
1-9-47	R	MUKHERJEE, Jitendra Nath, *Merchant*, 10 Canning Street, Calcutta.
2-8-26	N	*MUKHERJEE, Jnanendra Nath, C.B.E., D.Sc. (LONDON), F.N.I., F.R.A.S.B., *Director, Imperial Institute of Agricultural Research*, New Delhi.
4-3-46	R	MUKHERJEE, Naryandas, *Cashier, Calcutta Port Commissioners.* 14 Satchasipara Lane, Baranagore, Cal.
1-2-43	R	MUKHERJEE, S. K., M.Sc., Ph.D., P.O. Royal Botanic Garden.
6-5-46	R	MUKHERJEE, Saila Kumar, B.L., *Solicitor, Chairman, Howrah Municipality;* 21 Ramlal Mukherjee Lane Salkia, Howrah.
2-12-46	R	MUKHERJI. Ajitranjan, M.A., B.L., *First Asst. Secretary, Bengal Legislative Assembly*, Assembly Building, Calcutta.
5-8-46	L	MUKHERJI, B., D.Sc., M.D., *Director*, Central Drugs Laboratory. 110 Chittaranjan Avenue, Calcutta 12.
5-3-45	R	MUKHERJI, Iswar Prosonno, *Barrister-at-Law.* 10 Allenby Road, P.O. Elgin Road, Calcutta.
2-4-45	R	MUKERJI, J. C., *Medical Practioner.* 22 Park Street, Calcutta.
1-4-46	R	MUKERJI, Nishith Ranjan, B.L., *Advocate, Calcutta High Court, Mercantile Officer, The Imperial Tobacco Co. of India Ld.* 7 Hazra Road, Kalighat, Calcutta 26.
2-12-46	R	MUKHERJI, Pobitra Kumar, *Managing Director, Eastern Mutual Insurance Co. Ld.*, 15 Chittaranjan Avenue, Calcutta.
4-2-46	R	MUKHERJI, Prasanta Bihari, *Barrister-at-Law*, 4 Gokhale Road, Elgin Road, Calcutta.
1-3-48	R	MUKHERJI, Sachindra Nath, I.E., (*Benares*), A.I.E.E. (Lond.), Committee Member of the Institution of Electrical Engineers (London), (Overseas Branch), Electrical Engineers, Senior Technical Assistant Govt. Test House, Alipore. P-18 Lake Road, Cal. 29.
1-1-45	R	MUKERJI, Shankar, M.D.H. (W.W.I.), *Registered Homeopathic Practitioner.* 79/3/A Lower Circular Road, Calcutta.
5-7-26	R	MUKHOPADHYAYA, Prabhat Kumar, M.A., *Research Assistant, Calcutta University.* 6 Hindusthan Park, Ballygunge, Calcutta.

Date of Election.		
2-2-21	R	MUKHOPADHYAYA The Hon'ble Mr. Justice Ramaprasad, M.A., B.L. 77 Asutosh Mookerjee Road, Bhawanipore, Calcutta.
3-7-44	R	MULLICK, Birendra, *Land-holder, Marble Palace,* 46 Muktaram Bobu Street, Calcutta.
2-4-28	R	MULLICK, Kartick Chrun, Kumar, *Director, Raja D. N. Mullick & Sons. Ld.* Coolootola Rajbati, Chittaranjan Avenue, Calcutta.
1-9-47	R	MUNGAVIN, J. M., M.B., B.Ch., M.R.C.S., L.R.C.P. (Cantab), *Registered Medical Pratitioner, Medical Department, I.C.I. (India) Ltd.,* 18 Strand Road, Calcutta.
2-4-45	R	MURPHY, William Edward, *Director, Messrs. Guest, Keen, Williams, Ltd.* 7 Council House Street, Calcutta.
7-5-28	N	MURRAY, Eugene Florian Oliphant, A.I.M.M., F.G.S., *Mining Geologist and Engineer.* Tatanagar, B.N.Ry.
3-6-46	R	MURSHED, Mrs. Lyla (Mrs. S. M.), 16, Congress Exhibition Road, (top floor) Calcutta.
3-6-46	R	MURSHED, Syed Mahbub. M.A., B.L., *Barrister-at-Law*, 16 Congress Exhibition Road, (Top floor) Calcutta.
5-2-45		NAMGYAL, Pladen Thondup, *Maharaj-Kumar of Sikkim.* The Palace, Gangtok, Sikkim.
5-12-27		NAMGYAL, H. H. Maharaja Sir Tashi, K.C.I.E., *Maharaja of Sikkim.* Gangtok, Sikkim.
6-6-27	N	NANDI, Maharaja Sris Chandra, M.A., M.L.C., *Zemindar, Kasimbazar* Rajbari, Kasimbazar, Murshidabad.
5-6-39	R	NAG, Kalidas, M.A. (CAL.), (D.LITT.) (PARIS), *Lecturer, Calcutta University.* P. 26 Raja Basanta Roy Road, Landsdowne Road Extension, Calcutta.
5-2-34	N	NARIMAN, Rustom K., M.I.C.E., A.C.H., F.R.G.S. (*Retired Superintending Engineer, Punjab Irrigation*), *Professor of Engineering, Osmania University.* 9 Esplanade Mansion, Esplanade, Bombay.
2-12-46	R	NASKAR, Nabendu Sekhar, B.A., *Zamindar,* 72 Beliaghata Main Road, Calcutta.
2-4-45		NATH, Jogendra Chandra, *Imperial Forest Service, Forest Utilisation Officer, Bengal.* 6 Dover Lane, Ballygunge, Calcutta.
2-10-44	R	NATH, Rajmohan, B.E., *Executive Engineer,* P.W.D. Jorhat, Assam.
3-3-47	R	NAYAK, Hari Prasad, M.A., *Businessman,* 20, Maharshi Debendra Road, Calcutta 7.
5-3-45	R	NAZIM-UD-DIN, Kwaja Sir, K.C.I.E., Governor General of Pakistan, Karachi.

Date of Election.		
2-12-46	R	NEOGY, Birendra Prosad, M.B. (Cal.), M.R.C.S. (Eng.), M.R.C.P. (London), *Visiting Physician, Jadavpur Tuberculosis Hospital*; 13 Deshapriya Park Road, P.O. Kalighat, Calcutta.
5-3-28	R	NEOGI, Panchanan, M.A., P.h.D. F.N.I., I.E.S. (retd.), *Principal, Maharaja Manindra Chandra College.* 44A New Shambazar Street, Calcutta.
2-7-45	R	NEWATIA, Radhakrishnan, *Merchant.* 185 Harrison Road, Calcutta.
3-12-24	R	NEWMAN, Chas, F., F.R.G.S., M.R.S.T., M.C.P. Ramnagar, **Benares.**
1-1-45	R	NIXON, Allan, *Second Officer, Merchant Navy, Chief Officers S.S. Barpeta* c/o M/s Mackinon Mackenzie & Co., Bombay.
3-3-47	R	NOPANY, Rameshwar Lall, *Merchant,* 178 Harrison Road, Calcutta
3-11-47	R	NORONHA, George E., Diploma in Journalism, M.A. (Philosophy), Ph.D. in Education, *Additional Secretary, Indian Institute of Art in Industry,* 15 Park Street, Calcutta.
2-11-42	R	NORMAN, G.A.S., *Agent, Standard Life Assurance Co., Ld.* 32 Dalhousie Square, Calcutta.
6-8-45	R	NOWLAKHA, Chunilal, *Banker.* 118-B Chittaranjan Avenue, Calcutta.
1-1-45	F	OGDEN, Lionel R., MAJOR, O.B.E., M.A. (CANTAB), F.R.S.A., F.R.A.I., *Assistant Superintendent, Burma Frontier Service.* c/o Messrs. Grindlay & Co. Ld., 54 Parliament Street, London, S.W.
7-4-15	L	OHTANI, Count Kozul. San-ya-so, Edomachi, Fushimi Kyoto, Japan.
1-9-47	R	OJHA, Jayantilal, *Merchant,* Security House, 102/A Clive Street, Calcutta.
5-2-45	R	ORMOND, The Hon'ble Mr. Justice Ernest Charles, *Barrister-at-Law, Judge, Calcutta High Court.* 10 Judges' Court Road, Alipore, Calcutta.
3-1-44	N	OSBORN, Howard Baldwin, *Doctor of Dental Surgery, Fellow of the International College of Dentists.* Bombay.
6-5-46	R	PAL, Radhabinod, M.A., D.L., *Advocate, Calcutta High Court;* 21 Beadon Street, Calcutta.
7-1-46	R	PALIT, Bidyut Kumar, M.A. (Cal.), B.A. Hons. (Lond.) *Purchase Officer, Department of Supply,* 189 Lansdowne Road, Calcutta.

Date of Election.		
2-4-45	R	PALMER, William John, B.A., (CANTAB), I.C.S., *Chief Presidency Magistrate*. United Service Club, Calcutta.
2-6-47	N	PANDEY, G. L., Lieut., *Township Magistrate*, Imlia Villa, Khapradih, Fyzabad.
6-12-48	F	PARK, Richard Leonard, S.B., M.A. (Harvar) Professor; Research Fellow 1948-49, Social Science Research Council, Washington, D.C., U.S.A.; 11859 Edgewater Drive, Lake Wood, Ohio, U.S.A.
2-9-46	R	PARKS, John A., F.S.I., *Chairman*, Calcutta Improvement Trust, 5 Clive Street, Calcutta.
5-2-34	F	PASRICHA, Chiranji Lal, M.A., M.B., B.CHIR. (CANTAB.), M.R.C.S. (ENG.), L.R.C.P. (LOND.), LT.COL., I.M.S. Medical Adviser to the High Commissioner for India in U.K., India House, Aldwych, London W.C.2.
2-6-41 ·	R	PATERSON, Edward Alford, *Assistant, Jardine, Skinner & Co., Ld.* 4 Clive Row, Calcutta.
1-4-46	N	PATHAK, Saryu Prasad, B.A., T.T.C., Visharad, Kavyatirtha, Sahityabhun. *Asst. Master, Govt. Jagannath High School*; Kalikakuti, Shamkarighat, Mandla (Fort), C.P., B.N.Ry.
5-8-46	R	PATNEY, Harkishan Lal, M.R.C.S., L.R.C.P., D.O. (OXON), Ophthalmic Surgeon, 5/B Heysham Road, Calcutta.
4-2-46	N	PATTERSON, Harry, *Tea Planter*, Maluicherra Tea Estate P.O. Sylhet, Assam.
3-2-47	R	PAUL, Harendra Chandra, *Professor of Persian*, Vill. Fartabad, P.O. Garia 24 Parganas.
6-8-45	R	PAUL, Surendra Nath, M.Sc., *Biochemist, Presidency General Hospital.* 98/7 Russa Road, Calcutta.
2-4-45	R	PECKER, Claude Bertram, *Incorporated Accountant, General Manager, T. E. Thomson & Co.* 9/A Esplanade East, Calcutta.
3-6-46	R	PEGG, A. D., *Surgeon and Physician*, 2/2 Harrington Street, Calcutta.
5-3-45	R	PELL, Terrence, *Master Pilot, Bengal Pilot Service.* United Service Club, Calcutta.
6-6-88	L	PENNELL, Aubrey Percival, M.A., *Barrister-at-Law.* St. Canon's Tower, Loch Awe, Argyll, Scotland.
5-2-34	L	PERCIVAL, Frederick George, O.B.E., Ph.D. (LON.), F.G.S., *General Superintendent, Ore Mines and Quarries, Tara Iron and Steel Co.* 3 Beldih Lake, Jamshedpur.

Date of Election.		
7-4-47	R	PERCY-LANCASTER, Sydney, *Secretary, The Royal Agri-Horticultural Society of India*, 1, Alipore Road, Calcutta.
1-4-25	R	PERIER, Ferdinand, S. J., *Most Reverend the Archbishop of Calcutta.* 32 Park Street, Calcutta.
1-14-45	N	PICKETT, Jarruil Waskom, D.D., LL.D., *Senior Bishop of the Methodist-Church in Southern Asia, Chairman of the National Christian Council of India, Burma & Ceylon.* 12 Boulevard Road, Delhi.
3-5-48	N	PISSURLENCAR, Panduranga S.S., Curator, Government Archives, Goa, Nova Goa.
1-1-45	R	PODDAR, Anandilall, M.L.A., *ex-Mayor of Calcutta.* 115/A Chittaranjan Avenue, Calcutta.
1-1-45	R	PODDAR, Badri Prasad, B.Com., *Merchant,* 115/A taranjan Avenue, Calcutta.
4-6-45	R	PODDAR, Bal Krishna, *Stock and Share-Broker.* 153/A Muktaram Babu Street, Calcutta.
7-8-44	R	PODDAR, Biswanath, *Merchant and Businessman.* 115/A Chittaranjan Avenue, Calcutta.
3-1-44	R	PODDAR, Kishen Lall, *Merchant, Landowner.* 115/A Chittaranjan Avenue, Calcutta.
1-1-45	R	PODDAR, Madan Gopal, *Solicitor.* 6 Old Post Office Street, Calcutta.
4-2-46	N	POWELL, John Enoch, Brigadier, M.B.E., Late Fellow of Trinity College, Cambridge; 45 Southdown Road, Seaford Sussex.
5-4-48	R	PRAKASH, Om, M.A., LL.B., Research Scholar at Agra College, Agra.
2-9-46	N	PRASAD, Awadhbihari, *Zemindar and Banker.* Anand Bhawan, Darbhanga.
19-8-44	R	PRASAD, Rev. Ayodhya, Pundit, B.A., *Minister of the Calcutta Arya Samaj.* 85 Bow Bazar Street, Calcutta.
3-4-18	L	*PRASAD, Baini, O.B.E., D.Sc., F.Z.S., F.R.S.E., F.N.I., F.R.A.S.B., *Fishery Adviser to the Government of India.* 13 Tughlak Road, New Delhi.
6-5-46	N	PRAKASH, Seth Budha, M.A., *Rais, Banker and Landlord,* Moti Bhawan (Rani Bazar), Saharanpur, U.P.
6-5-46	R	PRESVELOS, Miltiades, M.D. (Athens), Consul Gen. for Greece, 30 Park Mansions, Calcutta.
5-8-46	R	PROSSER, Walter Henry, *Chief Engineer,* Calcutta Improvement Trust, 5 Clive Street, Calcutta.

Date of Election.		
3-8-25	N	*PRUTHI, Hem Singh, M.Sc., Ph.D. & Sc.D. (CANTAB), F.N.I., F.R.A.S.B., *Plant Protection Adviser to the Government of India. Ministry of Agriculture* New Delhi.
5-8-46	R	PURANESH, D. G., M.A. (OXON), Ph.D. (Lond., & Berlin), *Writer and Author*, 19 Jubilee Park, Tollygunge, Calcutta.
3-12-24	R	PUSHONG, E. S., M.D., L.S.A., *Medical Practitioner.* 1 Chapel Road. Hastings, Calcutta.
6-12-48	N	RAGHAVAN, Dr. U. Sanskrit Dept., University of Madras; Kuppaswami Sastri Research Institute Madras. Editor Journal of the Music Academy; Literary Secretary, Madras Sanskrit Academy.
1-3-43	R	RAHMAN, A. F.M. Khalilur, B.A. (LONDON), Ph.D., *Special Officer, Current Problems, Government of Bengal.* 103 Ballygunge Place, Calcutta.
1-5-44	R	RAHMAN, Fazlur, M.A., B.L., M.L.A., *Chief Whip, Government of Bengal.* 2 Syed Ameer Ali Avenue, P.O. Circus, Calcutta.
1-2-46	R	RAHMAN, Hamoodur, *Barrister-at-Law*, 15, Nasiruddin Road, Calcutta 17.
5-3-45	R	RAHMAN, Mahammad Fazlur, *Barrister-at-Law.* 22 Lansdowne Road, Calcutta.
1-1-45	R	RAHMAN, The Hon'ble Mr. Justice A. S. M. Latifur, Nawabzada, M.A. (CANTAB), *Barrister-at-Law, Judge, Calcutta High Court.* 10 Nawab Abdur Rahman Street, Calcutta.
3-5-43	N	RAJGARHIA, Chand Mull, *Mining Engineer.* Giridih, E.I.R.
1-9-47	N	RAMAIYA, U. V. Seeta, B.A., B.L., *Advocate*, P.O. Hosur, Salem District.
3-3-47	N	RAMESVARA, Brahmachary, Ayurvedavisarada, Kavyatirtha, *Hony. Head Pandit, S.R.S. Vidyalaya, Chandpurabazar*, P.O. Desari, Dt. Muzaffarpur.
4-11-46	R	RAMPURIA, Shreechand, *Pleader*, 15 Noormal Lohia Lane, Calcutta.
2-4-45	L	RAMSAY, Robert Erskine, *Proprietor, Central and South Jemehari Collieries, Mining Engineer.* P.O. Siarsol Rajbari, Dt. Burdwan; (27 Alexandra Court, 60/1 Chowringhee, Calcutta).
3-3-47	N	RANA, Suberna Shum Shere Jung Bahadur, M.A. (Allahabad), Lt.-Col., Nepal Army, Bhat-Bhateni, Kathmandu, Nepal.
2-10-39	N	RANGARAJAM, Krishnaswami, *Employee, I.C.I. (India) Ltd.* Rukmani Building, Mambalam West, Madras.

Date of Election.		
5-3-45	R	RANGASWAMI, C. S., *Managing Editor, Indian Finance.* 116 Lower Circular Road, Calcutta.
5-2-45	N	RAO, Bhavaraja Venkata Krishna, M.A., B.L., *(Foundation Secretary, Andhra Historical Research Society, Rajahmundry), Commissioner Hindu Religious Endowments Board.* P.O. Cathedral, Madras.
3-12-45	N	RAO, Motu Palli Surya Prakasa, D.D.S., *Dental Surgeon.* Rajahmundry, M.S.M.Ry.
1-2-26	N	RAO, Y. Ramachandra, Rao Bahadur, M.A., F.R.E.S., *Dy. Director, Bureau of Plant Protection, Dept. of Agriculture.* Imperial Secretariat, New Delhi.
5-11-45	N	RAPARIA, Tara Chand, B.A., *Merchant,* Belangung, Agra.
3-8-42	N	RATH, Purna Chandra, B.A., Dip.Ed., *Superintendent of Archaeology, Patna State.* P.O. Balangir, E.S.A.
1-4-46	R	RAY, Ajit Nath, B.A. (OXON), *M.A.* (Cal.) *Barrister-at-Law,* 15 Panditia Place, Calcutta.
6-8-45	R	RAY, Bimal Prasad, B.L., R.A., *Auditor and Registered Accountant.* 139 Janak Road, P.O. Rashbihari Avenue, Calcutta.
7-9-21	L	RAY, Hem Chandra, M.A., Ph.D. (LONDON), D.Litt. (LONDON), *Professor and Head of the Department of History, University College* Colombo, Ceylon.
5-1-21	N	RAY, Jagadishnath, Maharaja, *Maharaja of Dinajpore.* Dinajpore.
1-1-45	R	RAY, Khush Bakht, M.A., LL.B. 24-B Park Street, Calcutta.
1-3-43	R	RAY, Nihar-Ranjan, M.A., D.Litt. & Phil. (LEIDEN), Dip. Lib. (LONDON), F.L.A., *Bageswari Professor of Fine Arts, Calcutta University.* 18/7 Fern Road, Calcutta-19.
1-7-40	R	RAY, Sukumar, M.A., *Lecturer, Calcutta University.* 35-A Southern Avenue. P.O. Rashbihari Avenue, Calcutta.
1-1-45	R	RAY, Tridibnath, M.A., B.L., *Advocate, High Court.* 19 Srinath Mukherjee Lane, P.O. Ghugudanga, Calcutta.
4-12-39	R	*RAY-CHOWDHURY, H. C., M.A., Ph.D., *Carmichael Professor of Ancient Indian History and Culture, Calcutta University* 6 Mysore Road, Kalighat, Calcutta.
4-2-46	N	RAZAVY, Seyed Mohamad, *ex-Acting Minister, Government of Iran,* c/o The Iranian Consulate-General, New Delhi.

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Date of Election.		
6-12-48	R	REID, Cecil Philip, B.Eng., Grad. I.E.E. (Lond.) Construction Engineer, Calcutta Electric Supply Corpn., Victoria House, Calcutta.
5-11-28	L	REINHART, Werner, *Merchant.* c/o Messrs. Volkart Bros. Rychenberg, Winterthur, Switzerland.
3-11-41	A	REYNOLDS, Rev. Herman M., M.A., B.D., *Missionary.* Pendra Road, C.P.
2-4-24	F	RICHARDS, F. J., I.C.S , TREEPS, Hurstpier Piont, Sussex, England.
3-12-45	N	RICHARDSON, Hugh Edward, O.B.E., I.C.S., *Officer-in-Charge* Indian Mission, Lhasa, c/o Political Officer, Gangtok, Sikkim.
7-6-48	F	ROCK, Joseph F., Ph.D., Research Fellow of Harvard Yenching Institute, Cambridge, Mass, U.S.A.
3-12-24	L	ROEFICH, George Nicholas, M.A., M.R.A.S., *Orientalist.* 310 Riverside Drive, New York, U.S.A. 'Crookety', Kalimpong, via Siliguri.
5-6-33	A	ROSSETTI, Felix Francis Leo, B.Sc., B.H., 27 Threatre Road, Calcutta.
2-4-45	R	ROSTRON, Arthur Henry Cunliffe, *Managing Director, Latax Treatments, Ltd.* 10 Government Place, East, 1 Raja Santosh Road, Calcutta.
5-12-26	N	ROY, Sir A. K. Kt., *Barrister-at-Law, Formerly Law Member, Government of India.* New Delhi.
5-2-40	R	ROY, B. C., B.A. M.D., D.Sc., F.R.C.S. (ENG.), M.R.C.P. (Lond.), F.S.M.F. (BEN.), 36 Wellington Street, Calcutta.
5-4-37	N	ROY, David, M.B.E., *Retired Magistrate,* Shillong, Assam.
4-2-46	N	ROY, Lala Nagendra Kumar, *Journalist,* Lala House, Buxi Bazar, P.O. Cuttack.
1-12-30	N	ROY, Raja Kamalaranjan, B.A., *Zemindar,* Cossimbazar Post and Dt. Murshidabad.
3-3-47	R	ROY, Narendra Nath B.A., Tatwanidhi, F.R.Econ S. (Lond.), *Superintendent of Post Offices;* 19B Ballygunge Place, P.O. Ballygunge, Calcutta.
5-7-43	R	ROY, Sudhindra Nath, M.A. *Landlord.* 3 Tiloke Road, Ballygunge, Calcutta.
4-2-46	R	ROY CHOUDHURY, Birendra Kishore, *Landholder and Businessman,* 55 Ballygunge Circular Road, Calcutta.
3-3-47	R	ROY CHOUDHURY, Pritindra Nath, B.A., *Landholder, Hony. Vice-Council for Spain,* Santosh House, 21 Raja Santosh Road, Alipore, Calcutta.

Date of Election.		
5-7-43	A	ROLLFS, Rev. Montague John, *Missionary London Mission*, Kamalapuram, Dt. Cuddappah, Madras Presidency.
7-4-41	R	ROXBURGH, The Hon'ble Mr. Justice T. J. Y., C.I.E., I.C.S., *Barrister-at-Law, Judge, High Court*. 7 Lee Road, Calcutta.
5-3-45	R	RUSSELL, Joshua Forbes, *Chief Engineer, Irrigation Branch, C. & W. Department*. United Service Club. Calcutta.
2-4-45	R	SACHDEVA, Rajendra, *Manager, Messrs. Steel Industries of India, Ld.* 116 Chittaranjan Avenue, Cal.
4-1-43	R	SADEQUE, A., M.A. (ECON.) *Professor, Islamia College.* 177-B Park Street, Calcutta.
7-5-28	L	*SAHA, Meghnad, D.Sc. F.R.S., F.N.I., F.R.A.S.B., *Palit Professor of Physics, Calcutta University.* 92 Upper Circular Road, Calcutta.
6-9-43	L	SAHU, Lakshminarayan, M.A., *Member, Servant of India Society*. Indigaparia Cuttack.
1-5-44	N	SAKSENA, Jagdamba Prasad, B.A., B.T. (B.H.V.), M.R.A.S., *Member. Board of Studies in Hindi, Utkal University, Cuttack. Headmaster, Orient Paper Mills High School*. Brajarajnagar, Dt. Sambalpur, Orissa.
5-2-34	L	SALE, Harold Montague, M.A., F.G.S. Mancetter Cottage, Atherstone, Warwickshire, England.
3-3-47	R	SAMAD, A., M.A., B.E.S., *Principal, Govt. Commercial Institute:* 15 Clive Street, Calcutta.
5-3-45	R	SANYAL, Hem Nath, *Barrister-at-Law.* 96/1 Lansdowne Road, Calcutta.
3-12-45	R	SANYAL, Prabhat Kumar, M.Sc., *Proprietor Ballygunge, Chemical Works*, 13-C Deodar Street, Ballygunge, Calcutta.
1-1-45	R	SANYAL, Snehamay, M.A., STUD. INSTT. TRANS. (LONDON), *Transportation Inspector (Commercial) E.I.R. Howrah Division*. 43 Ramcharan Sett Road, P.O Santragachi, Howrah.
4-2-46	R	SANYAL, Suhridmohan, *Solicitor*, c/o Messrs. Orr Dignam & Co., 32 Dalhousie Square, Calcutta.
5-7-48	N	SARBAHI, D.S., D.Sc., *Assistant Fisheries Development Officer*, 203 Ganga Prasad Road, Lucknow, U.P.
4-6-45	R	SARAF, Chouth Mal, B.C., B.L., *Advocate.* 62 Nalini Sett Road, Calcutta.
4-10-43	N	SARAN, Paramatha, M.A., (BENARES), Ph.D. (LONDON), *Lecturer in History, Benares Hndu University*. Benares.

Date of Election.		
1-12-47	R	SARBADHIKARI, Prabhat Chandra, D.Sc. (London), Ph.D. (Lond.), D.I.C., F.L.S., *Ghose Professor of Botany and Head of the Department*, 84 Ballygunge Place, Calcutta.
7-4-47	N	SARKAR, Himansu Bhusan, M.A., *Principal and Professor of History, Devendra College*, Manikganj, Dist. Dacca.
1-9-47	R	SARKAR, Himangshu Lal, M.Sc., *Assistant Lecturer, Government of India Inland Fisheries Training Scheme*. 177 Upper Circular Road, P.O. Shambazar, Calcutta.
4-2-46	R	SARKAR, K. L., *Merchant and Landholder*. 21 Nilmani Mullick Lane, Howrah.
6-12-48	R	SARKAR, Kshitish Chandra, M.A., B.L., *Lawyer; Hony. Secretary, Varendra Research Society*, 21/C Mohanlal Street, Shambazar, Calcutta.
4-2-35	R	SARKAR, Nalini Ranjan, 237 Lower Circular Road, Calcutta.
2-12-46	R	SARKAR, Subrata, B.A., *Manager, Bengal Central Bank, Ld.*, (Bhowanipore Branch), 171/A Lansdowne Road, Calcutta.
5-3-45	R	SARMA, Harendra Nath, B.L., *Advocate, High Court*. 35, Chittaranjan Avenue, Calcutta 12.
1-3-48	R	SARMA, Miss Joytirmoyee, M.A. (Chicago), Ph.D., (Chicago), *Social Anthropologist*, Sarma House, Sahapur P.O., Behala, Calcutta.
4-9-44	N	SARMA, Venkataraya, Pundit, Dharmaranjan, Ph.D., *Landholder*. Narayanasram Bhadarikavanom, P.O. Karavadi, Ongole Taluq, Dt. Guntur.
7-5-45	R	SARAOGI, Kishori Lal, Visharad, *Exchange Broker*. c/o Messrs. Poddar Seraogi & Co., 4 Royal Exchange Place (Room No. 11), Calcutta. 1.
4-12-44	R	SARASWATI, Sarasi Kumar, M.A., *Lecturer, Calcutta University*. 6/1 Mahendra Road, Calcutta.
4-11-46	R	SASSOON, David Victor, 8 Middleton Street, Calcutta.
4-9-44	N	SASTRY, J. S. Venkatachala, *Pundit, Jodidar*, 61 Gramadevathi Street, Upparahalli, Bangalore City.
5-8-46	N	SAXENA, Brahm Swarup, M.A., M.O.L. (Honours in Persian and Urdu). *Senior Professor of Persian and Urdu*, Near Ganj Mandi, Ferozepur City.
5-2-45	R	SCHROFF, Mahadeva Lal, A.B.Hons. (CORNELL), M.S., M.I.T., *Chief Chemist, Messrs. Birla Bros. Ltd.*, *and Secretary, Birla Laboratories*. 7 Lower Rowdon Street, Calcutta.

**Date of
Election.**

———**.**

6.3-33 | R | SEAL, Satis Chandra M.A., B.L., *Honorary Secretary, Indian Research Institute.* 170 Maniktola Street, Calcutta.

1-1-45 | R | SEN, The Hon'ble Mr. Justice Amarendra Nath, *Barrister-at-Law, Judge, Calcutta High Court.* 4 Hungerford Street, Calcutta.

1-4-46 | R | SEN, Amulya Chandra, M.A., B.L., *Advocate, High Court.* 13 Sebak Baidya Street, Calcutta.

1-3-43 | R | SEN, Anil Kumar, M.B. (CAL.). 45 Ballygunge Place, Calcutta.

1-4-25 | R | SEN, Benoy Chandra, M.A., Ph.D. 40 Dr. Sarat Banerjee Road, Ballygunge. Calcutta.

5-8-46 | N | SEN, Bijoy Kumar, Rajsabha Bhushan, Dewan Bahadur, M.A., B.L., *Political and Local Self-Government Minister, Tripura State,* Agartala P.O. Tripura State.

5-4-44 | N | SEN, Bhupes Lobhan, *Textile Chemist (Expert in Practical Dyeing Chemistry).* c/o Messrs. Volkart Bros., P.O. Box 199, Bombay (224 Sir Bhalchandra Road, Matunga, Bombay 19).

9-12-36 | R | SEN, D. N. 7 Rawdon Street, Calcutta

2-12-46 | R | SEN, Hirendra Kumar, M.Sc., F.F.A., *Consulting Actuary,* 15 Chittaranjan Avenue, Calcutta.

1-6-36 | N | SEN, J. M., Rai Bahadur, M.ED. (LEEDS), B.Sc. (CALCUTTA). *T.D.* (LONDON), DIP.ED. (OXFORD), F.R.G.S., F.N.I. *Principal, Krishnagar College,* Krishnagar, Nadia.

3-5-43 | R | SEN, Karunaketan, B.Sc., I.C.S., *Deputy Director-General, Disposals. Directorate-General of Disposals* Shahjahan Road, New Delhi.

5-4-37 | N | SEN, Kshiti Mohan, *Principal, Visvabharati.* Santiniketan, Dist. Birbhum.

1-4-46 | R | SEN, Kumud Bihari, M.Sc., F.R.I.C., *Chief Chemist,* Messrs. Bird & Company; 9/C Mohonlal Street, Calcutta.

5-12-23 | | SEN, Lakshman, H. H. Raja of Suket. Lakshman Palace, Sundernagar, Suket, Punjab.

1-1-45 | R | SEN, Mihir Kumar, M.A., B.L., *Professor of Civics and Economics, Vidyasagar College.* 50 Lake Place, Calcutta.

1-2-43 | R | SEN, Nepal Chandra, C.B.E., Rai Bahadur. M.A., *Controller of Rationing, Calcutta Industrial Area.* 35 Gopalnagar Road, Alipur, Calcutta.

4-2-46 | R | SEN, Prokash Chandra, Barrister-at-Law, 47 South Chakrabere Road, Bhawanipore, Calcutta.

Date of Election.		
2-12-46	R	SEN, Prodyot Kumar, *Agency Manager, Calcutta Insurance Ld.*, 115G Rash Behari Avenue, P.O. Rash Behari Avenue, Calcutta 29.
5-3-45	R	SEN, S. N·, *Solicitor.* c/o Messrs· C.C. Basu & Co., 9 Old Post Office Street, Calcutta.
3-5-48	R	SEN, Satyendra Nath, M.A·, *Lecturer, Calcutta University.* 82/C Beltala Road, Calcutta 26·
3-4-44	R	SEN, Siba Pada. B.A. (HONS.), (LONDON), *Professor of History and Politics, C. E. T., Bengal. Jadabpur.* 5-A Motilal Nehru Road, Calcutta·
2-4-45	R	SEN, Sudhendu Sekhar, Rai Bahadur, M·A·, D.L.O. (ENG.), F.R.C.S. (E). *Civil Surgeon, Government of Burma.* 13 Harrington Street, Calcutta.
7-2-44	R	SEN, Sukumar, M.A., Ph.D., *Lecturer, Calcutta University.* 27 Goabagan Lane, Calcutta·
5-2-40	N	SEN, Suresh Chandra, B.Sc. (CAL.), B.A· (CANTAB.), A.M.I.Chem.E· (LONDON), *Superintendent, Cinchona Cultivation in Bengal.* Mungpoo, Riyand, D.II. Ry.
5-5-47	R	SEN GUPTA, Kali Kinkar, M.A., M.B.·, D.T.M., 45/1/B Beadon Street, Calcutta.
6-8-45	R	SEN· Tara Kumar, M·A. (ALLAHABAD). *Educationist.* 259 Upper Chitpur Road, Calcutta·
2-12-46	R	SEN, GUPTA, Dilip, M.A. (Missourie, U.S.A.), *Purchasing Officer*, Martin & Co.; Manoharpukur Road, Kalighat, Calcutta.
4-11-46	N	SEN GUPTA, Mono Gopal, M·M·G·I., *Colliery Proprietor, P·O.* Jharia, Dt. Manbhum.
1-4-29	R	SEN-GUPTA, Naresh Chandra, M·A., D.L., *Advocate High Court.* P.93 Manoharpukur Road, Calcutta.
3-7-44	N	SEN-GUPTA, Sailendranath, M.A., *Bengal Civil Service (Judicial Branch), Munsiff.* Netrakona, Mymensingh.
3-4-44	R	SERA, Stanley Eric. 103 Clive Street, Calcutta·
5-7-11	L	*SEWELL, Robert Beresford Seymour, C.I.E., M.A., Sc·D. (CAN.), M.R.A·S.B., L.R.C.P., F.Z·S., F.L.S· F.R.S., F.N.I., F.R.A·S.B., Lt.-Col., I.M.S., *Director, Zoological Survey of India (retd.).* 18 Barrow Road, Cambridge, England.
6-3-44	N	SHAHA, Akshaya Kumar, B·Sc·, (DACCA), M.Sc. (Moscow), *Honorary Candidate of Science, U.S.S.R. 1935; Engineer, Scientist, Officer on Special Duty, Supply Department, Government of India.* c/o The Director of Industries, Patna·

Date of Election.		
1-1-45*	R	Shahidulla, Muhammad, M.A., B.L., Dilip.Phon. (Paris), Docteur de l'universite de Paris, *Principal, Azizul Huq College.* Bogra, Bengal.
2-12-46	R	Shakur, Mohammad Abdul, *Curator,* Peshwar Museum, Peshawar.
	N	Sharaf-ud-Din, S., M.A., B.L., *Vice-Principal, Islamia Intermediate College.* Dacca.
2-11-25	N	Sharif, Mohammad, D.Sc., F.R.M.S., F.L.S., F.N.I., *Entomologist, Haffkine Institute.* Parel. Bombay.
6-8-45	R	Sharma, Behari Lal, *Manager, Golden Soap Factory, Ltd.* 171/1A Harrison Road, Calcutta.
4-6-45	R	Sharma, Beni Shanker. B.L., 228/A Chittaranjan Avenue, Calcutta.
4-11-46	N	Sharma, S. P., *Lecturer in Geography,* B. L. J. Intermediate College, Mirzapur, U.P.
3-5-48	R	Sharma, Satya Deo, M.A., LL.B., Journalist, Representative "Bombay Chronicle" & "National Herald", 4 Gua Bagan Lane, Calcutta 6.
6-5-29	N	Sharma, Sri Ram, M.A., F.R.Hist.S. (London), *Principal, D.A.V. College,* Sholapur (Bombay).
5-3-45	L	Sharpe, Alfred George, M.A. (Cantab), M. Inst.-Struct.E., *Chartered Structural Engineer.* The Royal Bombay Yacht Club, Bombay 1.
1-12-47	R	Sharma, Yajna Datta, Sahitya-Sastri, M.A., B.Litt., D.Phil. (Oxon), *Assistant Superintendent, Archaeological Survey,* 32 Chittaranjan Avenue, Calcutta 12.
3-2-41	L	Shastri, Gangeyanarottam, Kavyatirtha, Kavickracudamani, *Landholder.* Gangeya Bhawan, 280 Chittaranjan Avenue, Calcutta.
4-9-44	R	Shastri, Vishwanath, Veda and Vyakarantirtha (Punjab Univ.), *Office Superintendent of the All-India Hindu (Arya) Dharma Seva Sangha.* 102 Muktaram Babu Street, Calcutta.
2-5-23	F	Shebbeare, E. O. The 'Sands' House, South Newington, Banbury, Oxon, England.
6-1-09	N	Shiereff, Alexander Grierson, B.A., I.C.S. *(retd.).* The Orchard House, Childrey, Wantage, Berkshire, England.
4-6-45	N	Sholto Douglas, The Hon'ble James Eric Wilfrid Hamilton, Ackworth Grange, Near Pontefract, Yorksire, England. (Hydroponic Research Centre, Government Experimental Farm, Kalimpong, D.H.Ry.).
6-2-28	N	Shumser Jung Bahadur Rana, Sir Kaiser, K.B.E., Surpradipta Manyavara, Lieut.-General, *Nepalese Army.* Kaiser Mahal' Kathmandu, Nepal.

Date of Election		
2-4-45	N	Si, Lao Ntin, Lieut.-Col., M.A., E.D., A.D.C., *Joint Administrative Officer, University of Rangoon.* Elysium Hotel, Simla.
4-11-29	R	Siddiqi, Mohammad Zubayr, M.A., B.L., Ph.D. (Cantab), *Sir Asutosh Professor of Islamic Culture, Calcutta University.* P. 6 Suhrawardy Avenue, Calcutta.
6-2-39		Simeons, Albert Theodore M.D. (Heidelberg), *Physician*, Khatau Mansion, Cooperage, Bombay.
5-3-13	N	*Simonsen, John Lionel, D.Sc., F.R.I.C., F.R.S., F.R.A.S.B., *Director of Colonial Products Research, Imperial Institute.* Exhibition Road, South Kensigton, London, S.W. 7.
6-3-39	F	Sinclair, Gregg M., *Director, Oriental Institute, and President, University of Hawaii.* Honolulu, Hawaii, U.S.A.
3-3-47	N	Singh, Ganda, Ld., M.A., *Lecturer in History, and Head of the Sikh History Research Department,* Khalsa College, Amritsar.
4-11-46	N	Singh, Ganya, Raja of Parone Estate, *Jagirdar,* Estate-Parone, Viaguna, Gwalior State.
3-4-44	N	Singh, Kalyan, *Raja of Bhinai, Istimardar of Bhinai.* P.O. Bhinai, Dt. Ajmer-Merwara, Rajputana.
7-6-48	R	Singh, Hari, B.Sc., *Journalist.* 89 Netaji Subhas Road, Calcutta.
5-3-34	N	Singh, His Highness The Hon'ble Maharajadhiraja Sir Kameswar, K.C.I.E. Darbhanga.
7-6-48	R	Singh, Jaipal, M.A. (Oxon.) *Barrister-at-Law,* Member, *Constituent Assembly,* Ranchi. 217 Imperial Hotel, New Delhi.
5-7-43	R	Singh, Partap, *Merchant and Industrialist.* 181 Grand Trunk Road, North, Howrah.
2-1-33	N	Singh, Rudra Pratap, Rao Bahadur, *Proprietor, Sanbarsa Raj,* Sonbarsa Kachery, P.O. Soharsa, District Bhagalpur.
3-2-47	N	Singh, Vibhuti Narain, H. H. Maharaja Bahadur of Banaras, Fort Ramnagar, Banaras.
6-8-45	R	Singhania, Balabux, *Electrical Merchant.* G.P.O. Box No. 2117, Calcutta.
5-2-45	N	Singhania, Madan Mohan, *Businessman.* 14 Sircar Lane, Calcutta.
4-9-44	R	Singhi, Ramchandra, B.A., A.C.A. (London), R.A., *Chartered Accountant.* 1-B Old Post Office Street, Calcutta.

Date of Election.		
7-8-33·	N	SINH, Raghubir, Maharajkumar. M.A., D.Litt., LL.B., *Heir-Apparent of Sitamau State.* Raghubir Niwas, Sitamau, C.I.
5-7-43	R	SINHA, Ananda Prasad, M.A., B.L., Ph.D. (COLORADO). c/o Tech. Recruiting Office, 28 Theatre Road, Calcutta.
3-3-47	R	SINHA, Kalipada, M.A., B.L., *Advocate*, 3-A Mahanirvan Road, Calcutta 29.
4-2-46	R	SINHA, Sasi Bhusan, Barrister-at-Law, *Advocate*, High Court; 35/1 Hari Ghosh Street, Calcutta.
3-5-48	R	SINHA, Sudhindra Nath, Lt.-Col., M.B. *Medical Practitioner*, 37-B, Ballygunge Place, Calcutta 19.
1-4-46	N	SINHJI, Dharmakumar, Raol Shree, *Scientific Research and Member of Post-War Reconstruction Committee of Preservation of Wild Life*, Dil Bahar, Bhavnagar State.
1-11-48	N	SINGHAL, Harish Chandra, M.Sc., M.A., Lecturer, Delhi University, Suvriti Kunj, 705 Sahukara, Bareilly.
4-1-26	N	SINTON, J. A., O.B.E., Lt.-Col., I.M.S., V.C., *Officer-in-Charge, Malaria Bureau.* Central Research Institute, Kasauli.
16-4-46	R	SIRKAR, Amal Chandra, M.A., *Barrister-at-Law*, 29 Palit Street, Calcutta.
2-12-46	R	SIRCAR, D. C., M.A., Ph.D., *Lecturer, Calcutta University*, P. 93-94 Manoharpukur Road, Kalighat, Calcutta 29.
5-7-16	R	SIRKAR, Ganapati, Vidyaratna. 69 Beliaghatta Main Road, Calcutta.
6-1-47	R	SIRKAR, Manchan Lal, B.A., *Zemindar and Businessman*, 131 Bowbazar Street, Calcutta.
5-8-46	R	SIVARAMAWURTI, C., M.A.,. *Assistant Superintendent, Archaeological Survey of India*, Indian Museum, Calcutta.
1-4-46	F	SKIPWITH, William Estouteville, 16 St. Andrews Road, Bedford, England.
6-8-45	F	SMYRTH, Robert Patterson, Lt.-Col., R.A.M.C., M.B.B.Ch. B.A.O., C.A.S. (M.), Adv. Hq. ALFSEA, S.E.A.C. (Present address not known).
3-9-34·	R	SONDHI, Ved Pall, M.B.E., M.Sc., F.G.S., *Assistant Superintendent, Geological Survey of India.* 27 Chowringhee, Calcutta.
4-3-36	R	SOPHER, Allan Edward. 11 Camac Street, Calcutta.

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Date of Election.		
4-3-36	R	SQUAREY, D. N. P., *Director, Messrs. Turner, Morrison & Co. Ld.*, 6 Lyons Range, Calcutta.
2-12-46	F	SQUIRE, Sir Giles, K.B.E., *His Majesty's Minister at Kabul, Kabul*, Afghanistan.
29-8-04	L	*STAPLETON, Henry Ernest, M.A., B.Sc., D.Litt., F.R.A.S.B., *Formerly Director of Public Instruction, Bengal.* St. Brelade, Jersey, C.I., England.
5-3-45	R	STARK, Alan Forrest, B.L., M.L.A., 6/2 Moira Street. (Present address not known).
5-3-45	N	STARPE, Alfred George, M.A. (Cantab), M.Inst.Struct. E., *Chartered Engineer.* c/o The Royal Bombay Yacht Club, Bombay No. 1.
6-3-44	F	STEVEN, J. W.R. 21 Heziot Row, Edinburgh, Scotland.
3-12-45	R	STUART, Malolm Moncrieff, O.B.E., I.C.S., Magistrate's House, Alipore, Calcutta.
5-6-46	R	SUBRAHMANYAN, Kuppuswami. C.E., B.E. (Madras), S.M. (Harvard), M.I.E., A.M.I.C.E., *Civil Engineer, Professor of Sanitary Engineering, All-India Institute of Hygiene and Public Health,* 110 Chittaranjan Avenue, Calcutta.
5-3-45	N	SUBRAHMANYAM, P. K., *Manager, Import Dept. M/S. Larsen & Toubro Ltd.,* P.O. Box 278, Bombay.
6-8-45	R	SUGLA, Hardatta Rai, *Advocate.* 4 Chittaranjan Avenue. Calcutta.
5-4-43	R	SUKUL, L., *Lecturer, Calcutta University.* Kent House, Mission Row Extension, Calcutta.
3-3-20	N	SUNDARA, RAJ, Bunguru, Dewan Bahaduh, M.A., Ph.D., F.N.I., *Fisheries Development Officer.* Civil Secretariat, U.P., Lucknow.
7-11-32	N	SUVARNA, SHUMSHER JUNG BAHADUR RANA, *Major-General in the Nepalese Army.* Singha Darbar, Kathmandu, Nepal.
2-4-45	R	SWAIKA, G. V., Rai Bahadur, *Oil Mill Owner, Landholder.* c/o Messrs. Swaika Oil Mill, Pollock House, 28/A Pollock Street, Calcutta.
7-6-48	R	SWANU, Robert Swinney, B.A. (Cantab.), U.K. Foreign Service, United Service Club, Chowringhee, Calcutta.
4-11-46	R	SWAYNE-THOMAS, G., M.A. (Cantab), F.R.I.B.A., F.I.I.A., Lt.-Col., R.E., *Architect and Army Officer, Commander, Royal Engineer,* 6 Esplanade East, Calcutta.
1-1-45	N	TAGORE, Probindra Mohan, *Maharaja, Landholder.* Haradham Palace, Benares Cantonment.

Date of Election.		
5-3-45	R	TAGORE, Purnendu Nath, *Barrister-at-Law.* 4 Darponarain Tagore Street, Calcutta.
1-1-45	L	TAGORE, Rathindra Nath, B.Sc. (ILLINOIS), *Zemindar, General Secretary, Visva Bharati.* Santiniketan, Bengal.
5-3-45	F	TAIMURI, Mirza Hamid Raza, *Director of Archaeology, and the State Hamidia Library.* Bhopal.
3-12-45	R	TATIA, Nathmal, M.A., Singhi Park, 48 Gariahat Road, Calcutta 19.
3-12-45	N	TAYLOR, Francis Ernest Alfred, I.C.S., *formerly Revenue Secretary to the Government of Bihar,* Patna, Bihar
5-11-45	R	TAYLOR, George Thomas, *Chief Officer, Dredger and Despatch Service.* c/o Calcutta Port Commissioners, 15 Strand Road, Calcutta.
3-6-46	R	THAKUR, B. T., *General Manager, United Commercial Bank Ld.,* 2 Royal Exchange Place, Calcutta.
7-5-45	R	THARAD, B.A., *Businessman.* 4 Kali Krishna Tagore Street, P.O. Burrabazar, Calcutta.
3-11-47	R	THOMPSON, John William (III), *Information Officer, Foreign Service Reserve,* Major, United States Marine Corps Reserve (inactive), U.S. Foreign Service, Presidential, American Consulate-General, 9 Esplanade Mansions, Calcutta.
3-2-41	R	TRIBEDI, B. P., M.B. (CAL.), D.B. (LOND.), *Professor of Pathology and Bacteriologist to the Government of Bengal.* Medical College, Calcutta.
1-1-45	R	TRIPATHY, Ramsanker, *Journalist.* 160 Harrison Road, Calcutta.
3-5-48	R	TRIPATHI Yogendra R., M.Sc., Asst. Research Officer, Central Inland Fisheries Research Station, 2/B Outram Street, Calcutta.
6-2-44	F	TRIVEDI, Prabhashanker Keshavji, B.A. (LOND.), POSTE RESTANTE. Arusha, T.T., B.E., Africa.
3-3-47	N	TRIVEDI, Vipin Behari, M.A. (CAL.), *Lecturer in Hindi,* Lucknow University, Lucknow U.P.
5-2-45	R	TUFNELL-BARRETT, Hugh, C.I.E., I.C.S., *U.S.* Club, Calcutta.
2-9-46	R	TYABJI, Akbar H. B., c/o Bird & Co., Chartered Bank Buildings, Calcutta 1.
3-5-43	R	TYSON, G. W., C.I.E., *Editor, 'Capital'.* 4 Lyons Range, First Floor, Calcutta.
7-1-46	R	VEIL, Amulya Chandra, M.B. (Cal.), M.S.P.E., F.S.M.F.B. (Hon.Causa), F.N.I. 3 Creek Row, Calcutta.

Date of Eletion.		
5-5-47	R	UPADHYAYA, Rupnarain, M.A., *Research Scholar*, 161/1/1 Harrison Road, Madho Bhaban, Calcutta.
4-11-46	N	VARMA, Kailas Chandra, *Manager, Systems Department, Remington Rand, Inc. & Taluqdar*, c/o Remington Rand Inc., Kashmere Gate, Delhi.
2-12-46	R	VENKATAKRISHNAN, N. S., M.A., A.I.C.W.A., *Cost Accountant, Messrs. Jardine Skinner & Co.* 4 Clive Street, Calcutta.
3-4-44	R	VENKATARAMAYYA, Pappa, B.E., A.A.I.E.E. c/o The Office of the Electric Commissioner with the Government of India, 4 Hastings Street, Calcutta (Present address not known).
7-4-41	N	VICARY, Rev. Thomas C., M.A. (LOND.), A.K.C., *Missionary, Principal, Union Christian Training College.* Berhampore, Bengal.
3-12-45	N	VIJAYAJI, Muni Ratna Prabha, Maharajah Sri, M. D. (N. Y.), *Member, Bombay Branch, R.A.S., Acharya Maharaja Sriman Nemisurisvari, Panchra Pole Upashraya.* Panjra Pole Ahmedabad.
6-3-01	L	*VOGEL, Jean Philippe, LITTD.D., F.R.A.S.B. Louise de Colignylaan. 19, Oegstgust, near Leinden, Netherlands.
27-9-94	L	VOST, William, LT.-COL., I.M.S. 'Woodhurst'. Manor Way, South Rand, Inc. & Taluqdar, c/o Remington Rand Inc., Kashmir Gate, Croydon, Surrey, England.
4-11-46	R	WADDINGTON, Hilary, *Superintendent, Archaeological Survey of India*: U.S. Club, Calcutta.
6-5-25	N	*WADIA, D. N., M.A., D.Sc., F.R.G.S., F.N.I., F.R.A.S.B., *Geological Adviser to the Planning and Development Department, Government of India.* New Delhi.
3-3-47	N	WADOOD, Qazi Abdul, B.A., Hons. (CANTAB.), *Barrister-at-Law*, Bhawarpokhar, Bankipur, Patna.
5-3-28	R	WAIGHT, Harry George, M.A. (OXON), Ph.D., I.C.S. United Service Club, Calcutta 16.
2-4-45	R	WARREN, Patrick Francis Sutherland, B.A. (HONS.), (CANTAB.), A.M.I.C.E., A.M.I.E. (INDIA), *Managing Director & Chairman, Jessop & Co. Ltd.* 93 Clive Street (9 Asoka Road), Calcutta.
6-5-46	R	WATERS, Hugh Clough, Solicitor, *Partner, Messrs. Orr Dignam & Co.* 32 Dalhousie Square, Calcutta.
2-7-45	N	WATSON, Francis Leslie, *Director, Research & Reference Division, Information & Broadcasting Department.* Old Secretariat Building, Civil Lines, Delhi.

Date of Election		
7-5-45	L	WATT, Joseph Herbert Saltmarsh, B.Sc., MAJOR, R.A.O.C., F.R.Econs-S., St. Catherines, 286 Havant Road Drayton, Portsmouth England.
6-3-33	N	WELLSTED, Thomas Arthur, A.R.S.M., B.Sc., ASSOC. INST.M.M., *Mining Engineer*. Mansar, P.O. Kandri, Ramtek, C.P.
6-2-33	N	WEST, William Dixon, M.A., Sc.D. (CANTAB.), F.N.I., *Director, Geological Survey of India*. 27 Chowringhee, Calcutta.
1-11-26	R	WESTCOTT, Foss, Most Reverend, D.D. (CANTAB.), HONORARY *D.D.* (OXON), *Lord Bishop of Calcutta and Metropolitan of India, Burma and Ceylon* (*retd.*). c/o Bishop's House, 51 Chowringhee. Calcutta.
19-9-06	L	*WHITEHEAD, Richard Bertram, LITT.D., F.R.A·S.B., I.C·S. (retd.). 30 Millington Road, Cambridge, England.
7-9-36	R	WILLIAMS, N. T., Messrs. Orr Dignam & Co. 101/1 Clive Street, Calcutta.
2-4-45	R	WILLIS, R. H., *Company Director*. Wellesley Place, Calcutta.
5-3-45	F	WISE, John Mal, *Horologist and Jeweller*, H.I.A., N.G.S. 5300 Haddon Avenue Baltimore 7, Md·, U.S.A.
1-4-08	R	WORDSWORTH, William Christopher, C.I.E., ·M.A·, I.E.S. (retd.)· c/o The 'Statesman', Chowringhee Square, Calcutta·
2-10-39	N	ZAFAR HASAN, Maulvi, Khan Bahadur, O.B.E. Nasheman, Delhi Gate, Delhi (Present address not known).
7-6-43	R	ZAKARIAH, Abu Kazem Mohammed, *Ex-Mayor of the City of Calcutta; Ex-Member, Calcutta Port Trust; Fellow, Calcutta University*. 68 Syed Ameer Ali Avenue, Calcutta.
3-3-47	N	ZAMINDAR, N. C., M.A., Convenor, Malav Itihasa Mandal, Bada Rawla, Juni Indore, Indore City.

SPECIAL ANNIVERSARY HONORARY MEMBERS

Date of Election.	*(Science)*
15-1-34	ALBERT EINSTEIN, c/o Princeton University, New Jersey, U.S.A.
15-1-34	M. A. LACROIX, Secretaire Perpetual, Academie des Sciences, Paris.
15-1-34	SIR SVEN HEDIN, Stockholm, Sweden.
7-2-44	PROF. A. V. HILL, F.R.S., 16 Bishopswood Road, High Gate, London, W 6.

(Letters)

15-1-34	SIR JOHN H. MARSHALL, KT., C.I.E., LITT.D., F.S.A., F.B.A., c/o Messrs. Grindlay & Co., Ltd. 54 Parliament Street, London.
15-1-34	TAHA HOSAIN, Cairo.
15-1-34	ARTHUR CHRISTENSEN, 62 Raadhusvej. Charlottenlund, Denmark.
15-1-34	J. VAN KAN, President, Royal Society of Arts and Letters, Batavia, Java.
7-2-44	LI FONG-KWEI, A.B., M A., Ph.D., Fellow, Academia Sinica, Chungking, China.

ASSOCIATE MEMBERS

Date of Election.	
2-11-42	*P. C. SEN-GUPTA, M.A., *Retired Professor of Mathematics, Bethune College.* 3-B Deshapriya Park Road, Kalighat, Calcutta.
3-12-45	REV. F. A. PETER. Kangra Mission, Palampur, Kangra District, Punjab.
3-12-45	V. VEDANTATIRTHA, M.A. 8/4E Nepal Bhattacharya Lane, Kalighat, Calcutta.
1-12-47	JOGENDRANATH GUPTA. Mahanirvan Road, Kalighat, Calcutta.
28-10-29	†N. C. VEDANTATIRTHA, M.A. Bagchi Bhattacharya, Sanrehya tirtha, Mimamsatirtha, Tattwaratna, Sastri, P.O. South Garia, 24 Parganas.

*Re-elected for a further of five years on 5-7-1948 under Rule 20.

†Re-elected for a further period of five years on 1-12-47 Rule 20.

INSTITUTIONAL MEMBERS

Date of Election.	
28-10-29	Legatum Warnerianum (Oriental) Department), University of Leyden, Leyden, Holland.
2-12-29	Adyar Library, Adyar, Madras S.
4-5-31	Banaras Hindu University Library, Banaras.
7-12-31	Ohtani University Library, Kyoto, Japan.
30-10-33	Annamalai University Library, Annamalainagar, Chidambaram. S. India.
30-4-34	Allahabad University Library, Allahabad.
6-1-36	Bombay University Library, Bombay.
4-5-36	Annamalai University Library, Annamalainagar, Chidambaram, S. India. 5
7-12-36	Islamia College, Peshawar.
4-1-37	Patna College, Patna.
7-6-37	Forest Research Institute, Dehra Dun.
7-2-44	Dacca University, Dacca.
7-8-44	Agra University, Agra.
5-11-45	Gaudiya Missian. Calcutta.
5-11-45	Calcutta University Library, Calcutta.
2-12-46	New Asiatic Vedic Research Society, Jaipur City.
5-11-45	All-India Radio, Calcutta.
3-12-46	The Museum of the Burma Oil Company (India Concessions) Ltd.
5-6-48	Delegation Archaeologique en Afganisthan.

ORDINARY FELLOWS

Date of Election.	
5-2-13	J. Ph. Vogel, Ph.D., Litt.D.
2-2-16	Sir L. L. Fermor, Kt., O.B.E., A.R.S.M., D.Sc., F.G.S,, M.Inst.M.M., F.R.S.
7-2-17	F. H. Gravely, D.Sc., F.N.I.
6-2-18	J. L. Simonsen, D.Sc., F.I.C., F.R.S.
5-2-19	J. Coggin Brown, O.B.E., M.I.M.E., F.G.S.
5-2-19	D. R. Bhandarkar, M.A., Ph.D.
5-2-19	R. B. Seymour Sewell, C.I.E., M.A., Sc.D., M.R.C.S., L.R.C.P., F.L.S., F.Z.S., F.R.S., F,N,I,
6-2-28	H. E. Stapleton, M.A., D.Litt., B.Sc.
6-2-28	B. Prasad, O.B.E., D.Sc., F.Z.S., F.R.S.E., F.N,I,
6-2-28	C. A. Bentley, C.I.E., M.B., D.P.H., D.T.M. & H
4-2-29	Sir Edward D. Maclagan, K.C.S.I., R.C.I.E.
3-2-30	S. L. Hora, D.Sc., F.Z.S., F.R.S.E., F.N,I,
3-2-30	J. P. Mills, C.I.E., I.C.S., M.A., J.P., F.N,I,
3-2-30	Meghnad Saha, D.Sc., F.R.S., F.N.I.
2-2-31	Sir R. N. Chopra, Kt., C.I.E., M.A., M.D., Sc.D., F.N,I,
2-2-31	R. B. Whitehead, Litt.D.
1-2-32	J. Bocot.
6-2-33	Percy Brown, O.B.E., A.R.C.A.

Date of Election.	
6-2-33	Ordhendra Coomar Gangoly. B.A.
5-2-34	D. N. Wadia, M.A., B.Sc., F.R.G.S., F.N.I.
3-2-36	Suniti Kumar Chatterji, M.A., D.Litt.
3-2-36	A. M. Heron, D. Sc., F.Sc., F.G.S., F.R.G.S., F,R,S,E,, F,N,I.
15-2-37	H. M. Habib-ur-Rahman Khan, D.Th.
15-2-37	K. N. Bahl, D.Sc., D.Phil., F.N.I.
15-2-37	N. N. Law, M.A., B.L., Ph.D.
6-2-39	J. N. Mukherjee, C.B.E., D.Sc., F.N.I.
6-2-39	Sir Cyril S. Fox, Kt., D.Sc., M.I.M.E., F.G.S., F.N.I,
5-2-40	B. S. Guha, M.A., A.M., Ph.D., F.N.I.
5-2-40	U. N. Ghoshal, M.A., Ph.D.
5-2-40	B. C. Law, M.A., B.L., Ph.D., D.Litt., F.R.G.S,
1-2-43	R. C. Majumdar, M.A., Ph.D.
7-2-44	H. S. Pruthi, M.Sc., Ph.D., F.N.I.
5-2-45	Sir J. C. Ghosh, Kt., D.Sc., F.N.I.
4-2-46	G. S. Bose, M.B., D.Sc., F.N.I.
4-2-46	P. C. Bagchi, M.A., Dr.-es-Lettres.
4-2-46	Dr. (Miss.) Roma Chaudhuri, M.A., D.Phil (Oxon).
4-2-46	Dr. H. C. Ray-Chaudhuri, M.A., Ph.D.
4-2-46	Dr. W. D. West, M.A., Sc.D. (Cantab.), F.N.I.
3-2-47	Dr. Verrier Elwin, D.Sc. (Oxon.), F.N.I.
3-2-47	Dr. Radhakumud Mookerjee, M.A., Ph.D.
3-2-47	Lt.-Col. C. L. Pasricha, M.A., M.B., B.Chir. (Cantab.), M.R.C.S., L.R.C.P., I.M.S., F.N.I,

HONORARY FELLOWS

Date of Election.	
4-2-20	A. FOUCHER, D. Litt. Boulevard Raspail 286, Paris, XVI.
4-2-20	SIR ARTHUR KEITH, M.D., F.R.C.S., LL.D., F.R.S.A. *Lately Hunterian Professor at the Royal College of Surgeons of England.* Buckston Browne Farm, Downe, Farnborough, Kent, England.
4-2-20	R. D. OLDHAM, F.R.S., F.G.S., F.R.G.S., 1 Broomfield Road, Kew, Survey, England.
4-2-20	J. TAKAKSU, Imperial University of Tokyo, Tokyo, Japan.
2-3-21	F. W. THOMAS, C.I.E., M.A., Ph.D., *Boden Professor of Sanskrit, University of Oxford.* 161 Woodstock Road, Oxford, England.
7-6-22	SIR THOMAS HOLLAND, K.C.S.I., K.C.I.E., D.Sc., F.R.S., The University, Edinburgh, Scotland.
7-6-22	SIR LEONARD ROGERS, Kt., F.C.S.I., C.I.E., M.D., Ll.D., F.R.C.P., F.R.S. 14 Heath Drive, London, N.W.3.
7-1-25	STEN KONOW. Ethnographisk Museum, Oslo, Norway.
7-3-27	RT. HON'BLE THE EARL OF LYTTON, P.C., G.C.S.I., G.C.I.E. Knebworth, Herts, England.

Date of Election.	
5-5-30	SIR ROBERT ROBINSON, M.A., F.R.I.C., LL.D., F.R.S.E., D.Sc., F.R.S., *Waynflete Professor of Chemistry in the University of Oxford.* The Dyson Perrins Laboratory, South Parks Road, Oxford, England.
7-2-38	RT. HON'BLE, SIR JOHN ANDERSON, P.C., G.C.B., G.C.I.E., G.C.S.I., C.B., K.C.B. *Chancellor of the Exchequer.* 4 *Chancellor, Benares Hindu University.* Benares. Lord North Street, Westminister, S.W.I. England.
4-9-30	SIR S. RADHAKRISHNAN, Kt., M.A., D.Litt., F.B.A., *Banaras Hindu University,* Banaras.
4-9-30	THE MOST HON'BLE THE MARQUESS OF ZETLAND, K.G., P.C., G.C.S.I., G.C.I.E., LL.D., D.Litt., F.B.A, Aske, Richmond, Yorkshire, England.
4-9-30	SIR JADUNATH SARKAR, Kt., C.I.E., M.A., D.Litt., 10, Lake Terrace, Calcutta 29.

CHANGES IN MEMBERSHIP

LOSS OF MEMBERS DURING 1947-1948.

BY RETIREMENT.

I. A. Clark (1945)
Subodh Ch. Bose (1946)
G. G. Franklin (1945)
M. N. Dutt (1945)
Faqir Ahmed (1946)
M. H. Kashani (1945)
Sunny Gupta (1946)
A. S. M. Akram (1945)
J. C. De (1929)
Bishop B.T. Badley (1945)
R. H. Asham-Capell (1946)
Mrs. Ramola Sinha (1947)
A C. Banerjee (1947)
S. Singh Roy (1946)
Mrs. S. Chaudhury (1946)
R. N. Sinha (1945)
S. N. Bhattacharya (1946)
J. Aitken
G. Galstaun (1926)
M. Fouchet (1946)
Mrs. Rita Ray (1945)
H. P. Ganeriwala (1945)
P. K. Goopta (1946)
K. Khandelwal (1945)
T. G. May (1945)
Sir D. Cumberbatch (1946)
F. R. Goadby (1946)

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S. A. Das (1944)
Sir B. P. Singh Roy (1946)
E. H. Shuttleworth (1946)
G. B. Hedley (1945)
H. D. Khandewal (1946)
Rev. C. F. Ball (1944)
Ramabhadran (1943)
N. R. Das Gupta (1946)
D. Schlumberger (1946)
W. Taneja (1947)
L. L. Hodson (1940)
P. Norton Jones (1946)
H. P. Bagaria (1945)
U. S. Rao (1945)
K. N. Mukherjee (1946)
K. B. Roy (1945)
Sashi Bhusan Mandal (1946)
Amiya Kumar Ganguli (1945)
Arun Ganguli (1945)
H. F. Mooney (1946)
C. O. Tattersall (1946)
T. N. Banerjea (1946)
Wm. C. Patton (1947)
J. H. O'Hagan (1946)
M. Gupta (1947)
Raja B. N. Ray Chowdhury of Santosh (1945)
Thomas S. Bloodworth, Jr. (1947)
R. L. C. Footit (1945)
C. R. Stonor (1947)

By Death.

Ordinary Members.

P. K. Day (1946)
Nicholas Roerich (L.M., 1928)
Dr. B. M. Barua (O.F. 1948)
S. Das Gupta (1944)
Lt.-Col. Ambhuj Nath Bose (1936)
Hon ble John Clough (1931)

UNDER RULES 38

J. C. Bhattacharya (5-8-43)
A. Bramhachari (3-7-44)
Sir A. Chatterjee (27-10-15)
J. M. Chaudhuri (2-10-44)
Harigopal Chatterjee (2-10-44)
B. B. Chatterjee (5-3-45)
J. C. De (3-6-40)
L. C. Finch (7-5-45)
H. M. A. Hai (4-1-43)
P. D. Low (2-4-45)
G. H. Mason (5-3-45)
Hariram Patel (2-8-44)

K. R. Savarja (5-3-45)
Mowdadoor Rahman (2-4-45)

UNDER RULES 40

A. E. R. Bruce (4-3-40)
K. C. Mahindra (8-2-24)
J. R. K. Modi (1-11-26)
H. I. Poleman (3-6-40)

MEDALLISTS

ELLIOTT GOLD MEDAL AND CASH

RECIPIENTS.

1893   Chandra Kanta Basu.
1895   Yati Bhusana Bhaduri.
1896   Jnan Saran Chakravarti.
1897   Sarasi Lal Sarkar.
1901   Sarasi Lal Sarkar.
1904   Sarasi Lal Sarkar.
       Surendra Nath Maitra.
1907   Akshoy Kumar Mazumdar.
1911   Jitendra Nath Rakshit.
       Jitendra Mohan Datta.
1913   Rasik Lal Datta.
       Saradakanta Ganguly.
       Nagendra Chandra Nag.
       Nilratan Dhar.
1918   Bibhutibhushan Dutta.
1919   Jnanendra Chandra Ghosh.
1922   Abani Bhusan Datta.
1923   Bhailal M. Amin.
1926   Bidhu Bhusan Ray.
1927   Kalipada Biswas.
1931   T. C. N. Singh.
1932   P. N. Das-Gupta.
1933   Nirmal Kumar Sen.
1934   D. P. Roy Chowdhury.
1935   Kalipada Biswas.
1937   Pulin Behari Sarkar.
1939   P. K. Chatterjee.
1941   M. C. Nath.
1944   S. K. Chakravarti.

BARCLAY MEMORIAL MEDAL

RECIPIENTS.

1901   E. Ernest Green.
1903   Sir Ronald Ross, Kt., K.C.B., K.C M.G., M.R.C.S., F.R.C.S.,
       D.P.H., LL.D.., D.Sc., M.D., F.R.S.
1905   D. D. Cunningham, C.I.E., F.R S.

1907   A. W. Alcock, C.I.E., M.B., LL.D., F.R.S.
1909   Sir David Prain, Kt., C.I.E., C.M.G., M.A., M.B., LL.D.,
       F.R.S.E., F.L.S., F.Z.S., M.R.I.A., F.R.S.
1911   Carl Diener.
1913   William Glen Liston, C.I.E., M.D., D.P.H.
1915   J. S. Gamble, C.I.E., M.A., F.R.S.
1917   H. H. Godwin-Austen, F.R.S., F.Z.S., F.R.G.S.
1919   N. Annandale, C.I.E., D.Sc., C.M.Z.S., F.L.S., F.R.S.
1921   Sir Leonard Rogers, Kt., C.I.E., M.D., B.S., F.R.C.P., F.R.C.S.,
       F.R.S.
1923   Sir Samuel Christophers, Kt., C.I.E., O.B.E., F.R.S., M.B.
1925   J. Stephenson, C.I.E. B.Sc., M.B., Ch.B., F.R.S., F.R.C.S.,
       F.R.S.E.
1927   S. W. Kemp, B.A., D.Sc., F.R.S., F.R.A.S.B.
1929   Sir Albert Howard, Kt., C.I.E., M.A.
1931   R. B. S. Sewell, C.I.E., M.A., Sc.D., M.R.C.S., L.R.C.P.,
       F.Z.S., F.L.S., F.R.A.S.B., F.R.S.
1933   R. Row, O.B.E., D.Sc.
1935   B. Sahni, M.A., Sc.D., D.Sc., F.G.S., F.R.S., F.R.A.S.B.
1937   Sir R. N. Chopra, Kt., C.I.E., M.A., M.D., F.R.A.S.B.
1939   Sir R. McCarrison, Kt., C.I.E., M.D., D.Sc., F.R.C.P., LL.D.,
       K.H.P.
1941   Sir David Prain, Kt., C.M.G., C.I.E., M.A., LL.D., F.R.S.E.,
       F.R.S., F.L.S., F.Z.S., M.R.I.A.
1943   Rai Sir U. N. Brahmachari Bahadur, Kt., M.A., M.D., Ph.D.,
       F.S.M.F., F.R.A.S.B.
1945   Hem Singh Pruthi, M.Sc., Ph.D., Sc.D. (Cantab.), F.N.I.,
       F.R.A.S.B.
1947   Rai Bahadur K. C. Mehta, M.Sc., Ph.D., Sc.D. (Cantab.)

1947   SIR WILLIAM JONES MEMORIAL MEDAL

RECIPIENTS.

1927   Sir Malcolm Watson, Kt., LL.D., M.D., C.M., D.P.H.
1928   Sir George A. Grierson, K.C.I.E., O.M., Ph.D., D.Litt., LL.D.,
       F.B.A.
1930   Felix H. D'Herelle.
1932   C. Snouck Hurgronje.
1934   Rai Sir U. N. Brahmachari Bahadur, Kt., M.A., M.D., Ph.D.,
       F.S.M.F., F.R.A.S.B.
1937   A. J. Wensinck.
1940   Sir Prafulla Chandra Ray, Kt., C.I.E., D.Sc., F.R.A.S.B., F.N.I.
1943   Sir S. Radhakrishnan, Kt., M.A., D.Litt., F.B.A.
1947   Prof. M. N. Saha, D.Sc., F.R.S.

ANNANDALE MEMORIAL MEDAL

1930   Charles Gabriel Seligman, M.D., F.R.C.P., F.R.S.
1933   Eugene Dubois.
1936   John Henry Hutton, C.I.E., M.A., D.Sc., F.R.A.S.B.

1939 Frank Weidenreich.
1942 B. S. Guha, M.A., A.M., Ph.D., F.N.I., F.R.A.S.B.
1945 R. B. S. Seymour Sewell, Lt.-Col., C.D.E., M.A., Sc.D. (Cantab),
      M.R.C.S., L.R.C.P., F.Z.S., F.L.S., F.R.S, F.R.A.S.B, F.N.D.

JOY GOBIND LAW MEMORIAL MEDAL

Recipients.

1929 Max Weber.
1932 Ernst J. O. Hartert, Ph.D.
1935 Leo Semenowitch Berg.

1938 Baini Prasad, O.B.E., D.Sc., F.Z.S., F.R.S.E., F.R.A.S B.
1941 K. N. Bahl, D.Sc., D.Phil., F.N.I., F.R.A.S.B.
1944 S. L. Hora, D.Sc., F.Z.S., F.R.S.E., F.N.I., F R.A.S.B.

PAUL JOHANNES BRUHL MEMORIAL MEDAL

Recipients.

1931 Ethelbert Blatter, S.J.
1934 Isaac Henry Burkill, M.A.
1938 Sir David Prain, Kt., F.R.S.
1942 R. B. G. N. Rangaswami Ayyangar, F.N.I.
1944 N. L. Bor, D.Sc.
1947 Prof. S. R. Bose, M.A., Ph.D., F.N.I.

INDIAN SCIENCE CONGRESS MEDAL, CALCUTTA

1935 Meghnad Saha, D.Sc., F.R.S., F.R.A.S.B.
1938 Sir James H. Jeans, D.Sc., Sc.D., Ll.D., F.I.C., F.R.S.

PRAMATHA NATH BOSE MEMORIAL MEDAL

Recipients.

1943 Sir Lewis L. Fermor, Kt., F.R.S.
1947 D. N. Wadia, M.A., B.Sc., F.R.G.S., F.R.A.S.B., F.N.I.

DR. BIMALA CHURN LAW GOLD MEDAL

Recipients.

1943 Suniti Kumar Chatterji, M.A., D.Litt., F.R.A.S.B.
1944 D. R. Bhandarkar, M A., Ph.D., F.R.A.S.B.
1945 Percy Brown, M.B.E., A.R.C.A., F.R.A.S.B.
1946 Sir John Marshall, C.I.E.,
1947 Dr. B. M. Barica, M.A., Ph.D.

SARAT CHANDRA ROY MEMORIAL MEDAL

Recipients.

1944 Verrier Elwin, D.Sc., F.N.I..
1945 J. P. Mills, C.I.E., I.C.S., F.R.A.S.B.
1946 W. V. Grigson, I.C.S.

PROCEEDINGS OF THE ORDINARY MONTHLY MEETINGS, 1948

Monday, the 5th January, 1948, at 5-30 p.m.

Present:

Dr. B C Law, M.A., B.L., Ph.D., D.Litt., F.R.A.S.B., F.R.G.S.
President, in the Chair.

Members:

Agrawal, Mr. B. M.; Bhattacharya, Mr. N. C.; Bloodworth, Mr. T. S.; Chakravarty, Mr. D. C.; Chakravarty, Mr. P.; Das, Mr. J. N.; Das Gupta, Mr. T.; Guha, Mr. D.; Gupta, Mr. A. R.; Ishaque, Dr. M.; Mohiyuddin, Dr. A. H. M.; Mookerjea, Mr. A.; Roy, Dr. Nihar-ranjan; Saha, Dr. M. N.; Waddington, Mr. H.
and others.

At the outset Mr. B. M. Agrawal, on behalf of the Society, offered hearty congratulations to the President, Dr. Bimala Churn Law for the conferment upon him of a Doctorate of Literature (*Honoris Causa*) by the Allahabad University on the occasion of the Silver Jubilee Celebrations of its foundation.

The Chairman, on behalf of the Society, offered hearty congratulations to Dr. W. D. West, President-elect of the Society for 1948, on the conferment upon him of the distinction of C.I.E. by His Majesty the King, on the New Year's Day.

The minutes of the last meeting, held on 1st December, 1947, were then read and confirmed.

The General Secretary reported the presentation of the following books received in November which were exhibited:—

Bhattacharji, H.—Hand-book of Sugar and Gur Industry, Calcutta, 1947. (*Presented by the author.*)

Bhattacharji, H.—An Improved method of making Sugar-candy (with Special reference to Palm-candy or Tal-Misri), Calcutta, 1947. (*Presented by the author.*)

Bloch, Jules.—Structure Grammaicale des langues Dravidiennes. Paris, 1946. (*Presented by the Ministere de L'Education Nationals, Paris.*)

Dharma-samuccaya, I-IV (Pt. 1). Paris, 1946. (*Presented by the Ministere de L'Education Nationale, Paris*).

Chakravarti, P. B.—Chota Nagpur Raj. Ranchi. (*Presented by the author.*)

Pithawalla, M. B.—Location of the original Aryan Home and other Early Aryan Settlements. Karachi, 1946. (*Presented by the author.*)

Swami Sadananda.—Pancatirtha. Calcutta, 1946. (*Presented by the author.*)

Swami Sadananda.—Balidwipa. Calcutta, 1944. (*Presented by the author.*)

Danish Ministry of Foreign Affairs.—Denmark, 1947. (*Presented by the Danish Government Trade Commissioner in India.*)

Gadre, A. S.—Archaeology in Baroda (1934-47). Baroda, 1947. (*Presented by the Director of Archaeology, Baroda.*)

Royal Society—Newton Tercentenary Celebrations, July 1946. London, 1947. (*Presented by the Royal Society.*)

Les Prix Nobel en 1945.—Stockholm, 1947. (*Presented by the author.*)

The General Secretary then submitted the following reports and communications from the Council.

1. H.E. the Governor-General of the Pakistan Dominion regrets his inability to be the patron of the Society on the ground that it is a provincial organisation.

2. The Council nominated Dr. R. C. Majumdar, Vice-President to represent the Society on the Advisory Board of Archaeology in India, in place of the Hon'ble Mr. Justice N. G. A. Edgley, Kt.

3. The Council nominated Mr. M. Mohibbul Hasan Khan, M.A. to represent the Society on the Indian Historical Records Commission (Publication Section) for a period of five years with effect from 1947.

The following loss of membership, since the last meeting, was reported :—

(A) By deaths :—

(1) Sir Albert Howard (A Life Member, 1923; An Ord. Fellow, 1929).

(B) By resignation :—

(1) P. E. A. Johnson-Marshall (An Ord. Member, 1943).

The undermentioned lapses of Election under Rule 9 were reported :—

(1) A. K. Mathur (Elected on 1-9-47).
(2) Ali Ahmed (Elected on 1-9-47).
(3) P. K. Sur (Elected on 1-9-47).

Mr. B. M. Agrawal gave notice of the following motion to be moved at the next Monthly Meeting under Rule 47-d :—

"*That the Council prepare a scheme for pushing the sales of the Society's publications and put up such scheme within two months from date.*"

The Chairman announced that the Council recommended the election of Dr. D. R. Bhanderkar, M.A., Ph.D., F.R.A.S.B., as an

Honorary Fellow of the Society as prescribed in Rule 13 and stated the grounds on which the recommendation was made.

The President announced that, in accordance with Rule 38, the names of the following Ordinary Members would be suspended as defaulters within the Society's building to be removed from the Society's registers for non-payment, unless the amount due was paid before the next Ordinary Monthly Meeting in February, 1948:—

1. J. F. Bagnall.
2. J. C. Bhattacharya.
3. Asutosh Bharmachari.
4. Sir Atul Chatterjee.
5. Ashoke Chatterjee.
6. P. Claque.
7. J. M. Chaudhuri.
8. B. R. Chatterjee.
9. K. K. Chatterji.
10. H. G. Chatterjee.
11. B. B. Chatterjee.
12. J. C. De.
13. S. L. Dugar.
14. L. C. Finch.

15. H. C. Gupta.
16. H. M. A. Hai.
17. P. D. Low.
18. J. C. Mukherji.
19. G. H. Mason.
20. Sir K. Nazimuddin.
21. H. R. Patel.
22. B. N. Ray Chaudhuri.
23. M. Rahman.
24. M. Shariff.
25. K. R. Savaria.
26. P. K. Subramaniyam.
27. H. G. Waight.

The following papers were read:—

(1) Bimala Churn Law.—*Mithilá, an ancient City.*

An attempt has been made here to present a short account of the ancient city of Mithila, the well-known capital of Videha. The information has been gathered from all available sources, Brahmanical, Jain, and Buddhist. Videha once a very powerful kingdom rose into importance and flourished side by side with Kasi and Kosala, Kuru and Pancala. Videha as a kingdom does not find mention in the Rigveda. The Satapatha Brahmana alone speaks of the past glory of the ancient kings of Mithila, particularly of its philosopher king Janaka, and great Brahmin philosopher Yajnavalka, It tells us that Mathava Videgha was the first king of Videha. Buddhist legends mention Makhadeva or Maghadeva as the first king, who was the progenitor of the long line of the Janakas. The first Janaka from whom the dynasty took its name was the third king of the family, the son of Nimi and grandson of Makhadeva. The Ramayana traces the dynasty from Nimi whose son was Mithi and grandson, Janaka the first. The royal house of Janaka of Mithila was matrimonially connected with that of Dasaratha of Ayodhya. Janaka, the foster father of Sita, is known as Siradhvaja Janaka. The Mahabharata and Jatakas pay high tribute to Janaka who was the greatest among the Janakas. The Videhan kings earned their reputation as much for their learning, good rule, and promotion of the cause of religion and culture, as for the great example of renunciation set by them. The Janaka was one of the Iksvaku lines of Ksatriyas of the solar race. In the Jatakas and other texts we have mention of a few other kings of Videha-Mithila under the Pala rulers came to be included in Tirabhukti (modern Tirhut) below Nepal. This is indeed the ancient location of Mithila as found in the Mahabharata. Mithila never ceased to be

an important seat of Brahmanism and Brahmanical learning, and it maintained this position up to a late period of Indian history.

(2) Devaprasad Guha.—*Metres in the Jatakas—Catukkanipata.*

An attempt has been made in this paper to make a critical analysis of the metres in the verses of the catukkanipata of the Jatakas. The stanzas, two hundred in number, have been broadly divided into two groups, viz. dimeter and trimeter. The dimeter verses have been sub-divided into four main sub-groups, viz. pure anustubh, mahapankti, pure, and irregular epic anustubh. The trimeter includes in it the two main varieties of tristubh and jagati. Besides, there is a mis-cellaneous section which includes stanzas that do not come under the classes mentioned above. The paper also contains some relevant general observations on the points discussed. A few table are sup-plied to indicate the frequency of rhythms in the dimeter verses.

The Chairman then announced that the Annual Meeting of the Society would be held on Monday, the 2nd February at 4 p.m.

Monday 2nd February, 1948, immediately after the adjournment of the Annual Meeting.

Present:

Dr. S. L. Hora, Vice-President (in the Chair).

Members:

Agrawal, Mr. B. M.; Banerjee, Dr. J. N.; Biswas, Dr. K.; Goadby, Maj. Gen. F. R. L.; Habibullah, Dr. A. B. M.; Job, Dr. T. J.; Nag, Dr. K.; Saraswati, Mr. S. K.; Sondhi, Mr. V. P.
and others.

At the outset, the Chairman announced that a national tragedy to India had happened on account of the death of Mahatma Gandhi. He then passed the following condolence resolution on behalf of the Society, all present standing:

"Few men have weilded so momentous an influence on the history of our times as late Mahatma Gandhi who strove for the independence of India. His deep humanity, profoundly religious nature, clear vision and tenacity awoke in the oppressed people of India a sense of their d dignity and a resolution to strive for their independence.

"The Society places on record its great sorrow at the demise of Mahatma Gandhi who throughout his life struggled for the independence of India and attained it for its people".

The Chairman then adjourned the meeting to the 16th February, 1948 to be held immediately after the adjournment of the Annual Meeting.

An Ordinary Monthly Meeting (adjourned from 2nd February) of the Royal Asiatic Society of Bengal was held on Monday, the 16th February, 1948, immediately after the termination of the Annual Meeting.

Present:

Dr. Bimala Churn Law (Vice-President) in the Chair.

Members:

Agrawal, Mr. B. M.; Bagchi, Dr. K. N.; Barua, Dr. B. M.; Basu, Mr. Jna; Batia, Mr. C. M.; Chakravarty, Mr. P.; Chanda, Mr. A. K. Das-Gupta, Dr. C. C.; Edgley, Sir Norman; Fawcus, Mr. L. R.; Guha, Mr. D.; Mukherji, R. B. B. B.; Trivedi, Mr. V. B.; Vendantatirtha, Mr. N. C.; *and others.*

The minutes of the last meeting held on the 5th January, 1948 were confirmed.

At the outset the General Secretary submitted to the meeting a requisition, signed by 8 Ordinary Members that the following names of candidates for membership be suspended in terms of Rule No. 5 :—

(1) *Ghosh, Subodh Kumar*, M.Sc. (Cal.), Rai Bahadur, 5-P-14Q Middle Road, Entally, Calcutta.

Proposer: K. N. Bagchi. *Seconder*: H. Waddington.

(2) *Bhaduri, Jnanendra Lal*, D.Sc. (Edin.), Lecturer in Zoology, University of Calcutta, 10/2, Abinash Mitra Lane, Calcutta 6.

Proposer: S. C. Law. *Seconder*: B. C. Law.

(3) *Khaitan, Mrs. Kumudini*, B.A., 'Debikay', 25 Ballygunge Circular Road, Calcutta.

Proposer: K. P. Khaitan. *Seconder*: K. N. Bagchi.

(4) *Khaitan, Rudranarayan*, B.Com., 'Debikay', 25 Ballygunge Circular Road, Calcutta.

Proposer: K. P. Khaitan. *Seconder*: K. N. Bagchi.

(5) *Mehra, Pratap Narain*, M.A., Late Lecturer St. Stephen's College, Delhi 12II Park Street, Calcutta.

Proposer: A. N. Sen. *Seconder*: N. Ray.

(6) *Mukherji, Sachindra Nath*, L.E., (Benares), A.I.E.E. (Lond.), Committee Member of the Institution of Electrical Engineers (London) (Overseas Branch), Electrical Engineer, Senior Technical Assistant, Government Test House, Alipore; P. 18 Lake Road, Calcutta 29.

Proposer: K. N. Bagchi. *Seconder*: R. C. Majumdar.

(7) *Khaitan, G. P.*, Merchant, 1 Commercial Buildings, Calcutta.

Proposer: K. P. Khaitan. *Seconder*: K. N. Bagchi.

(8) *Sarma, Miss Jyotirmoyce*, M.A. (Chicago), Ph.D. (Chicago), Social Anthropologist, Sarma House, Sahapur P.O., Behala, Calcutta.

Proposer: B. S. Guha.   *Seconder*: Miss. U. Chowdhury.

The Chairman passed an order accordingly.

The General Secretary announced the following loss of membership:—

(a) *Deaths*:

   (2) P. K. Dey   (An Ordinary Member, 1946).

(b) *Resignations*:

(2) P. K. Dey	(An Ordinary Member, 1946).
(3) I. A. Clark	(An Ordinary Member, 1945).
(4) Subodh Ch. Bose	(An Ordinary Member, 1946).
(5) G. G. Franklin	(An Ordinary Member, 1945).
(6) M. N. Dutt	(An Ordinary Member, 1945).
(7) Faqir Mohammed	(An Ordinary Member, 1946).
(8) M. H. Kashani	(An Ordinary Member, 1945).
(9) Sunny Gupta	(An Ordinary Member, 1946).
(10) A. S. M. Akram	(An Ordinary Member, 1945).
(11) J. C. De	(An Ordinary Member, 1929).

The Chairman announced that in accordance with Rule 40, the following names would be removed from the Member's List of the Society:—

   (1) A. E. R. Bruce.

   (2) K. C. Mahindra.

   (3) J. R. K. Modi.

   (4) H. I. Poleman.

In accordance with Rule 13, the Chairman called for a ballot for the election as an Honorary Fellow of the Society of Dr. D. R Bhandarkar, M.A., Ph.D., whose name had been proposed for election at the last Ordinary Monthly Meeting.

The Chairman announced the result of the ballot for the election of the Honorary Fellow, and declared that the candidate had been duly elected.

Monday, the 1st March, 1948, at 5-30 p.m.

Present:

Dr. W. D. West President, in the Chair.

Members:

Agrawal, T. N.; Banerjee, J. N.; Basu, Jna.; Bhattacharyya, N. C.; Chakravarti, P. B.; Das, J. N.; Das, Sudhir R.; Das, Tarak Chandra; Ganguli, K. K.; Guha, Devaprasad; Gupta, O. S.; Gupta, P. C.; Job, T. J.; Majumdar, R. F.; Mallya. B. G.; Menon, P. M. G.; Mitra, Miss E.; Mitra, P. C.; Mukerji, P. C.; Ray. Niharranjan; Ray, S.; Saraswati, S. K.; Sen, A. K.; Trivedi, V. P.

and others and 6 visitors.

The General Secretary read the minutes of the last Ordinary Monthly Meeting held on Monday, the 16th February, 1948 for confirmation.

Dr. A. K. Sen, on a point of order, moved that the minutes of the last Annual General Meeting, of the adjourned Extraordinary General Meeting held in 1947, of the Ordinary Monthly Meeting held on the 2nd February, 1948, and of the Extraordinary General Meeting held on the 23rd February, 1948, should first be read and confirmed.

After some discussion, the President ruled that the minutes of an Annual General Meeting should ordinarily be confirmed at the next Annual General Meeting, and that the minutes of a meeting which stands adjourned cannot be read until the meeting is completed. Dr. Sen agreed, however, that as the Rules were not clear on the point, and to meet the wishes of the members present, the minutes of the last Annual General Meeting might be read and confirmed at the next Ordinary Monthly Meeting.

On an objection being raised by a member that the minutes of the last Ordinary Monthly Meeting were incomplete, the President took the vote of the house as to whether the confirmation of the minutes should be postponed to the next Ordinary Monthly Meeting. This was unanimously agreed to.

The General Secretary reported the receipt of the following presentation of books received during December 1947 and January 1948:

Nahata, Agarchandra and Bhambarlal.—Yugapradhana Sri Jinadatta Suri. Calcutta. (*Presented by the authors.*)

Sankaram, A.—Descriptive Catalogue of Kannada Manuscripts. Government Oriental Manuscripts Library, Madras, Vol. IV, 1946. (*Presented by the Oriental Manuscripts Library, Madras.*)

Vedantatirtha. N. C. (ed).—Kusumanjalikarika. Asutosh Sanskrit Series, No. 2. (*Presented by the Editor.*)

The following candidates were ballotted for election as Ordinary Members:

(1) *Ghosh, Subodh Kumar*, M.Sc. (Cal.), Rai Baahadur, 5-P-14K Middle Road, Entally, Calcutta.
Proposer: K. N. Bagchi. *Seconder*: H. Waddington.

(2) *Bhaduri, Jnanendra Lal*, D.Sc., (Edin.), Lecturer in Zoology, University of Calcutta, 10/2, Abinash Mitra Lane, Calcutta 6.
Proposer: S. C. Law, *Seconder*: B. C. Law.

(3) *Khaitan, Mrs. Kumudini*, B.A., 'Debikay', 25 Ballygunge Circular Road, Calcutta.
Proposer: K. P. Khaitan. *Seconder*: K. N. Bagchi.

(4) *Khaitan, Rudranarayan*, B.Com., 'Debikay', 25 Ballygunge Circular Road, Calcutta.
Proposer: K. P. Khaitan. *Seconder*: K. N. Bagchi.

(5) *Mehra, Pratap Narain*, M.A., formerly Lecturer St. Stephen's College, Delhi, 12H Park Street, Calcutta.
Proposer: A. N. Sen. *Seconder*: N. Ray.

(6) *Mukherji, Sachindra Nath*, L.E. (Benares), A.I.E.E. (Lond.) Committee Member of the Institution of Electrical Engineers (London) (Overseas Branch), Electrical Engineer, Senior Technical Assistant, 'Government Test House, Alipore; P. 18 Lake Road, Calcutta 29.
Proposer: K. N. Bagchi. *Seconder*: R. C. Majumdar.

(7) *Khaitan, G. P.* Merchant, 1 Commercial Buildings, Calcutta.
Proposer: K. P. Khaitan. *Seconder*: K. N. Bagchi.

(8) *Sarma, Miss Jyotirmoyee*, M.A. (Chicago), Ph.D· (Chicago), Social Anthropologist, Sarma House, Sahapur P.O., Behala, Calcutta.
Proposer: B. S. Guha. *Seconder*: Miss U. Chowdhury.

(9) *De, Sushil Kumar*, M.A., B.L., (Cal.), D.Litt. (Lond.), F.R.A.S., Formerly Professor and Head of the Department of Sanskrit, Dacca University; 19A Chaudhuri Lane, Shambazar, Calcutta.
Proposer: B. C. Law, *Seconder*: N. C. Law.

(10) *Uddin, Syed Muhammad Imam*, M.A., Lecturer, Islamia College; 22, Daftar Bagh, P.O. Belgachia, Calcutta.
Proposer: V. B. Trivedi. *Seconder*: L. Sukul.

(11) *Prakash, Om*, M.A., LL.B., Research Scholar at Agra College, Sundar Hotel, Agra.
Proposer: T. C. Raparia· *Seconder*: N. Tatia.

(12) *Dutta Roy, R. K.*, M.Sc., Dr. Ing., F.N.I., Chemist, Geological Survey of India, 27 Chowringhee, Calcutta.
Proposer: W. D. West,. *Seconder*: V. P· Sondhi

Dr. N. Roy enquired as to why four applications for membership made on the 20th November, 1947, had been rejected, Dr. Sen raised a point of order as to whether the Council had any right to reject a name proposed for membership.

The President ruled that while the Council had the right to approve the name of a candidate, it had not the power to reject names, and he gave an assurance that he would personally look into the cases of candidates whose names had been rejected during the past two years.

The following members gave notice of motions to be moved at the next Monthly Meeting under Rule 57(d) : —
(1) Mr. B. M. Agrawal.
(2) Dr. A. K. Sen·
(3) Dr. N. Ray.
(4) Mr. T. C. Das.
(5) Mr. N. C. Bhattacharya

On Dr. A. K. Sen's request that the Annual Report for 1947 be discussed at the next Ordinary Monthly Meeting, the President agreed to include it in the agenda of the next meeting.

The following loss of membership since the last meeting was reported : —
(A) By death :
  3. Nicholas Roerich   (A life Member since 1928).

(In connection with the death of Dr. Nicholas Roerich, it was announced that Dr. S. K. Chatterji had been requested to write an obituary notice. The meeting stood in silence as a mark of respect to the deceased member).

(B) *By resignations*:

12.	Bishop B. T. Badley	(An Ordinary Member, 1948).
13.	R. H. Asham-Capell	(An Ordinary Member, 1946).
14.	Mrs. Ramola Sinha	(An Ordinary Member, 1947).
15.	A. C. Banerjee	(An Ordinary Member, 1947).

The following lapses of Election under Rule 9 were reported :--

(4) Mrs. B. Mukherjee (elected on 3-11-47).

With regard to Rule 57(h), Dr. A. K. Sen expressed the view that the word 'communications' meant all correspondence received by the Society.

The President ruled that 'communications' was not intended to mean all correspondence received by the Society.

Dr. N. Ray, asked for information regarding the publication of a paper by Dr. N. K. Sinha. The General Secretary stated that it had been referred to an authority in the United Kingdom.

The President then read out the names of those candidates who had been elected Ordinary Members, which were as follows:—

(1) Ghosh, Mr. Subodh Kumar.
(2) Bhaduri, Dr. Jnanendra Lal.
(3) Mukherji Mr. Sachindra Nath.
(4) Sarma, Miss Jyotirmoyee.
(5) De, Dr. Sushil Kumar

As the hour was late, the President adjourned the meeting to 5-30 p.m. on Wednesday, the 17th March, 1948.

The Adjourned Ordinary Monthly Meeting of the Royal Asiatic Society of Bengal was held on Wednesday, the 17th March, 1948, at 5-30 p.m.

Present:

Dr. W. D. West (President. in the Chair).

Members:

Agarwala, T. N.; Basu, J. P.; Bagchi, Dr. K. N.; Biswas, Dr. K. P.; Chatterjee, P. C.; Das Gupta, Dr. C. C.; Gupta, O. S.; Mukherjee, N. D.; Trivedi, V. B.

1. The Chairman requested Dr. C. C. Dasgupta to read summary of the following paper:—

(1) Kalipada Mitra—*A Jaina Tale,—its Origin and Developments.*

In this paper, the author has related a Jaina tale, entitled 'Kadarapinya-Katha-nakam', occurring in Harisenacarya's Brhat-kathakosa. He has drawn attention to certain distinctive features that are characteristic of the Jaina tales in the book.

To speak of the Jaina tales is to presume that the Jaina themselves were the inventors of the tales. But there are innumerable instances to prove that the tales were just taken from the current stock by the different schools of writers, as for instance by the Buddhists in their Jatakas and Nikayas, and utilized for their own purposes. If many of the parables in Ramakrishna's Kathamrita are to be traced in the Pali Nikayas and Jatakas, the same is the inference to be drawn with regard to the Jaina tales.

The Chairman thanked Dr. Dasgupta for communicating the paper of Mr. *Kalipada Mitra.*

The following papers were taken as read as the authors were not present : —

(2) S. L. Hora.—*Sanskrit Names of Fish and their Significance.*

The author discusses the meanings of 22 Sanskrit synonyms of fish and comes to the conclusion that the ancient Hindus were keen naturalists and knew a great deal about the external features and habits of a variety of fresh water fishes of India, particularly of the Indo-Gangetic Plain.

(3) Bikash Basu.—*Some Problems of Snow Survey in the Eastern Himalayas.*

Monday, the 5th April, 1948, at 5-30 p.m.

Present:

Sir B. L. Mitter (Vice-President) in the Chair.

Members:

Banerjee, Dr. J. N.; Bhaduri, Dr. J. L.; Bhattacharyya, N. C.; Bose, Dr. J.K.; Burman, D.; Chakravarty, Narendra Nath; Chatterjee, (Mrs.) Bani; Chatterjee, Dr. S. K.; Das, J. N.; Das, S. R.; Das, T. C.; Gangoly, K. K.; Garg, Kamala Devi; Guha, D. P.; Guha, Dinesh Chandra; Gupta, A. B.; Gupta, O. S.; Gupta, P. C.; Habibullah, Dr. A. B. M.; Majumdar, A. K.; Majumdar, Dr. G. P.; Majumdar, Dr. R. C.; Mohiyuddin, Dr. A. M.; Mookerjee, R. P.; Mookerjee, Monotosh; Mukherji, B. B.; Ray, Dr. Nihar-ranjan.; Schroff, M. L.; Sen, Dr. A. K.; Sen, Prankumar; Sengupta, K. K.; Shaha, A. K.; Sukul, L.; Trivedi, V. B.; Waddington, H.; Ukil, Dr. A. C.; Upadhayaya, Rup Narain.

Visitors: Kar, R. C.

The Chairman called upon the General Secretary to read for confirmation the minutes of the Ordinary Monthly Meeting held on 2nd February and 16th February, 1st March and 17th March, 1948.

Dr. A. K. Sen: On a point of order, Dr. West, our President gave an assurance at the last Monthly Meeting that minutes of the Annual General Meeting shall also be placed at this meeting.

Chairman: All I can say on the point of order is that I have to go by the agenda, and if any undertaking was given that undertaking has nothing whatever to do with this meeting.

Dr. Sen: May I bring to your notice that the agenda of this meeting does not contain the words—"Monthly Meeting" but only "Minutes of the meetings?"

General Secretary then read minutes of Ordinary Monthly Meeting held on 16th February, which was adjourned from the 2nd February, 1948.

Chairman: I take it that it is your pleasure that these minutes be confirmed and signed.

Dr. Sen then invited the attention of the Chairman to Ruls 57 e.

Chairman: My reading of the rules is that if the minutes have not been taken down according to the rules it would certainly be a contravention of the Rules, but if the minutes have been taken down according to the Rules, then all we are concerned about is that the minutes be confirmed, and I take it is your pleasure that these minutes should be confirmed and signed.

The minutes of the Monthly Meeting held on 16th February, which was adjourned from 2nd February read out by the General Secretary were then confirmed.

General Secretary then read the minutes of Annual General Meeting of 16th February, adjourned from 2nd February.

Chairman: Is it your pleasure that these minutes be confirmed?

Dr. Majumdar: I would suggest that the names of the scrutineers be added to that. My reason for saying so is that something very unusual took place, because a candidate himself was the scrutineer. Well-known members of the Society were usually put in charge of the ballot boxes in previous years but this time we found the gentleman who was put in charge was unknown to the members, and enquiry showed that he was put there by the Zoological Department.

Chairman: I think the best course would be to record the views of the members and then discuss the matter again here. The question is, the minutes so far recorded seem to be correct and to which no one takes objection. My submission to the meeting is, since the minutes have been taken down according to the past practice, let us confirm the minutes now and if anything is to be included in the minutes, let a resolution be tabled and placed at the next Monthly Meeting

General Secretary: The names of the scrutineers are already there in the minutes.

Dr. Sen: When some members who were asked to place the voting papers in the ballot box raised the question why the ballot boxes were not locked or sealed, the attention of the house was drawn to that point. I would suggest that that should be recorded for future guidance.

Chairman: That being an important matter, I think it should be recorded in the minutes that "attention was drawn to the fact that the ballot boxes were not locked." Subject to that addition in the proper place, the minutes should be confirmed.

General Secretary then read minutes of Ordinary Monthly Meeting held on 2nd February.

Chairman: I take it that it is your pleasure that these minutes be confirmed. The minutes were confirmed and signed.

General Secretary now reported the receipt of following books presented to the Society in February 1948.

Ali Ahmed.—Bangla Kalami Puthir Vivaran, Pt. I. Noakhali, B.E. 1354. (*Presented by the Author.*)

Haridas Das.—Sri Sri Gaudiya Vaisnava-sahitya, 1st Edn. Navadvipa, 462 Chaitanya Era. (*Presented by the Author.*)

Mahadevi Varma.—Yama, 2nd Edn. Kitabistan, Allahabad, 1947. (*Presented by Aryavarta Sanskrit Samsad.*)

Mahadevi Varma.—Dipa-sikha. Kitabistan. Allahabad. 1942. (*Presented by Arya-varta Sanskrit Samsad.*)

The following candidates were ballotted for election as Ordinary members in addition to the names submitted for ballot last month:—

(10) *Uddin, Syed Muhammad Imam*, M.A., Lecturer, Islamia College. 22, Daftar Bagh, P.O. Belgachia, Calcutta.
Proposer: V. B. Trivedi. *Seconder*: L. Sukul.

(11) *Prakash, Om*, M.A., LL.B., Research Scholar at Agra College, Agra.
Proposer: T. C. Raparia. *Seconder*: N. Tatia.

(12) *Dutta Roy, R. K.*, M.Sc., Dr. Ing., F.N.I., Chemist Geological Survey of India, 27 Chowringhee, Calcutta.
Proposer: W. D. West. *Seconder*: V. P. Sondhi.

(13) *Coates, Joseph*. Geologist. The Burmah Oil Co. (I.C.), Ltd., 11 Guru Saday Road, Ballygunge, Calcutta 19.
Proposer: H. Waddington. *Seconder*: W. D. West.

(14) *Sinha, Sudhindra Nath*, Lt.-Col., M.B., Medical Practitioner 37-B, Ballygunge Place, Calcutta 19.
Proposer: S. C. Das. *Seconder*: A. K. Majumdar.

(15) *Bose, Samarendra Nath*, 22 Ballygunge Circular Road, Calcutta.
Proposer: Sir Norman Edgley. *Seconder*: Sir S. M. Bose.

(16) *Singh, Sarabjit*, M.A., B.L., Proprietor, Messrs. Jeet Bros., Engineers and Contractors, 72 Meredith Street. Calcutta 13.
Proposer: T. C. Das. *Seconder*: A. K. Sen.

(17) *Journot, Claude*, Joint Cultural Adviser for France in India, 24 Park Mansions, Park Street, Calcutta.
Proposer: P. C. Bagchi. *Seconder*: S. K. Chatterji.

(18) *Sharma, Satya Deo*, M.A., LL.B., Journalist, Representative 'Bombay Chronicle' and 'National Herald', 4 Goa Bagan Lane, Calcutta 6.
Proposer: M. Ishaque. *Seconder*: W. D. West.

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Chairman: Now, as regards the next item, notices have been given by more than five members that the election of the candidates, 14 to 18, be suspended for one month under Rule 5.

Dr. Ukil: Could no reason be given as to why they are suspended?

Chairman: The Rules do not ask for reasons.

The following members gave notices of motions to be moved at the next meeting:—

(1) Dr. R. C. Majumdar.
(2) Mr. K. K. Ganguli.
(3) Mr. A. K. Majumdar.
(4) Mr. N. C. Bhattacharya.
(5) Dr. J. K. Bose.
(6) Dr. A. K. Sen.

Chairman: I rule that instead of reading out notices of intended motions, thereby taking up the time of the meeting, such notices be handed over to the General Secretary for circulation among members present.

The following motions, of which notices were given on 5-1-48 and 1-3-48 under Rule 57-e, were disposed off:—

(1) Mr. B. M. Agarwal:

That the Council prepare a scheme for pushing the sales of the Society's publications and put up such scheme within two months from date.

Chairman: I have got a note from the office which, if I place before the meeting, will curtail this motion—"Stocktaking is being carried out, and as soon as it is completed the Council will prepare a scheme for pushing the sale of the Society's publications." So on that, I think, the motion should stand over.

(2) Dr. A. K. Sen.

Whereas, on the recommendation of the Special Enquiry Committee (Lort-Williams Committee), the Council of the R.A.S.B. in 1939 made provision for transferring Rs. 5,000 from the surplus funds, as a result of considerable saving owing to the abolition of the post of the paid General Secretary, to the Permanent Reserve Fund of the Society.

*Whereas, Rule 70 of the Society directs that 'All sums received from Members as Compounding Fees shall be regularly invested by the Treasurer as soon as possible after the receipt thereof, * * * * Such investment shall form, and be treated as, part of the Permanent Reserve Fund under Rule 67'.*

Whereas, the Council of the Society, at least since 1939, resolved that the extraordinary Receipts of every year, by admission and compounding fees of Members and Institutional Membership Registration Fees, shall go to the Permanent Reserve Fund of the Society.

Whereas, since 1939, the Society has received by admission and compounding fees and Institutional Membership Registration fees Rs. 43,179 approximately.

Whereas, according to the Investment Account of the Society, the Permanent Reserve Fund of the Society in 1939 was Rs. 2,54,200 (face value) and even in 1947, the same Fund stands at Rs. 2,54,200 (face value) only, instead of Rs. 2,54,200 + Rs. 43,179 + Rs. 5,000 approximately, showing that the Council and the Treasurer of the Society have failed in discharging their duties according to Rules 4 and 70 of the Society.

And whereas, Rules 67, 69 and 70 of the Society taken together, provide 'only interest accuring therefrom (i.e., from that portion of the Permanent Reserve Fund created by the investment of the Members' Compounding Fees) shall be considered available for the general expenditure of the Society'.

And whereas, the Council of the Society, at present, instead of re-investing the annual interests accruing from the Permanent Reserve Fund of the Society, to the Permanent Reserve Fund are, illegally and unconstitutionally utilizing them for the current ordinary general expenditure of the Society.

Be it Resolved:

That the members of the R.A.S.B. at this monthly general meeting strongly disapprove of the irregular and unconstitutional actions of the Council, Finance Committee and the Treasurer of the Society regarding the Accounts and Permanent Reserve Fund of the Society.

Resolved further that this meeting do appoint a Special Enquiry Committee of eleven resident members of the Society to go into the Financial Administration of the Society and to suggest ways and means, among others, for improving the financial position of the Society.

Resolved further that the said Committee be requested to submit its Report and Recommendations, with the observations of the present Finance Committee of the Council of the Society thereon, to the June, 1948, Monthly Meeting of the Society, and

That five members should form a quorum of the said Committee.

Chairman: It is more than resolution. My reading is that the preamble to the resolution will be taken in the sense of a speech and the last portion, beginning from "Be it Resolved," as the resolution.

Mr. Mookerjee: I suggest that this motion be sent to the Council for discussing this item. At the last meeting of the Council most of the members were new who had no information about the issues referred to in the resolution, most of them who were there in 1939 have ceased to be members of the Council, and some of them are present at this meeting this afternoon. It will be helpful if the Council is associated and helped by these members to go into the matter and find out as to how and to what extent there has been any deviation from the rule.

I am not sure myself but I think on the material I have that on the previous occasion there has been a technical violation of the rule, but there has not been any appropriation of any amount in money for the purposes for which it was not available.

I shall just give you certain particulars which will at once clear the situation. According to Rule 70, only the compounding fees re·ceived from members are to be invested in Government papers and transferred to permanent reserve. From 1940 to 1947 Rs. 14,000 odd had been received as compounding fees from members, and there had been two investments, Rs. 5,000 in 3 per cent Loan of 1951-54 and Rs. 10,000 in 3 per cent Defence Loan of 1953-55. Therefore, the total amount received, Rs. 14,000, had been invested as required. The two investments are shown in the Society's investment account as temporary reserve but may be shown from next year as permanent reserve. The technical defect is that instead of showing it as perma-nent reserve it has been shown under a separate head as temporary reserve. Why it was so done and under what circumstances it was done the present Council could not ascertain.

The difference between temporary reserve and permanent reserve is that temporary reserve can be touched year by year under special circumstances but permanent reserve can be touched by a majority of not less than three-fourths of the general body of members. The rules of the Society do not lay down any such conditions for admis-sion fees as in the case of compounding fees. The Council should invest admission fees and any surplus after meeting the expenses for running the Society for a year.

I may add that the recent increase in the Dearness Allowance which we had to agree to was occasioned because we thought that the members of the menial staff were not getting the minimum pay which they were entitled to get in these abnormal conditions. Therefore,. we had to agree to it, and the resolution accepted by the Council was to the effect that such increase would be granted with effect from the 1st of January. It would have been impossible for the Society to meet this high expense if it were not for the temporary grant of Rs. 20,000 from the Central Government. The grant is only for three years. One year only remains. 1948-49 is the last year of the Central Government grant. The resources or income of the Society will be very much less in the future.

I would, therefore, suggest that the resolution may be moved, if you so decide, but it must not be in the form of an indictment as drawn up and moved by Dr. Sen.

I would also suggest to Dr. Sen, if the resolution is to be pressed at this stage, it should be referred to the Council for reporting to the next Monthly Meeting as to what action the Council should take. Then, the very purpose for which the resolution is moved will be served, and at the same time there will be no bad blood.

Dr. Sen: Mr. Mookeriee has explained the position of the office. I want to explain my position. My complaint is that most probably the Finance Committee and the Council passed certain resolution but it has not been given effect to by the staff or by the administrator, because all these information and data which I have collected are from the Annual Reports of the Society, published up to date and which have been approved of by the Council and also by the Finance Committee. All the papers are there—the Annual Reports, the Ac-counts and the Finance Committee's Report. You will find that in

1876 under the agreement made with the Government, the Council, on behalf of the Society, accepted a sum of Rs. 150,000 in lieu of the accommodation which was originally assigned to the Society in the new Museum Building.

Mr. Mookerjee: I would like to raise a point of order. I want the mover to refer to the material which is in his possession because if he is referring to the material which does not appear here or to new material, there may be no right of reply. In all fairness to himself and the members, he ought to give us material which is in his possession, so that he can have a right of reply.

Dr. Sen: Mr. Mookerjee has referred to a rule and said that only compounding fees should be credited to the reserve fund. My point is, since the inception of this fund and since 1876 all these items which I have included in the resolution, all these extraordinary receipts, as extraordinary expenditures have been credited to the Reserve Fund. I am drawing your attention to the Annual Report for 1947. There you will find the budget and also the financial condition.

Dr. Ukil: On a point of order, may I request Dr. Sen to keep all these materials for a special meeting of the Council when he may be invited to place his materials before the Council for discussion, if he is not satisfied with the action that the Council will take, let him then bring the resolution to the meeting.

Dr. Sen: I have collected the facts from each and every Annual Report since 1937. You will get all these things in the budget which was placed before the Annual Meeting, and in the Annual Report adopted by the Council and placed before the Annual Meeting.

I am ready to have this item adjourned to the next meeting of the members of the Society or even to two months, and in the meantime let the Council go through these things and send us their points of view.

Chairman: I attended a meeting of the Council where we made all enquiries and it seemed that all the irregularities had been committed at the time by men who are not available now, so you could not get any explanation. Therefore, if you place the Council in possession of all the facts which you have collected, certainly the Council will go into the matter.

Dr. Sen: My point is, the Council had ample time to go through all these things, because I gave notice a month ago.

Mr. Mookerjee: May I make another appeal to the mover? I take it that the motion has been drawn up for really inviting constructive suggestions for correcting errors that might have been committed and for obviating the committing of mistakes in the future, if I have read it correctly. Then, I would appeal to the mover to agree to send this resolution to the Council for their consideration and wait for two months to see what action is taken by the Council.

Chairman: I go a little further and say that Dr. Sen should place all the material which he has taken the trouble to collect before the Council, so that the Council may go through it.

Dr. Sen: This motion has already been placed in the agenda. It is for the house to decide.

Chairman: This matter will be taken up in July Monthly Meeting.

Dr. Sen: Therefore, I take it that it is adjourned for three months and in the meantime the Council would go into the matter. I place my services at the disposal of the Council and the Treasurer.

Mr. Mookerjee: I have great pleasure in reporting to you that the movers of the motions all agree, subject to confirmation by the general body of members, that the resolutions be referred to the Council for their consideration, and what I propose is that each one of these movers be invited by the Council to help them in going through each one of the matters brought up this evening before the general body of members.

Chairman: This seems to be a sensible arrangement which, I hope, should be accepted.

Dr. Ukil: I support your proposal, but I should like to propose that the movers be thanked.

Mr. Mookerjee: Then, it is my very great privilege to thank the gentlemen who are taking such interest in the affairs of the Society.

Chairman: Then, all the resolutions notice of which was given in the last meeting will stand over till July Monthly Meeting.

Mr. Mookerjee: They are referred to the Council and the Council will report with regard to the steps taken on each of these resolutions, by the July Monthly Meeting of the Society.

The General Secretary reported the following changes made in the constitution of the Council, since the last Ordinary Monthly Meeting for confirmation under Rule 45.

Honorary Treasurer: Mr. R. P. Mookerjee, vice Mr. K. P. Khaitan resigned.

Medical Secretary: Dr. A. C. Ukil, vice Lt.-Col. C. L. Pasricha absent from India.

This item was confirmed with acclamation.

The following loss of membership, since the last meeting, was reported:—

(a) *By deaths*:

    (4) B. M. Barua. (Ordinary Member 1947 Fellow 1948).

(b) *By resignation*:

(16) S. Singh-Roy	(An Ordinary Member 1946).
(17) Mrs. S. Chaudhury	(An Ordinary Member 1946).
(18) D. N. Sinha	(An Ordinary Member 1945).
(19) S. N. Bhattacharya	(An Ordinary Member 1946).
(20) J. Aitken	(An Ordinary Member 1946).

Dr. Roy: Sir, in consideration of the sad demise of Dr. Beni Madhab Barua who had been elected Ordinary Fellow of the Society only very recently, I propose that a suitable resolution be framed at

this meeting offering our condolence to the bereaved family and expressing our deep sense of the loss that we have sustained.

Chairman: Will you read the wording of the resolution to me? I will ask the permission of the meeting to send a letter of condolence to the bereaved family. (The meeting stood in silence as a mark of respect to the memory of the deceased and it was decided to send a letter of condolence to the bereaved family.

The General Secretary then reported for confirmation, under Rule 48-d, of increased D.A. of Rs. 10/- p.m. granted by the Council to the members of the menial staff, Mr. Mookerjee explained that there were now 29 Lower Grade employees and each of them was getting a D.A. of Rs. 17, an interim relief of Rs. 3/- from 1947, and now the additional D.A. of Rs. 10 which make a total of Rs. 30 as D.A. That is what the Special Committee suggested, and I may inform the meeting that these employees have very gratefully accepted it.

A Member: Do the menial staff come under the Provident Fund scheme?

Mr. Mookerjee: There are certain matters which are now under the consideration of the Council, viz., the Leave Rules and Provident Fund Rules. With regard to Leave Rules, we were of opinion that the rules are not as we would like them to be. The Council have already taken steps to revise these rules. With regard to Provident Fund, they are ready to allow the same privilege.

Dr. Roy: Since the Ordinary Members have not the opportunity of going through the proceedings of the Council, I would like to enquire in connection with an item or two. First, I would like to enquire if any portion of the Lort-Williams' Committee Report has been given effect to. I understand that the Superintendent of the Society has been elevated to the position of Assistant Secretary. Is it in pursuance of Lort Williams' Committee Report or just a resolution of the Council?

Dr. Sen: In the Annual Report for 1947 you will find that Mr. P. O. Matthai was placed in charge of the office, including general publication. This requires the immediate sanction of the Monthly Meeting and it has not been placed before an Ordinary Monthly Meeting, as laid down under the Rules.

Mr. Mookerjee: That was done last year, and not this year.

Dr. Sen: In order to make my position clear, and through you, Sir, to Mr. Mookerjee, I would say that according to the rules the abstract proceedings of the Council are supposed to be published in the Year Book, but we have not yet got the Year Book of 1946. The Ordinary Members were supplied with the Year Book of 1945. Now, as regards the activities of the Society for 1946-47, we are in the dark, but only in the Annual Report for 1947 do we find that the Superintendent is placed in charge of the office as Assistant Secretary. To enable the members to actively co-operate with the decision of the Council it is meet and proper that the activities of the Society be brought to the attention of the general body of members as soon as possible and that a bulletin should be issued which would convey the matters decided at the Council Meetings.

Mr. Bhattacharya: We do not object to the promotion of Mr. Matthai nor we do object to the allowance being given to him but what we do object to is that the matter was not reported to the General Meeting.

There are a number of motions that I personally gave notice of. I am prepared to have these motions forwarded to the Council. Instead of their appearing in the agenda the motion of which I gave notice to-day would be sent to the Council.

The Chairman declared that Nos. 10, 11, and 13 have been duly elected:

The Chairman announced that as the author of the following two papers are not present, the paper are taken as read:—

(1) *Two Cases of atypical Development in Chick* by Himadri Kumar Mookerjee and Sivatosh Mookerjee.

Two cases of atypical development in chick have been described. The first case has a peculiar morphogenetic architecture, having extra pair of limbs and peculiarly distorted head. This specimen among other features exhibits curious neural-cum-notochordal atypicality. The second case is a conjoint twin, duplicity extending as far as the upper beak. Except the lower beak and the sternum, all parts are duplicate. The synsacral and the caudal regions offer many interesting features. The probable developmental mechanisms of such abnormal embryos have been discussed.

(2) *Cecidozoa and Zoocecidia from India*, by M. S. Mani.

This is mainly a monograph on gall-forming animals and animal-produced galls from India.

The author has given brief notes on distribution, habits and life histories of about 200 species of Cecidozoa, 70 of which are either new to science or are being recorded for the first time from India. He has described altogether over 300 different kinds of galls which, however, are only a minute fraction of the total number of plant galls and gall-forming organisms occurring in India.

In order to make the monograph useful to the botanist and zoologist alike, the author has dealt with the Zoocecidia and Cecidozoa separately. As there is no comprehensive monograph in the English language on general cecidology, the author, in the general part of the paper, has summarized the results of his studies on morphology, physiology, biology, aetiology and teleology of galls. He has also included a classified bibliography comprising over 500 serially numbered titles and has attempted to bring together some of the more important of the much scattered literature on cecidology.

Since 1926 the author has been collecting plant galls practically from all over India and studying the complex association of the animals found in them. The bulk of these collections has been deposited in the Zoological Survey of India.

The Chairman then called upon the house to discuss the Annual Report of 1947.

Dr. Sen: According to Rule 48(f), the Council is to submit to the Ordinary Annual Meeting a report on the general concerns of the

Society.   Such report shall set forth the income and expenditure of
the calendar year.   The report shall also include an abstract of the
proceedings of the Council during the year.   That is the most im-
portant point.   Now, I have tried to go through all this, I mean the
Year Book of the Society, and I have found that for the last 10 years
it has been the practice of the Council, before the Report is submitted
to the Annual Meeting, to say that they approve of it.   In some cases
they say they approve of it, and in other cases they say they adopt it.
My submission is that this annual Report should rather be submitted
to the General Body of Members, if we take the meaning of the
word "submit" is to surrender or present for consideration or de-
cision.   Nowhere do I find that the Annual Report is only presented
before the members without coming to a decision by the members.
That is the only time when the members of the Society are given the
opportunity to see whether the aims and objects of the Society are
carried out.   That is the time when the Annual Report is discussed
by the members at the Annual Meeting and then it is either to
be adopted or discussed.   I raised these points at previous meetings.
I submitted that the Annual Report required to be passed by the
members at the Annual Meeting.   I have shown by referring to the
Rules and Regulations of the Society that the administrative direc-
tion and management of the Society have been entrusted to a Coun-
cil, or, in other words, the fundamental rights of the members have,
to a certain extent, been delegated to the Council, but nowhere in
the statute will you find that the passing of the budget or the passing
of the Annual Account has been delegated to the Council. Apart from
that point I submit that the Annual Report for 1947 is incomplete,
as it does not contain the abstract proceedings of the Council for the
year 1947.

My next point is that there are certain things which require the
attention of the Council.   Take for instance, the nomination of
Patron.   There is no provision in the Rules and Regulations of the
Society for the appointment of patrons.

At my suggestion this Annual Report is being discussed
here, and if you think that sufficient discussion has not taken place,
then let us adjourn it.   My point is, previously, say, for five years
either the Viceroy became the patron or the Governor became the
Patron, but later on I find—this year or last year—the Council asked
the Governor-General of Pakistan to become Patron which he refused.
Why shall we propose such a thing without informing the general
body of members first?   If you want to regularise a practice, or, ac-
cording to tradition, make either the Governor or Viceroy patron or
to have a general patronage of so and so, I think the time has come
when the Council should think whether they should have five or six
patrons or whether they can invite the Governor-General of Pakistan
to be a patron.

Chairman: Where do you find that he refused to become patron?

Dr. Sen: It was reported in one of the Monthly Meetings.   The
next point, you will find, is, it is written that Associate Members are
to be 15, but from the report I find that at least four of them had
ceased to be Associate Members, because, according to the constitu-

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tion, they are to be re-elected every five years. I am not against the Council appointing the Superintendent, Assistant Secretary or doing anything of that kind but what I am up against is that they should have placed such matters before the general body of members for their views first. Associate Members are elected or appointed on the recommendation of the Council and these members are not apprised of the lapse of their membership. People like Mr. P. C. Sen Gupta and others ceased to be Associate Members of the Society due to our own fault or the fault of our office. The Council should take immediate steps to rectify the mistake of the office.

As regards Ordinary Members, I find that in previous years we used to give in a nutshell the number of Ordinary members, resident non-resident and absent members in our Annual Reports. Foreign members who subscribed to this institution were given in the Year Book as well as in the Annual Report.

Our Society is a registered body, I find it has been registered in 1876. The statute does not provide for institutional membership. Their elections are, therefore, *ultra vires*. The Council has not done anything to validate institutional membership. That is the opinion of the Sub-Committee of your Council who are asked to frame rules or amend the rules of the Society. I think the time has come when the Council should rectify it.

At page 3 of the Report there is reference to Council making appointments. I raised the point in a Monthly Meeting that the Council had no right to appoint office-bearers. I think it is better that we employ the word "elected" in place of "appointed."

No mention was made of the honour given to our Premier, Dr. B. C. Roy who got a Doctorate (Hons. Causa) of the Allahabad University. He is an old member of the Society and as such this fact should have found a place in the Annual Report.

As regards the delegation of duty of the General Secretary to Additional Secretaries, according to Rule 51, no such delegation has been made. On the recommendation of the Council, resident members are elected by the Council as General Secretary and Additional Secretaries. An Additional Secretary works for furthering aims and objects of the Association. Then it is meet and proper that this additional secretary must be resident of Calcutta. What we find is that some Additional Secretaries were Ordinary Members who were not resident of Calcutta. I think the time has come when this should be rectified. We find even members absent from the Council used be recorded in the previous Year Books but for the last two years no such mention has been made.

I happened to be the Secretary of the Scientific Advisory Board. We passed certain resolutions and sent these resolutions to the Council but we have not seen the resolution being given effect to by the Council. Even resolutions as regards the arrangement for delivering lectures here on the History of Medicine had not been given effect to by the Council.

The next point I wanted to raise was regarding the appointment of the Superintendent as Assistant Secretary. New members of the Society are faced with a lot of difficulty. We tried to go through

the Year Book for the last few years and we found the same person saying there was no need of paid General Secretary. They do away with paid General Secretary in Lort Williams' Committee Report and they recommended for paid Assistant Secretary and after two years you find a paid Secretary is appointed on a salary of Rs. 900/- per mensem, and then again we find that we do away with that paid Secretary and appoint a man as Assistant Secretary. We find from the Year Book that Mr. Matthai, when he took charge of the Library, was very active at that time. He prepared more or less an index of 2,000 to 3,000 books. The attention of the Council was drawn to this and the Council transferred him from the Library to the General Office, and then Lort-William's Committee Report recommended a paid Assistant Secretary. Lort-Williams' Committee said there must be a well-paid Librarian instead of a mere Cataloguer. I have gone through the manuscript section which comprises valuable manuscripts in Sanskrit from the Indian Museum. We paid more than Rs. 3,000 to Rs. 4,000 for the preparation of catalogues. All of a sudden we stopped that. After two or three years they say it is no use having this. Members of the Society are all busy people who have no time to look through these matters, and that is why we have the Council who are responsible for any recommendations they make.

There seems some sort of discontinuity in the activities of the Council. The retiring Council have to nominate their successors There are always new members on the Council and there cannot be a continuity of policy. The Rule provides that when a Council retire they nominate their successors. I have taken statistics, and with due respect to Mr. Mookerjee I find only four or five new blood. New blood, because, some of the old members ceased to become members of the Council after five or six years. My idea, therefore, is that Council membership is meant only for aristocrats. I do not want to go into other points, as I have framed certain resolutions on those points. Regarding publication, there is the same difficulty in publishing our books on a commercial basis. On the recommendation of one Expert Committee consisting of senior members of the Council one was placed solely in charge of the publication. After educating him in the sale and other things, all of a sudden he goes away, and instead of appointing another efficient man the office is asked to do the needful. That is how we proceed with the work of the Society.

Now, I draw your attention to page 10 regarding a Librarian, and I think that is one of the most important functions of the Society. The machinery of Library requires a thorough overhauling. As regards the condition of the books, I shall invite the members of the Council to come and have a look at the books and the manuscripts. The other day I wanted to have an idea as to how the situation developed in our Society, and from the Library I took a book which contained 160 years' rules. I found that all these rules were taken out and replaced by a few copies of new rules and regulations. That is the condition of your Library. If you want any book—at least that was my unfortunate experience—you are told it is not available That goes not only for your books but for even our publications of which you may not get complete volumes. We have not got our own

binding department.   We give to outsiders valuable manuscripts and other things. They cannot be depended upon.

As regards the manuscripts section, the news bulletin was, published in 1946, and then discontinued. We should start this again. The last Year Book was published in 1945.   In 1946 and 1947 the members have been kept in the dark regarding the activities of the Society.   It is better that our Society follows the previous method of reporting books actually published in a tabulated form with page-marks and so on, as was done in 1945.

I find each and every report of the Society, since 1935 up to 1944, was made up in a detailed form which made it possible for members, without going through the audited accounts, to visualise in a nutshell the actual financial position.   It is not possible for us to find this out from subsequent reports.

On the Cultural Relation side, as you will see from my second resolution on the appointment of a special enquiry committee, since 1938 one enquiry committee is appointed practically every year to go in detail into all these things.   One year one Council appoints an enquiry committee and another year another Council appoints another enquiry committee.   The latest development is the Bapat Committee.   I think the time has come when I should really accept the advice given by Mr. Mookerjee about different sectional committees.   I am not a good financier but you will agree that the finance of the Society is not at all in good shape.   I drew attention of our Treasurer to the way the sale of a particular publication to the trade is being handled, which shows a loss of Rs. 6,600 to the Society.

General Secretary: In this connection may I point out that when this thing was taken up and decided by the Scientific Advisory Committee, Dr. Sen was at that time Secretary of the Scientific Advisory Board, and the whole thing was discussed before him and he knew all about it.

Dr. Sen: I am grateful to the General Secretary to have drawn attention to that.   That is the difficulty.   The Ordinary Members of the Society have not had the opportunity of discussing it.   If, later on, all these annual reports were placed before the Annual General Meeting of the Society and the Members commented on them, we would have nothing to say.   I raised all these questions before. My point is, if on each and every book we lose Rs. 4 to 5, it is better not to sell them to the trade.

Mr. Mookerjee: Has any book been published under that arrangement?

Dr. Sen: Fortunately not, and our Treasurer should put an end to such a thing.

I find in the list of members the name of the Anthropological Secretary was not given.   I want to be enlightened if the Council decided that a person who is not present in Calcutta ought to be Secretary, and if that is so, we welcome it.

General Secretary: It was placed before the Council and the Council agreed that the additional secretary should be resident in Calcutta.

Dr. Sen : I am not speaking of 1948, I am speaking of 1947, and in the agenda I find no mention of the name "Anthropological Secretary, Dr. Guha", and from the beginning. I told you, this was incomplete.

Another thing is when the Permanent Library Fund was created in 1936 it was decided that Government Papers should be bought and each and every year interest to be refunded till we get a total amount of Rs. 20,000, but though you will find from the accounts, it is written in some books and in the Annual Report that the total amount paid from the fund is Rs. 13,000, actually in the financial report you will find that more than Rs. 5,000 has not yet ben invested, and, thereby, we are losing interest of Rs. 1,500, according to my calculation. I suggest the Treasurer make a note of that.

Even in the case of some of these funds, for instance, the Sarat Chandra Roy Fund, the Council at its meeting thought that the award of this medal should be stopped. The widow of Mr. Sarat Chandra Roy donated Rs. 4,000 to the Society plus Rs. 250 in cash. The Society invested this in 3 per cent Victory Loan, and it is only getting an annual interest of Rs. 82 without being made free from income-tax. We are, therefore, losing 33 per cent interest. In 1947 we spent, you will find, Rs. 118 for the cost of the medal. Taken at the rate of 3 per cent it gives us Rs. 120 less -/4/-, i.e., Rs. 119/12, as the annual income in interest. Even in 1947 the cost of the medal was Rs. 118/3/3. It is the fault of the office that we have been losing interest for the last four or five years. In the case of Sir William Jones Medal, the Council awarded the medal to the value of Rs. 812/-, though the fund at its disposal was practically half. Constitutionally the Council cannot stop the award of such a medal as the Sarat Chandra Roy's Medal. With regard to B. C. Law Medal Fund, which earns an interest of 3 per cent, you are committed to award a gold medal to the value of Rs. 280. My point is, it is not always possible for us to follow the policy laid down by the Council. You should act in such a manner as would be in the interest of the members of the Society.

General Secretary : Regarding Sir William Jones' Medal costing more than Rs. 800, I will tell you why such expense was incurred. The medal was struck in His Majesty's Mint and contained 8½ tolas of gold as required now for casting in the die specially made for it, and this die does not take less than 8 tolas. Such a medal would naturally cost more than Rs. 800, and that was the reason why the Council spend Rs. 844 for that medal, as compared with Jeweller-made medals, such as the medals for Sir P. C. Roy and Sir S. Radhakrishnan, which cost about Rs. 242/- each. They bear no comparison with the Mint made medals.

Dr. Sen : On the question of presentation it is not the monetary value of the medal that matters. Even a bronze medal would suffice.

Chairman : From the observations of Dr. Sen I personally am convinced that this Annual Report should be thoroughly gone into. I, therefore, think the best course would be to adjourn this meeting.

The meeting was then adjourned till Monday, the 12th April, 1948, 5-30 p.m.

The adjourned Ordinary Monthly Meeting was held on Monday,
12th April, 1948, at 5-30 p.m.

Present:
Dr. W. D. West, the President, in the Chair.

Members:

Agarwala, B. B.; Banerjee, Dr. J. N.; Bensley, H. F.; Biswas, Dr. K. P.; Bose, Dr. J. K.; Chakravarti, P. B.; Chatterjee, P. C.; Chokhany, Ram Dev.; Ghosh, H.; Guha, Devaprasad.; Gupta, P. C.; Hora, Dr. S. L.; Ishaque, Dr. M.; Modi, J. R.; Mookerjee, R. P.; Mukherjee, H.; Mukherjee, N. D.; Ray, Dr. Nihar-ranjan.; Roy, Tridibnath.; Saraswati, S. K.; Sen, Dr. A. K.; Sen, Dr. Sukumar.; Sen Gupta, S.; Singh, P.; Sircar, Dr. D. C.; Trivedi, V. B.; and others.

President: The Monthly Meeting held on 5th April, was adjourned till to-day to continue the discussions of the Annual Report. The meeting is now open for that purpose.

Dr. A. K. Sen: In Rule 48-f it is stated that "such report shall set forth the income and expenditure for the Calendar year, the balance in hand, the debts and assets, the estimated income and expenditure of the succeeding year, the prosperity or otherwise of the Society, and the progress of the library," and the report shall also include, "an abstract proceeding of the Council during the year".

I drew the attention of the house to the fact that unless members are supplied with an abstract proceedings of the working of the Council for the year, it is not possible for them to know what actually is taking place in the Council. We got the Year Book of 1945 in 1948, or at the end of 1947. My personal experience is that we shall have to consider ourselves fortunate if we get the Year Book of 1946 even in the middle of 1949. That is how we are proceeding. We are more or less trying to isolate the Council from the members of the Society.

I also drew the attention of the meeting to other matters, such as Associate Membership. We know that Associate Members are to be re-elected every five years, but due to their not acting according to the constitution, four members ceased to be members of our Society. Now, I have put three names of Associate Members who ought to have been re-elected by 7-12-47.

I next drew your attention to the fact that the time has come when the Society should frame regulations for having portraits of leading personalities in the Hall of the Society and should lay down the standard size of such portraits.

President: Has that anything to do with the Annual Report?

Dr. Sen: It is in your Annual Report, and I draw your attention to page 5 wherein an amount of Rs. 1,866/- was contributed to Sir Norman Edgley's Portrait Fund.

As regards the office, I drew attention to the fact that Superinten-dent, P.O. Matthai was placed in charge of the Office, including gene-ral publication and library. No such information or communication was brought before the Monthly Meeting for confirmation. As far as

my information goes, he was given an increase of Rs. 50/-. As ours is a registered body and we have to act according to its constitution, such things, I think, were not sanctioned properly, due to the negligence of the Council or its office bearers. In all such cases, including that of Mr. Matthai which I have just cited, they should be made to refund such increases.

I also found that though the Committee, presided over by Sir Lort-Williams, recommended that there should be a permanent librarian, nothing has been done for his appointment. There was only one assistant librarian, and we find one cataloguer was put in charge of the library.

A deputation was sent on behalf of the Society to the Indian History Congress. No report was sent to the Council nor were the members apprised of what actually took place. I think, in such cases, it is only meet and proper that they should report to the Council and the Council, in turn, should inform the members of the Society as to what actually take place. Whenever we send out any member as representative on our behalf, he should submit his report to the Council, together with an abstract proceeding, so that the Council may acquaint the members with the activities of the Society in relation to other associations.

As regards the appointment of a librarian, I am taking it *in seriation*. First, if you go through page 10 of the Annual Reports of 1945, 1946 and 1947, you will see that no policy has been laid down by our Council. They appoint a person in 1945-46 as cataloguer and spend as much as Rs. 4,000 or Rs. 5,000, then they stop at the middle of the work, and then they change the cataloguing again.

The Scientific Advisory Board and the Medical and Public Health Expert Sub-Committee recommended that all catalogues be brought up to date but nothing further has been done. Over and above that the Council reported to the Annual Meeting that during the year they appointed a cataloguer for recording catalogues and other things, but as regards the 50,000 items, the work of cataloguing is more or less in a stagnant condition. In 1946 we prepared a summary catalogue of manuscripts for the year. I think we spend on it more than Rs. 4,000 but nothing further has been done. We want to know the progress up to date.

Now, coming to the manuscript section, I find the General Secretary has visited Delhi, and I think it is better if we incorporate in the proceedings his actual report, because we find that the Council sleep over such matters from year to year.

With regard to research activities, nothing has been said except that money has been spend on Research Fellows' work.

In regard to Permanent Endowment Library Fund, which was started in 1926, it was mandatory that all the interest be funded. We lost nearly Rs. 1,500 in interest. All this is in liquid cash and are deposited either as fixed deposit or in the bank with all interest credited to the General Fund.

As regards publication, in our previous Year Book we could find what actually was done, but for the last two years it is very difficult to know what has been done. I want to know from your office what is meant by "publication and printing", as I find in this report the words "Printed but will soon be published." Let us place the fact before

the members that either it has been printed or published.   No progress report was given here with regard to Sanskrit and Persian manuscripts and with regard to books under preparation.   I want to know whether the whole material is ready for the Press.

As regards Science Bulletins, I think we have already tabled a motion about this, so we shall take it up later on. But we are quite in the dark about advance proceedings and notice in monthly news bulletins.   We have not yet been informed why it was stopped.

Simultaneously with this Annual Report circulated to members you publish an appendix, but the abstract receipts and disbursements are not always available to members.   Even in that case, though published simultaneously, if you compare the financial statement contained in the Annual Report with the financial statement as contained in your abstract receipts and disbursements report, you will find that they do not tally.   I have already tabled a motion regarding this matter, so I need not take up your time on this point.

With regard to the point raised that the time has come when the Society should frame Rules and Regulations for allowing pictures to be placed in the hall (page 19), my opinion is we should not allow pictures of living personalities to be hung up in the hall of the Society.

We have not yet made the interest on investment fund income-tax free, which shows that nearly 33 per cent of interest is taken away by Government as income-tax.   That is a gross negligence indirectly on the part of the Council but directly on the part of your Treasurer and also your Finance Committee.

Mr. Pratap Singh: I would suggest that a sub-committee be formed to discuss these things on behalf of the general body of members with the present Council.   We are unaware of the details and some of the facts might be new to the Finance Committee.

President: Dr. Sen has been very helpful in drawing our attention to a number of omissions in the past.   A verbatim report has been taken of what he said and, I think the Council should first be given an opportunity of considering his remarks.

Mr. Bhattacharya: I have taken down some notes in connection with the Annual Report.   So far as it affects the library of the Society, I understand the Council went into the matter, and I do not propose to go into details at this stage, but one or two points require verification so far as it arises out of the item entitled "donations".   I find here is an item in connection with that Dr. B. C. Law donated Rs. 1,866 to Sir Norman Edgley's Portrait Fund. Was that Fund made open to the members of the Society, and was the proposal for having this (Sir Norman Edgley's) portrait in the Hall of the Society placed before the Ordinary Monthly Meeting of the Society?   How is it I received, personally, one letter as an ordinary member of the Society to contribute to the fund on the date when the portrait was going to be hung?   How is it that ordinary members, who were not invited at the unveiling ceremony and whom the Council had not the courtesy even to invite, were asked for subscription?

Mr. P. C. Chatterjee: I understand that the matter has been entrusted to one single member, Dr. Hora, and I understand that it must

have been the desire of the Council that Dr. Hora should approach, on behalf of the Council, every ordinary member.

General Secretary: Not on behalf of the Council.

Mr. Chatterjee: Then the Council does not take any responsibility with regard to the hanging of that portrait.

President: The Council must take the responsibility.

Mr. Chatterjee: Then it must be Dr. Hora, on behalf of the Council, who did it, and then it must be lack of courtesy on his part. Such an act does not enhance the fair name of a Society like ours.

Mr. Hari Charan Ghose: May I ask the Secretary to place a copy of the letter? That ought to clarify the matter. May I ask, is it fair to come to us for donations when we are told nothing about the portrait? Is it fair for the Council or Dr. Hora or anybody to approach the members for subscriptions a fortnight after the portrait had been hung?

President: As far as I can judge, it appears to have been done in most unfortunate manner.

Mr. Ghose: May I ask whether Dr. B. C. Law was the only person who contributed to this fund?

President: That is quite incorrect, because everybody has contributed, including myself.

Mr. Ghose: If that is the case, how is it Dr. Law's name only appears?

Dr. Sen: On a point of general constitutional issue, I want to clarify the position whether the present Council could say that as all these things have been done by the previous Council, they are not responsible for them. Your Year Book is there, your proceedings books are there. Let the Council carry on the day-to-day work of the Society as laid down by the different Councils from time to time, and, I think, the constitutional position is that unless you revise, by a resolution, the previous decision of the Council, you are to act according to that decision.

President: That is correct.

Dr. Sen: Is it not possible even for our present Treasurer to answer these questions as to why this was done or that was done.

Mr. R. P. Mookerjee: That is certainly not the case. The question raised by Dr. Sen is, if a resolution is passed by one Council that stands for four years, ten years, or even 20 years, unless it is modified or rescinded by the subsequent Council. But that is quite different from the other proposition that if in 1900, for instance, some decision had been made by the Council, the present Council is not expected to know of every piece of resolution or order passed by a Council or different bodies in each successive year. Unfortunately, I am only on the Council for a few months, and I do not know what has been done last year but if I do want to know anything I have to go through every piece of paper. If any lach is pointed out by any individual member, it would certainly be looked into.

Mr. Chatterjee: I should think all this appears to be rather a misunderstanding, because I think the present Council is very fortunate in having so many members taking keen interest in the affairs of the Society, and we are grateful to all these members for bringing to our notice these defects and irregularities. The Council is, moreover, lucky to have them in a concrete form as moved in different resolu-

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tions. It may be that some fault had been committed previously by the Council. We do not disown our responsibility or try to place it on the shoulders of others; we take our blame for omission or commission.

Mr. Ghosh : The letter which has been handed over to me by the Secretary shows there must have been a resolution at the Council Meeting. May I have a copy of that resolution ?

Dr. Sen: In the meantime may I suggest one thing, through you to our Treasurer,—whether it is not meet and proper for the Society to pass or adopt the Annual Report. I raise this question not only this time but I raised it many times before too, as to why members are not taking active interest in the day-to-day work of the Society. If you go through the reports and other things you will find members are even debarred from discussing Annual Reports and Accounts.

Mr. Mookerjee : That was only during the war.

Dr. Sen: One of my friends, a member of the Society, asked for a copy of the Annual Statement of Accounts, and he was told that he would not get it but that it would be placed on the table. I formally move that 'the Annual Report of 1947, as discussed here, with such addition and alteration, be adopted.''

President : I think it would be agreed that the statement of accounts and annual report should certainly be read and adopted at the annual meeting. The rules do not insist on that. In fact they merely state that the Annual Report should be read but that is one of the rules which obviously requires amendment. That will have to be taken up later if you wish to move a notice of motion.

Dr. Sen : I want a ruling from the Chair and I want to bring before you and, through you, before Mr. Mookerjee that I have tried to go through the rules since the inception of the Royal Asiatic Society to see how they have been changed from time to time. Rule 49-a defines —"to prepare and submit to the Ordinary Annual Meeting." Submission there means "consideration." (Reads Rules 58, 55). Now, your statute lays down that the institution is to submit its annual report and balance-sheet and also abstract proceedings and place them before the annual meeting. Then it is the duty of the Council, in preparing the agenda, to incorporate these in the agenda. These things cannot be done in accordance with those rules, so my submission is that it is the inherent right of the members to pass the account and to pass the annual report. You are to rule by regulations and not by orders. If we take all these things *in seriatim* I think the general body of members have not delegated their powers of passing the account or budget or annual report to the Council, so I formally move that the Annual Report, as submitted by the Council, be adopted, together with the discussions which have taken place as an appendix to it.

President : Am I to understand that you have given a notice of an intended motion ?

Dr. Sen : We have been discussing these things, and, as a result of that discussion, I move that we pass the Annual Report which has been submitted by the Council.

Mr. Chatterjee : May I suggest that this meeting be adjourned to give you time to consider whether that motion is in order ?

President : First of all you raised a point of order whether the

Report, in accordance with the Rules, be adopted by the Annual General Meeting. My reading of the ruling is there is no compulsion that it should be adopted.

Dr. Sen: Therefore, also, by your ruling we cannot move a motion that the action of the Council be approved, because we have not given any notice of motion to that effect.

President: It is laid down in the rules that the meeting should confirm these particular points placed before it for confirmation. Does any member wish to discuss the Annual Report ?

Mr. Mookerjee: I do not think I could discuss anything,—but I would personally thank the members for delving into the whole record and finding out acts of omissions. We are thankful to the members for drawing our attention to them. Some of them may be serious, some may be mere technicalities but all the same when each one of these items is brought to our notice it is up to us to look up the whole record for the purpose of setting our house in order. I have requested Dr. Sen to assist me in this regard and he has agreed to give me his notes on the points. As soon as I receive these notes, I shall personally take up the matter with the Council, apart from what may be done by the Secretary or any other member, and do my best to see how much of it I can bring to the notice of the Council.

Dr. Roy wanted to say something about the Library Department, which is one of the most important departments of this institution, containing priceless literature and manuscripts. I am not divulging a secret when I say that steps are being taken for having all the faults checked. Dr. Roy will himself be invited to assist the Council in doing this work, and scholars will not complain hereafter that books and manuscripts are not available to them. We are not concerned so much with the past as we are with the future. Past is helpful only for knowing what the future action will be. Every member, absent and present, will assist the present Council in setting our house in order.

President: I think we all associate with Mr. Mookerjee's observations, and I hope and trust that we shall have the co-operation of all of you gentlemen. Does any other member wish to speak?

As nobody else has come forward to speak I declare the meeting closed.

Monday, the 3rd May, 1948 at 5-30 p.m.

Present:

Dr. W. D. West, the President, was in the Chair.

Members:

Bajoria, Bhagwati Prosad; Banerjee, Dr. J. N.; Basu, Dr. U. P.; Bhattacharya, N. C.; Bose, Dr. J. K.; Chatterjee, P. C.; Chakravarti, P. B.; Chokhany, R. D.; Das, J. N.; Das, S. R.; Das, T. C.; Gangoli, R.; Ghosh, D. P.; Ghose, R. C.; Griffith, Dr. W. G.; Guha, Deva Prosad; Guha, Dinesh Chandra; Gupta, O. S.; Job, Dr. T. J.; Majumdar, Dr. G. P.; Majumdar, Dr. R. C.; Mitra, Prokash Chandra;

Mookherjee, R. P.; Mukherjee, B. B.; Mukherjee, N. D.; Ray, Dr. Nihar-ranjan; Saraswati, S. K.; Sen, Dr. A. K.; Sen, H. K.; Trivedi, V. B.; West, Dr. W. D.

In the absence of Dr. K. N. Bagchi, Dr. M. Ishaque acted in his place as the General Secretary.

The minutes of the last Ordinary Monthly Meeting held on the 4th of April and adjourned to the 12th of April were read by the Officiating General Secretary.

President: Have I your permission to sign the minutes as correct?

Dr. A. K. Sen: Before confirming the minutes I would like to say a few words. I find the minutes as read lack in details. I feel that at least some of the important details of the discussion that took place regarding the Annual Report, taken down by the shorthand reporter engaged for the purpose, ought to have been incorporated in the minutes as has always been done in the past, the idea being to place these discussions before the next Council Meeting, so that the house may be informed at the following Monthly Meeting as to the action taken by the Council.

(Mr. Bhattacharya and another member also associated themselves with the remarks of Dr. Sen).

Mr. R. P. Mookerjee: At least the points of discussion ought to be mentioned, so that we may take notes for future action. I, therefore, suggest that we defer the consideration of these minutes until a fuller report is placed before us.

Dr. Sen: I second the proposal of Mr. Ramaprosad Mookerjee. A major portion of the proceedings deals with my criticisms of the Annual Report and other things. I find that even the rulings from the chair on the points of order I raised have not been included in these minutes.

President: I think we might request Dr. Sen to give a summary of the points raised by him. I have been through the entire verbatim transcripts and accept full responsibility for these minutes, because they were mostly written by me. I admit I found it difficult to summarise the long report, and I ask Dr. Sen to let us have a summary of the points raised by him. I, therefore, suggest that Dr. Sen accept Mr. R. P. Mookerjee's proposal that these minutes be confirmed at the next Monthly Meeting. (The proposal was accepted by Dr. Sen).

The General Secretary reported receipt of the following books received as presentation during March 1948, which were exhibited:—

Kunhan Raja, C. and Sarma K. M. K. (ed.).—Catalogue of the Anup Sanskrit Library, Fasc. III. Bikaner, 1947. (*Presented by the Anup Sanskrit Library.*)

Puridas Mahasaya (ed.)—Harinamamrtavyakaranam. Dacca, 1947. (*Presented by Sri Achyutananda Das.*)

Upadhyaya, B. S.—India in Kalidasa. Kitabistan, Allahabad, 1947. (*Presented by the Author.*)

President: The next item on the agenda is to call for a ballot for the election of 13 candidates for membership which had been suspended in the meeting room of the Society under Rule 5.

Dr. Sen: In this connection, if I remember aright, you agreed at one of our Monthly Meetings to have the names of all persons who have been proposed for membership for the last two years placed before the Monthly Meeting.

President: What happened was, Dr. R. C. Majumdar raised the point about those members who had been proposed during the last 2 years and had not been recommended, when I gave an assurance that as soon as I got a list of these names I would go through it and see what could be done. I asked the General Secretary to give me these names but unfortunately I have not been able to get them. I understand they are now ready.

As it was decided to ballot those names which had been suspended under Rule 5 together with the names of candidates who had applied, the following were ballotted for election:—

(13) *Sinha, Sudhindra Nath*, Lt.-Col., M.B., Medical Practitioner, 37-B Ballygunge Place, Calcutta 19.
Proposer: S. C. Das, *Seconder*: A. K. Majumdar.

(14) *Bose, Samarendra Nath*, 22 Ballygunge Circular Road, Calcutta.
Proposer: Sir Norman Edgley. *Seconder*: Sir S. M. Bose.

(15) *Singh, Sarabjit*, M.A., B.L., Proprietor, Messrs. Jeet Bros., Engineers and Contractors, 72 Meredith Street, Calcutta 13.
Proposer: T. C. Das. *Seconder*: A. K. Sen.

(16) *Journot, Claude*, Joint Cultural Adviser for France in India, 24 Park Mansions, Park Street, Calcutta.
Proposer: P. C. Bagchi. *Seconder*: S. K. Chatterji.

(17) *Sharma, Satya Deo*, M.A., LL.B., Journalist, Representative 'Bombay Chronicle' and 'National Herald', 4 Goa Bagan Lane, Calcutta 6.
Proposer: M. Ishaque. *Seconder*: W. D. West.

The names of the following candidates for membership were also read and ballotted for:—

(18) *Basu, Satyendra Kumar*, M.Sc., Dy. Conservator of Forests (Retd.), 5/1/G Keyatola Road, P.O. R.B. Avenue, Calcutta 29.
Proposer: K. N. Bagchi. *Seconder*: I. P. Mukerji.

(19) *Das Gupta, Jitendra Nath*, B.A., B.E., M.I.E. (Ind.), M.R.San.I. (Lond.) (Retd.), Dy. Chief Engineer, Improvement Trust, Calcutta; 27 Lansdowne Terrace, Calcutta 29.
Proposer: Monotosh Mookerjee. *Seconder*: Tridibnath Roy.

(20) *Sen, Satyendra Nath*, M.A., Lecturer, Calcutta University, 82/C Beltala Road, Calcutta 26.
Proposer: N. Ray. *Seconder*: N. C. Bhattacharyya.

(21) *Chaliha, Jadavprosad*, B.Sc., Member, Executive Committee, Indian Tea Market Expansion Board, P-21 Golf Club Road, Tolly-gunge, Calcutta.
Proposer: P. C. Chatterjee. *Seconder*: D. Burman.

(22) *Haldar, Mayataru*, M.A., B.L., Rai Bahadur, District and Sessions Judge (Retd.), 78 Ballygunge Place, Calcutta.
Proposer: Anil Kumar Sen. *Seconder*: Tarak Chandra Das.

(23) *Basu, Snehendu*, M.A., LL.B., 4 Clive Row, Calcutta.
Proposer: A. B. Gupta. *Seconder*: N. Ray.

(24) *Pissurlencar, Sir Panduranga, S. S.*, the caveleiro d.s. Jago, and Associate of the Academy of Lisbon, Nova-Goa; Curator, Government Archives, Goa, Nova-Goa.
Proposer: R. P. Mookerjee. *Seconder*: K. N. Bagchi.

(25) *Tripathi, Yogendra R.*, M.Sc., Assistant Research Officer, Central Inland Fisheries Research Station, 2/B Outram Street, Calcutta.
Proposer: P. M. G. Menon. *Seconder*: V. B. Trivedi.

The Offg. General Secretary made the following reports and communications from the Council:

Resignations:

(11) G. Galstaun	(An Ordinary Member, 1926).
(12) M. Fouchet	(An Ordinary Member, 1946).
(13) Mrs. Rita Roy	(An Ordinary Member, 1945).
(14) H. P. Generiwalla	(An Ordinary Member, 1945).
(15) T. G. May	(An Ordinary Member, 1945).
(16) Sir H. D. Cumberbatch	(An Ordinary Member, 1946).

The Officiating General Secretary then read out the constitution of the different Standing Committee by the Council. They were as follows:—

Committees:

(1) *Finance*
The *President, General Secretary and Hony. Treasurer (ex-officio)*, Mr. A. J. Elkins, Dr. M. Ishaque, and Dr. B. S. Guha.

(2) *Library*:
The *President, General Secretary, Hony, Treasurer, Philological Jt. Philological, Biological, Physical Science, Library, Anthropological, Historical & Archaeological and Medical Secretaries (ex-officio)*, Dr. N. Ray and Dr. A. H. M. Mohiyuddin.

(3) *Publication*:
President, General Secretary, Hony. Treasurer, Philological, Jt. Philological, Biological, Physical Science, Library, Anthropological,

Historical and Archaelogical and Medical Secretaries (ex-officio), Mr. Norman A. Ellis, Dr. A. H. M. Mohiyuddin and Dr. W. G. Griffiths.

(4) *Bibliotheca Indica*:

President, General Secretary, Hony. Treasurer (ex-officio), Sir Jadunath Sarkar, Dr. M. Ishaque, Dr. K. Nag, Dr. M. Z. Siddiqi, Dr. S. K. Chatterji, Dr. N. Dutt, Dr. Satkori Mukherji, Dr. A. H. M. Mohiyuddin and Dr. A. B. M. Habibullah.

(5) *Building*:

President, General Secretary, Hony. Treasurer (ex-officio), Dr. M. N. Saha, Dr. A. J. Elkins, Sir B. L. Mitter, Mr. B. Mathews, Dr. S. C. Law, Maharajadhiraja of Burdwan.

Advisory Boards.

A . *Cultural.*

Sir B. L. Mitter, Maharajadhiraja Sir U. C. Mahtab, Dr. S. K. Chatterji, Dr. M. Ishaque, Dr. N. Dutt, Dr. M. Z. Siddiqi, Mr. L. R. Fawcus (Secretary), Mr. Atul Bose, Mr. H. Waddington, Mr. K. P. Khaitan, Dr. A. H. M. Mohiyuddin, Rai Bahadur B. B. Mukherji, Mr. S. Chaudhuri, Sir A. H. Ghuznavi, Dr. K. Nag, (Chairman).

B . *Scientific.*

Dr. W. D. West, Dr. M. N. Saha, (Chairman) Dr. K. N. Bagchi, Dr. K. Biswas, Dr. S. K. Mitra, Dr. Verrier Elwin, Dr. B. S. Guha, Dr. A. C. Ukil, Mr. M. L. Schroff, Mr. K. B. Sen, Dr. S. C. Law, Dr. B. Mukherji, Dr. A. K. Sen (Secretary).

President: Now, we will have to take the report on matters for confirmation under rule 48d.

Dr. Sen: If I remember aright, in one of our Monthly Meetings last year we raised the point that any new matter as regards appointment, increase of salary and so on should be incorporated in the agenda itself.   Not only that but we refused to sanction these things and referred it back to the next meeting.   Unless these items are placed in the agenda it is very difficult for members to take such financial matters into consideration.   Besides, I think these reports which you are now going to make before the Monthly Meeting ought to have been printed and circulated with the agenda.   I also drew your attention to the rules which said such matters were subject to confirmation at a subsequent general meeting, when all these things would be given effect to.   Therefore, when you are bringing these matters before the Monthly Meeting, they ought to be incorporated in the agenda, so that they may be intelligently discussed by the members at such meeting and then confirmed.

President: I think that is a reasonable proposal.   It certainly can be done in future meetings.

Offg. General Secretary reported that the Council have decided to continue paying the conveyance allowance of Rs. 150/- to the General Secretary with effect from the beginning of the current financial year.

Mr. R. P. Mookerjee: When the question of conveyance allow-ance was put before the Council, it was not put in that way. The previous resolution was rather loosely worded—no time limit was given as to up to which time that allowance should be paid. It was also not made clear whether it was applicable to the present Secretary or whether it was attached to the post itself. As far as I remember, we are to continue this allowance up to the end of the current year. Being myself on the Council, I pointed out to them that the allowance is attached to the post and will continue to the end of the current year.

Dr. Majumdar: But there is another point. Supposing, in the course of this year, the Council decides to appoint a Secretary on a high pay as last year, is it the intention of the Council to continue this allowance ? I think, irrespective of the fact whether you appoint a whole-time Secretary or not, we should allow this up to the end of the current year, or till the appointment of a whole-time Secretary.

President: I find that the actual resolution of the Finance Com-mittee, as drafted, which was submitted to the Council and accepted by them, is rather vague. According to the recommendation of the Finance Committee which was reported to the Monthly Meeting the sanction of conveyance allowance was made last year.

Dr. Majumdar: The Treasurer's idea is very different from what we find here.

President: It is obviously within the competence of this meeting to deal with such matter in any way they like.

Dr. Majumdar: I think the best way would be to refer it back to the Council. I do not think the rules give us power to amend it in any way. I am not sure but I think you can give a ruling on that.

President: I think possibly the best thing would be to refer it back to the Council.

It was decided to refer the question back to the Council.

Offg: General Secretary then reported that "the Council have de-cided to continue paying a special allowance of Rs. 50/- to Mr. P. O. Matthai for his work as Assistant Secretary on the recommendation of the Special Staff Committee."

Dr. Sen: While discussing the Annual Report, 1947 on the last Monthly Meeting, I draw your attention to the previous year when the Council said, "Let us not appoint an Assistant Secretary but a Lib-rarian." They had done this but had not notified to the Monthly Meeting. I, therefore, propose that the money which Mr. Matthai has drawn be refunded or that the Council be held responsible for its refund. Besides, I oppose such a resolution appointing a Superinten-dent of the office as an Asst. Secretary.

Dr. Roy: Who is the Assistant Secretary now ?

President: Mr. P. O. Matthai.

Dr. Roy: When was he appointed ?

President: He was appointed as such by the Council last year.

Dr. Roy: When does that appointment lapse?

President: He was appointed as Assistant Secretary until the question of a whole-time Secretary has been decided.

Dr. Roy :   Was it ever brought before the Monthly Meeting ?

President :   It was adopted at the Council Meeting.

Dr. Roy :   Unless it is brought before the Monthly Meeting it lapses automatically.

Dr. Majumdar :   It was not confirmed.

Mr. R. P. Mookerjee :   I do not know if it lapses in the way suggested. That may be Dr. Majumdar's or Dr. Roy's opinion, but I want to know if any ruling was given by any previous President or any opinion taken. If not, we should take legal opinion on that point.

Dr. Majumdar :   What is the point of bringing this matter before the Monthly Meeting unless it is done for confirmation.

President :   Was a ruling given last year with regard to the interpretation of that rule, and the ruling that was given was with regard to a semi-colon at the end of the first sentence? What was to be confirmed at the next subsequent meeting was the appointment of secretariat officers, clerks or servants and not the definition of their duties, allowances, gratuities and other privileges or their suspension, dismissal, etc.

Mr. Bhattacharya :   Rule 48-d. is quite clear on the point. (Reads). Here the Council was appointing a person as assistant Secretary. It was really a case of creation of the post of Assistant Secretary. That in itself is *ultra vires*, but to overcome that difficulty the allowance attaching to the posts should continue to be paid.

President :   I agree it should be reported.

Dr. Roy :   Personally, I do not want that Mr. Matthai should be appointed as Assistant Secretary. According to Lort-Williams Committee's Report, an Assistant Secretary should not only have academic qualifications but be a distinguished scholar. We do not want to make a superintendent an assistant secretary of such a cultural body.

President :   1 shall have to put it to vote. Are you agreeable to continue with the Council's decision of paying Mr. Matthai the additional Rs. 50/- a month for work as assistant secretary ?

Dr. Majumdar :   The two things may be independent of each other—the appointment as Asst. Secretary, and the continuance of paying the additional Rs. 50/- a month to Mr. Matthai. According to the President, the ruling is that that portion must be confirmed. Under Section 48-d, you may appoint as many secretariat officers as may be deemed necessary. Therefore there is no doubt about the first portion. Now, do you agree to take up this matter in two parts—first of all, whether Mr. Matthai should continue as Assistant Secretary ?

Dr. Roy :   Personally, I am prepared to overlook the non-confirmation of his appointment as Assistant Secretary till the last day of last year but before an Assistant Secretary is appointed such post has got to be duly advertised. Therefore we do not confirm his appointment as Assistant Secretary with effect from the first day of the current year

Dr. Majumdar :   That is the only thing before us.

President :   Then I will have to put the matter to the vote. Do you confirm the appointment of Mr. Matthai as Assistant Secretary

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from the beginning of the current financial year?　Those in favour of his appointment may raise their hands;—the matter is not confirmed in this meeting. • Therefore the question of taking vote on the second portion does not arise.

Offg: General Secretary then reported that the Council have changed the grade of Mr. B. M. Chakravarty from Rs. 125—15/2—200/- to Rs. 200—10—300/- on the recommendation of the Special Staff Committee, and his new grade has taken effect from January, 1948".

President:　I ask you now, are you willing to confirm that decision of the Council ?

It was put to vote and was confirmed. .

Offg: General Secretary further reported that the following members of staff were promoted by the Council to higher grades on the recommendation of the Special Staff Committee :—

(a) Mr. Sivdas Chaudhuri, Offg. Asst. Librarian Rs. 125—15/2—200/-; on an initial pay of Rs. 140/- (his previous pay was Rs. 100/- plus an offg. allowance of Rs. 30/-).

(b) Pt. G. N. Bhattacharjee, Sanskrit Section, Rs. 125—15/2—200/- previous Junior Grade Rs. 60—5—125/-; initial pay of Rs. 125.

(c) Maulavi M. Matiur Rahman, in charge of Arabic and Persian Section Rs. 125—15/2—200, previous junior grade Rs. 60—5—125· initial pay of Rs. 125/-.

Dr. Sen:　I move that consideration of all the remaining items be postponed till the next meeting.　We have already tabled certain resolutions.　I think the Council should appoint a Committee to go through the affairs of the Society.　I think it is time that this was done.　I do not even know whether these posts are permanent or not

President:　These are not created posts; these are promotions

Dr. Sen :　I think it is better that we allowed any sub-committee which may be formed to go through the detailed working of the Society, but before that is done we should not agree to these increments.

Dr. Majumdar :　On general ground that is all right.　I do not know the exact development but two or three months ago this gentleman was the only person in the Library.　I do not know whether that condition still holds good, and practically the entire library is in his charge.　I think he holds the post on a permanent basis.　His work has been satisfactory.　If we postponed the matter I am afraid it would take four to six months.　Therefore the postponement of this item would mean that the only man in the Library would be dubious about the future, and I would, under the circumstances, recommend the meeting to confirm item 4(a).

Dr. Sen :　In view of the statement made by Dr. Majumdar I withdraw my opposition to this item.

President:　Then I ask, are you willing to confirm the promotions as read out by the officiating General Secretary ?

The items 4(a), 4(b), and 4(c) were put to vote and confirmed.

The Offg: Secretary then reported that one of the typists has absented himself from 8-3-48.

The following members gave notices of the motions to be moved at the near meeting : —

    (1)   Mr. A. K. Majumdar.
    (2)   Mr. T. C. Das.
    (3)   Mr. U. P. Basu.
    (4)   Dr. Jitendra Nath Banerjee.
    (5)   Dr. A. K. Sen.

Dr. Majumdar: One other thing that has not been made ready by the officiating General Secretary and that is that the Council recommended the creation of the post of librarian.

Mr. R. P. Mookerjee: We have recommended the creation of the post of Librarian, and if the general meeting approves of the creation of such post, then we shall go into details and take necessary steps. The idea of the Library Committee and the Finance Committee, as also of the Council, is, that the Library is the most valuable part and its work is one of the most important functions of the Society, and the present condition of the Society is such that we require a full-time librarian not only for the purpose of looking after the books and manuscripts as they are but also to be here whole-time and be able to assist scholars and other readers who frequent the Society. It is not possible to have a person conversant with every department of work, but at the same time if there be a scholar who has imbibed in him the love of scholarship and who is also conversant with the various kinds of literature, he will be able to direct study in the library as well. We have therefore, thought that steps should be taken to appoint a Librarian on a salary in the grade Rs. 300—25—600, and this fact is to be reported to the Monthly Meeting. It may be that the starting salary is nothing less than Rs. 300/-, but a committee was appointed for the purpose of deciding the qualifications and the terms for advertisement. The committee consisted of three ex-officio members, with Dr. Roy and was appointed to go into the details. After the terms are certified by the Committee and the post advertised, applications will be received and the person recommended will come before the general meeting for confirmation.

Dr. Majumdar: I myself tried to impress upon the Council the necessity of a whole-time Librarian who should be paid well, and I heartily support what Mr. Mookerjee says. The Council should agree that this post be filled at an early date by a suitable candidate.

Mr. Mookerjee: There is one other matter. The stocktaking of the library is long overdue and there have been complaints about books missing, lost or stolen. I need not go into past history but what is necessary is that stocktaking of library books and manuscripts should be undertaken in an efficient manner. The Council has recommended to the general body that a sum of Rs. 1,000/-, in the first instance, would be the salary of temporary staff to be recruited for stocktaking. A Committee has been appointed consisting of the four gentlemen mentioned on the last occasion—three ex-officio office-bearers with Dr. Roy to be in charge of the work of stocktaking. Our idea is that the person in charge of stocktaking should be one who is not connected with the Society and would come from outside who would do the work with the help of two other persons. It may be necessary to increase this grant if we find the period of such stocktaking is to be further

extended. It should be possible to complete this within eight to nine weeks but the present condition of the catalogues and other things will not make it possible for us to finish this work as efficiently as we would like to. I therefore, suggest that you approve of this and the action which would be taken by the Council for this stock-taking. The library will have to be closed for complete stocktaking.

Dr. Sen: On a point of information, may I ask the Treasurer whether the stocktaking of the library will also include other property of the Society.

President: That is a separate matter.

Dr. Sen: My suggestion is to include in the stocktaking the other property of the library. I think pictures also come under library.

President: Dr. Sen's observation will be considered. I think that is a good idea but that is a separate matter.

Mr. R. P. Mookerjee: I won't be divulging a secret if I say that I have already taken steps in my capacity as treasurer for the purpose of getting out stocks of the books, and on the question of other items belonging to the Society, that will be taken up separately with the Council and the Finance Committee. Let us now confine ourselves to the proposal before us and see that the stocktaking of books and manuscripts is done properly and as quickly as possible.

President: The next item on the agenda is the disposal of motions notices of which were given at the last Ordinary Monthly Meeting, which will be moved at this Monthly Meeting.

Dr. Majumdar: I formally move the following motion:—

Whereas in the opinion or the members of the Society time has come when the Society should be designated as 'The Asiatic Society' as named by its founder Sir William Jones in 1784 while inaugurating it.

Resolved that the Council of the Society should take legal and constitutional means to give effect to the above by January, 1949.

Dr. Saha: The word "Bengal" was added later, and this has given rise to some difficulty. We approached the Government of India for a grant which was refused on the ground that our Society was the concern of the Bengal Government.

President: It would be more appropriate to have Dr. Majumdar's motion for changing the name of the Society postponed until the new constitution of India has been formulated, when we will know what the relation of India will be with the Commonwealth. It was decided, in any case, whether the motion is postponed or not, to take the advice of Sir Brojendra Lal Mitter on the legal aspect of the question.

Dr. Majumdar: Before taking legal opinion I should also like to know what the general feeling of the members is.

Several speakers were not in favour of leaving out the word 'Bengal' after the Society's name and suggested that as the matter was of a technical nature it be postponed, and Dr. Majumdar's motion was therefore postponed.

In view of the above the following motion standing in the name of Mr. K. K. Ganguly was also postponed:—

Resolved that the Royal Asiatic Society of Bengal, while being renamed as the Asiatic Society of Bengal may be known also by a name in an Indian language and a Committee consisting of not less than three members be formed to find out what Indian language would suit the purpose best and conn a name in that language within a period of three months.

President: The third motion is in the name of Mr. A. K. Majumdar.

Mr. A. K. Majumdar moved the following motion:—

Whereas great dissatisfaction prevails among a large number of members of the Society regarding the management of the Society's Journal particularly in view of long delays in such publication and other irregularities as

(a) *Publication of articles which are verbatim reproductions of articles published in other Journals;*

(b) *Non-publication of articles written by eminent scholars by following a highly unsatisfactory and objectionable procedure;*

(c) *Publication of articles condemned by eminent scholars;* *this meeting of the General Members of the Asiatic Society do hereby appoint a Committee to investigate into the affairs of the Journal of the Society and recommend measures for its imporvement to the Monthly Meeting of the Society.*

President: The Council has considered it very carefully and it is referring the matter for more detailed consideration to the Publication Committee and I think it would be very good if the mover of the motion attends the meeting of the Publication Committee, so that he may give them the benefit of his advice. Will the mover of the motion now kindly agree to adjourn his motion?

Mr. R. P. Mookerjee: I shall now read out the names of persons who are in the Organisation Committee. "This is to consist of three ex-officio members under the Rules. Besides, there are Dr. Roy, Dr. Sen, Mr. Das, Mr. Bhattacharya and Sir B. L. Mitter." You will find there are 4 (four) members of the Council and there are four members who are outside the Council who have been put on that Committee for the purpose of going into the entire work of the Society, which will be known as Organisation Committee for the purpose of making necessary recommendations for improvement of the work in every department of the Society. What we proposed on this occasion is that we should try to finish the work of the Organisation Committee within the life of the Council and try to implement their recommendations before the present Council goes out of office.

Dr. Sen: The majority of the members of the Society should take active interest in the work of the Society. That is one fundamental point I want to bring through you to the notice of the members. The second point is, you will find from the resolution that certain members want that the Committee should be formed and they volunteered to collect certain information for the purpose of recommending measures for the improvement of the journal. I do not see any harm

there. I do not even think that Mr. Mookerjee himself has got sufficient time to go into details of all the different departments of the Society.

A Member: What objection, if any, can be raised if certain articles published before should be published in the Society's Journal?

President: The Society's journal is for original articles. All we are concerned about is that the Council are too anxious to look into the matter. Nevertheless, Mr. Majumdar still wishes to press his motion, and I, therefore, put before you the motion of Mr. Majumdar. Those in favour of the motion to appoint a committee to investigate measures for its improvement to the Monthly Meeting, please raise their hands; those against—the motion is carried.

I think we have got to take the names of members who constitute the Committee and it is open to the house to present their views.

Dr. A. K. Majumdar: I want three ex-officio members.

Mr. R. P. Mookerjee: I have explained it is physically impossible to attend all the meetings.

President: I agree with Mr. Mookerjee. Last month I had to attend 14 meetings, some of which lasted for two hours. It is simply impossible.

It was decided to constitute a Committee as follows:—

> Mr. H. D. Bhattacharya.
> Mr. S. K. Chatterji.
> Dr. G. P. Majumdar.
> Dr. B. P. Neogy.
> Dr. J. N. Banerji.
> Mr. A. K. Majumdar
> Dr. M. N. Shaha.
> Mr. B. Mukherjee.
> Mr. T. C. Das.
> and three ex-officio members.

Mr. Bhattacharya then moved the following motion:—

Whereas, a Sub-Committee consisting of Dr. C. S. Fox, Dr. S. L. Hora, Mr. C. W. Gurner, Sir John Lort-Williams, Dr. S. P. Mookerjee, Dr. M. N. Saha and Dr. R. C. Majumdar was constituted by the Council of the R.A.S.B. on 23-11-1942, to enquire into and report upon the working of the system of administration of the Society.

Whereas, the said Sub-Committee in its final report, dated 30-1-1943, reports, among others, the following:—

Book Library.—A modified version of the 'Dewey' system of cataloguing, etc. was adopted upon the recommendation of the Special Enquiry Committee (Lort-Williams' Committee), after very careful consideration of experienced advice. We are of opinion that it is fully adequate and eminently suitable for the peculiar needs of our Library. The necessary special registers and equipment were purchased, at a cost of Rs. 711, so far back as August 1941. We find that during the seventeen intervening months very little work has been done on the Authors' Catalogue,

less on the Subjects Catalogue and some of the Registers have not even been touched. For many months nothing has been done at all. In such a lamentable state of affairs and in face of such gross slackness, confusion, ignorance and lack of necessary experience of those responsible, we are not surprised at the Report of the Library Sub-Committee.

MSS., Library.—The neglect of our priceless collection of MSS., for many years past amounts almost to a disgrace. Since the death of Dr. H. P. Sastri their cataloguing has been talked about for a long time, but very little has been done and much money has been wasted. We find that two part-time editors alone succeeded in absorbing Rs. 25,000. We undertook over six years ago, to prepare within two years, a Catalogue of 11,000 MSS, from the Indian Museum, entrusted to us by Government and the work has not yet been touched. We consider that these heavy task should be undertaken forthwith and unceasingly pursued by culturally qualified students tackling particular collection and being remunerated upon a specified project basis, out of the Oriental Publication Funds until the whole work has been completed. We cannot afford to get all this necessary work done quickly without some voluntary help and we recommend that efforts be made to enlist promising young scholars who are interested in this kind of work. . . .

Audit and Valuation, Press, Publications, Stock.—The insurance of our possessions is in a most unsatisfactory and muddled condition, mainly owing to the fact that we have only the vaguest idea about their value. A proper valuation, so far as possible, should be commenced immediately and a new policy taken out to cover accurately specified properties and complete inventories should be made of all our assets. A thorough overhaul of stock is necessary and accurate statements prepared showing which of our publications have been completed.

The press and publications side of our activities has been neglected and has suffered on account of slackness, lack of interest, unsuitability and lack of necessary equipment of the staff employed.

Whereas, the Council of the R.A.S.B., accepted the Report on 16-2-1943, but did not accept the concluding recommendation of the Sub-Committee 'That this Sub-Committee be reappointed, to assist the General Secretary, to make interim reports if necessasy, and after six months' trial, review the situation generally and re port to the Council on the results of the measures taken, and advise about the future, and whereas, although steps taken to implement the recommendations of the said Sub-Committee, resulted in considerable improvement in the Library and Publications Depts. during 1944 and 1945, such steps having since being discontinued, the state of the Society has again reverted to what it was in 1942.

Be it resolved that this meeting do appoint a Special Committee of eleven resident members of the Society to go into the administration of the Library, Manuscripts and Publication Departments of the Society, and to suggest ways and means for their improvement.

Resolved further that the said Sub-Committee be requested to submit its Report and Recommendations, with the observations of the present Library and Publication Committees of the Council of the Society thereon, to the July 1948 Monthly Meeting of the Society, and five members form a quorum of the said Committee, and the said Committee be empowered to fill up any vacancy in the Committee, from among the resident members of the Society, whenever necessary.

I would like to place before you my views about it. I have not approached the problem of reorganisation of the library as an obstructionist. I have felt, after studying some of the facts about the library, that there are certain serious defects in the management of the library and those defects should be removed as soon as possible. It is for this reason that I gave notice of this motion. Since then a Committee has been appointed by the Council, called the Organisation Committee, and the Council has also decided to appoint a librarian, and as you are aware, the appointment of a librarian has also been sanctioned by this meeting. In view of this fact I would like to withdraw the resolution, or perhaps it would be better, if you so suggest, to refer this resolution to the Organisation Committee. I reserve my right to speak further later on if any point arises out of this.

President: As the motion is down on the agenda paper I would like to have the permission of the meeting to adjourn that resolution as proposed by the mover.

Mr. Bhattacharya: I propose this resolution be forwarded for necessary action.

President: I take it you approve of that.

Dr. Bose: I formally move the following motion:—

Whereas, 'In 1943, Mrs. Roy, wife of the Late Rai Bahadur Sarat Chandra Roy, donated a sum of Rs. 4,000 in cash, to the R.A.S.B. for the creation of an endowment for the annual award of a gold medal to perpetuate the memory of her husband who was an Associate Member from 1929 to 1942.

Whereas, Mrs. Sarat Chandra Roy donated another sum of Rs. 250 for making the first medal to be awarded in 1944.

Whereas, the Council of the R.A.S.B. at its meeting of 25-10-1943 accepted the offers with thanks.

Whereas, the Council adopted the draft 'Regulations regarding the award of the Sarat Chandra Roy Memorial Medal' on 20-12-1943 and subsequent amendments on 24-7-1944 and reported, under Rule 48(a), to the Ordinary General Meeting of the Society in November, 1944, for the information of the Members.

Whereas, the Council on 8-9-1944 ordered: (a) Invest Rs. 4,000 donated by Mrs. S. C. Roy in 3% Defence Loan; (b) the value of the medal to be awarded every year should not exceed the interest available from the investment; if a gold medal cannot be made with the interest, then a silver medal should be awarded: (c) a die for the medal need not be made for the time being.

Whereas, 3% Victory Loan, 1957, of the face value of Rs. 4,000 was purchased at a cost of Rs. 4,016-10-8, and the value of the

*medal in 1945 was Rs. 228-0-3, in 1946—179-14-0, in
1947—Rs. 118-3-3, and the interest realized from the 3% Victory
Loan of the face value of Rs. 4,000 was, in 1945—Rs. 84-13-0, in
1946—Rs. 82-15-0, in 1947—Rs. 82, instead of Rs. 120 per year
free of Income Tax, less As. 4 bank charge,*

*And whereas, it was announced in the Annual General Meeting
of the Society in February, 1948, by the Hony. General Secretary
that 'The award of this medal was postponed for the time being,
due to the fact that the interest accrued every year from the corpus
of the Fund would not be sufficient to meet the cost of a gold medal
to be awarded every year. The matter was therefore referred back
to the donor of the medal to revise the terms so that it may be
awarded either biennially or triennially,'*

Be it resolved,

*That the Members of the R.A.S.B. at this Monthly General
Meeting strongly disapprove of the irregular, unconstitutional and
illegal action of the Council in the administration of the 'Endow-
ments' of the Society.*

*Resolved further that this meeting do appoint a Committee of
Enquiry of eleven Resident Members of the Society to go into the
administration of Endowment Funds of the Society and to recom-
mend changes, if necessary, in the present 'Regulations' of the
Society as regards their administration and award of medals and to
report to the Society within two months from the date.*

*That five members should form a quorum of the said Committee,
and that the Committee be empowered to fill up the vacancy among
its members whenever necessary from among the Resident Mem-
bers of the Society.*

Mr. R. P. Mookerjee: I propose an amendment that the first
portion be deleted, the remark about unsatisfactory conduct and so
forth. It does not seem to me, if there had been defective regulation
or rule, at this juncture proper to pass a vote of censure on the past
conduct of the Council. I would propose the first portion be deleted
and the second portion expunged.

Dr. Sen: I second the proposal. We are not moving a vote of
censure; we are only disapproving of the action of the Council for not
placing such matters before the Monthly Meeting for confirmation.

President: You are speaking on the amendment.

Dr. Bose: I have the right to oppose the amendment.

President: Your remarks do not seem entirely relevant whether
the first paragraph should go out or not.

Dr. Bose: If you like I can bring that in this way, I think you
will give me permission to speak again later on.

President: Yes.

Dr. Majumdar: Unless we disapprove of the action of the Coun-
cil justice cannot be done to the widow of Sarat Chandra Roy. What
one may object to is the language.

President: The amendment has been accepted by the mover.
Now, we come to the motion itself.

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Dr. Majumdar: I agree with Mr. Mookerjee that Dr. Bose's proposal as such cannot be accepted.

Dr. Sen: The House has got every power to amend the whole resolution. That is why 1 want that there should be a committee appointed to go through this matter, so that if required they can lay down certain fundamental rules for the consideration of the Council and also change the regulations.

President: Does anybody else wish to speak on the motion? The motion is to appoint a committee of 11 resident members of the Society to go into the administration of the Endowment Fund of the Society and to make change in the regulations and report to the Society within two months from date.

Dr. Roy: This was a specific resolution for appointment of a committee to go into the administration of medals as such. That was raised when we were discussing the Annual Report. What 1 propose is once an Organisation Committee is appointed, could we not refer this to that Organisation Committee and bring before it, either through a motion in the Ordinary Monthly Meeting, just when the Organisation Committee is sitting, or directly to the Organisation Committee, to investigate into these affairs? I would, therefore, formally move that this resolution, with these comments and further comments covered by Dr. Bose and Dr. Sen, be referred to the Organisation Committee

Dr. Majumdar: You mean both parts—that we do not approve of the action.

Dr. Roy: That portion has been deleted.

Mr. Bhattacharya: I beg to second this resolution

President: Those in favour of passing the motion, the first paragraph of the resolution, with the exception of what has been deleted, may raise their hands: those against—the motion was passed.

Now, Dr. Roy's proposal has been seconded that the rest of the resolution be forwarded to the Organisation Committee for their consideration and necessary action. Those in favour of that may please raise their hands, those against—the proposal was passed.

President: The next motion is in the name of Dr. A. K. Sen

Dr. Sen: I formally move the following motion:—

Whereas, on a 'letter dated 24-5-1940 from Dr. S. Krishnaswami Aiyangar suggesting that the Centenary of the deciphering of the Asoka inscriptions by James Prinsep should be suitably celebrated by the Society' the Council of the R.A.S.B. resolved that Dr. Kalidas Nag, Mr. H. C. Chakladar and Dr. B. S. Guha should form a Sub-Committee to consider the publication of a special number of the Society's Journal in Commemoration of the Centenary of James Prinsep.

Whereas, the said Sub-Committee recommended on 20-11-1941: (1) that a medal called the James Prinsep Medal for Indian Epigraphy be awarded by the Society biennially for the best original work in Ancient Indian Epigraphy and Numismatics, the details of which are to be worked out by the Council and the cost of the Medal to be met out of the Funds of the Society—the first medal to be awarded, if possible, in 1942;.(2) that Prof. S. K. Aiyangar's

suggestion as contained in his letter be accepted when publishing the Special Commemoration Number may be truly international the publication be postponed till the end of the War, though necessary steps to approach different scholars may meanwhile be taken,

Whereas, the recommendations of the Sub-Committee as modified below was accepted by the Council of the R.A.S.B. on 26-11-1941: (1) *that Funds be raised for instituting a medal to be called the James Prinsep Medal to be awarded biennially by the*

Society for the best original work in Ancient Indian History. The first medal to be awarded, if possible, in 1942: (2) *that a special Commemoration meeting be called to consider details to the project*: (3) *that Prof. S. K. Aiyangar's suggestion as contained in the letter be accepted when publishing the Special Commemoration Number of the Journal, and in order that the number may be truly International the publication be postponed till the end of the War, though necessary steps to approach different scholars may meanwhile be taken.*

Be it resolved that this meeting of the Society regrets the non-implementation of the above by the Council of the R.A.S.B. up till now and request the Council to find out ways and means so as to implement them in the near future and directs that the James Prinsep's Medal be awarded at the Annual General Meeting of the Society in February, 1942, the cost to be borne, even if required, from the Funds of the Society, and that the Special Commemoration Number of the Journal be published by February, 1949, and that the Council should communicate, at every Monthly General Meeting of the Society, the progress of work done by the Council this direction.

Dr. Majumdar: I second it.

President: The resolution passed by the Council on this motion is as follows, "The Council regrets that its predecessore took no action and is taking immediate steps to examine the position through the Finance and Publication Committees. The Council views the resolution passed by its predecessor sympathetically and the one brought by Dr. Sen before this meeting sympathetically and is taking action through these two Committees.

Dr. Sen: I have formally moved this resolution. I shall be glad if the President agrees that in every Monthly Meeting we are apprised of the work on this line of the Council. My resolution was to that effect or it can even be done at the end of every three months. I did not ask in this case for the formation of any committee, and I think Mr. Mookerjee will appreciate that.

President: I understand that your resolution has been changed now from every month to every quarter.

Dr. Sen: Every third Monthly Meeting.

President: Then I take it that the meeting is willing to pass Dr. Sen's resolution with the addition of every third Monthly Meeting.

The following two papers were taken as read as the authors are not present: —

(1) *Knowledge of the ancient Hindus concerning Fish and Fisheries of India. By S. L. Hora.*

In this paper, the author has quoted passages from Kautilya's *Arthasastra* to show that even in the dim past ages, fishery was a well-established industry in India, and that fish was relished as an article of diet. During famines or other national calamities, greater use was made of fish to tide over food shortages. Fishermen were charged low licence fees for catching fish and were given concessions for fording or crossing rivers. Fish processing (dry fish and fish manures) was known in the days of Kautilya and fishery products were charged a low rate of toll tax. The ancient Hindus possessed a considerable general knowledge of the habits of fishes, and used that knowledge to practical purposes, or in using metaphors.

(2) *On a new hermaphrodite Species of Microphthalmus (Polychaeta-Hesionidae) from the sandy Beach, Madras. By K. H. Alikunhi.*

Of the four known species of *Microphthalmus*, *M. sczelkowii*, *M. aberrans*, *M. similis* and *M. fragilis*, the last two are hermaphrodite, while nothing is known regarding the reproductive organs of the other two. The new Madras species is also a hermaphrodite. In view of Bobretzky's meagre description of *M. fragilis* and *M. similis* and the difference between the Madras *Microphthalmus* and *M. sczelkowii* and *M. aberrans*, it has been considered advisable to describe the Madras worm as a new species.

M. urofimbriata sp. nov. occurs in fair numbers. Specimen 6 to 8 mm. long have 40 to 75 setigerous segments. Cephalic appendages are well developed. The two eyes are forwardly placed. Nuchal organs are conspicuous. Parapodia are biramous the dorsal division carrying 12 to 18 capillary setae including the pectinate seta. Simple and compound setae are present in the ventral division. The anal plate has 20 to 30 finger-shaped processes on the margin. Male reproductive organs occupy the anterior and female reproductive organs the posterior segments. The two penes, situated between segments two and three have cuticular supporting rods. A pair of male genital ducts runs forwards from the anteriormost testis segment to open at the base of the penes. In each female segment is a pair of receptacula seminis. Transference of sperms probably takes place during copulation.

The arrangement of the cephalic appendages, the nature of the setae, the fimbriated anal plate, the cuticular supporting rods of the copulatory organs, the elongated vasa deferentia, and the absence of intermingling of the sexual elements are some of the important features characteristic of *M. urofimbriata*.

Monday, the 7th June, 1948, at 5-30 p.m.

Present:

Dr. M. N. Saha, Vice-President, in the chair.

Members:

Banerjee, J. N.; Binani, Vithaldas; Chatterji, Dr. S. K. Chakravarti, P.; Das, J. N.; Das, S. R.; Gupta, Omkar Shanker; Gupta, A. B.; Guha, D.; Ganguli, R.; Ghose, R. C.; Ghose Chaudhuri, H.; Habibullah, Dr. A. B. M.; Majumdar B. C.; Majumdar, Dr. G. P.; Mukherjee, N. D.; Mukherjea, A.; Paul, H. C.; Roy, Dr. N. R.; Saraswati, S. K.; Sen-Gupta, K. K.; Trivedi, V. B.

The Chairman opened the proceedings by calling upon the General Secretary to read the minutes of the Monthly Meeting of the 5th April. The General Secretary pointed out that as the minutes covered about 36 typed pages, he had requested Dr. A. K. Sen to make a summary but subsequently it was found, both by himself and the latter that that was not possible. Dr. Sen put forward the following suggestions, (1) that in future these minutes be laid on the table before they were confirmed to enable members to go through them, and (2) that the shorthand transcripts be reduced to a longhand summary and circulated to the members concerned for necessary revision, as that was the only way, he thought, the minutes could be confirmed. Upon the General Secretary remarking that according to the Rules the minutes should be read Dr. R. C. Majumdar asked for a gist of the proceedings to be read, ommiting the discussions and the wording of the resolutions, so that the form might be observed. The General Secretary thereupon began to read the minutes of the Meeting of the 5th April, of the meeting adjourned to the 12th April, and of the last meeting which was held on the 3rd May. Considering this to be tediously long the Minute Book was passed round to the members at the instance of the President. Dr. Majumdar suggested the postponement of the confirmation at the end of the Meeting which was agreed to by the members.

The General Secretary reported that the following eight books were presented to the Society : —

Dikshitar, V. R. R.—Southern India and China (Calcutta, n.d.). *Presented by the Author.*

Garga, Kamala—Hindi Ho Keon? (*in Hindi*), Calcutta, 1948. *Presented by Sri O. S. Gupta.*

Gitanjali.—Tr. by Amarendramohan Bhattacharji (*in Sanskrit*), Calcutta. 1336 B.S. *Presented by the Translator.*

Indian Historical Records Commission—Proceedings of Meetings, Vol. XXIII (New Delhi, 1947), *Presented by the Government of India.*

Isvara-Kavya-Gumphika—Pt. I. Harirasa (Calcutta, 1995 samvat). *Presented by Rai Bahadur R. D. Chokhany.*

Rampuria, S. C.—Cult of Ahimsa (Calcutta, 1947). *Presented by the Author.*

Ruttonsha, Mrs. G. N. Juvenile Delinquency and Destitution in Poona. (Poona, 1947). *Presented by the Deccan College, Poona.*

Mahatma Gandhi—A collection from the writings of Rabindranath Tagore (*in Bengali*), Calcutta, 1948. *Presented by Visvā Bharati, Santiniketan.*

The following candidates were balloted for election as Ordinary Members:—

(21) *Bryan, Denzil Arnold*, B.A. (Cantab.), U. K. Trade Commissioner, 1 Harrington Street, Calcutta.
Proposer: L. R. Fawcus. *Seconder*: W. D. West.

(22) *Singh, Jaipal*, M.A. (Oxon.), Barrister-at-Law, Member, Constituent Assembly, Ranchi (217 Imperial Hotel, New Delhi).
Proposer: K. Nag. *Seconder*: V. B. Trivedi.

(23) *Singh, Hari*, B.Sc., Journalist, 89 Netaji Subhas Road, Calcutta.
Proposer: T. N. Agarwala. *Seconder*: V. B. Trivedi.

(24) *Choubey, Ram Mahesh*, B.A. (Hons.), B.L., Headmaster (Offg.), Shree Maheshwari Vidyalaya, 4 Sova Ram Bysack Street, Calcutta.
Proposer: T. N. Agarwala. *Seconder*: V. B. Trivedi.

(25) *Mukherji, Rajani*, B.A. (Allahabad), 139-B Rash Bihari Avenue, Calcutta.
Proposer: L. Sukul. *Seconder*: D. P. Ghosh.

(26) *Sen, Makhanlal*, Journalist, 58-A Hindusthan Park, Calcutta.
Proposer: D. Burman. *Seconder*: S. K. Saraswati.

(27) *Lal, Aradh Bihari*, Sahityacharya, M.A., B.L., Preacher, Arya Samaj, 214 Chittaranjan Avenue, Calcutta.
Proposer: M. Himatsingka. *Seconder*: B. L. Sharma.

(28) *Kelasa, Shin*, B.A., Post-graduate Student (Cal. Univ.), 4-A Bowbazar Street, Calcutta.
Proposer: D. Guha. *Seconder*: A. H. M. Mohiyuddin.

(29) *Banerjee, Sivadas*, M.A., B.Sc., Journalist, 3-A Mahanirvan Road, Calcutta 29.
Proposer: D. Guha. *Seconder*: S. K. Saraswati.

(30) *Bhaduri, Jyoti Sankar*, M.A., Kavyatirtha, Secretary, Sonapur Tea Estate, 51-D Sambhunath Pundit Street, Calcutta.
Proposer: D. Guha. *Seconder*: S. K. Saraswati.

(31) *Bhansali, Balwant Raj S.*, B.Com., LL.B., Labour Officer, Hastings Mill, Ltd., Messrs. M. Bangur Bros., Ltd., 9 Netaji Subhas Road, Calcutta.
Proposer: Muni Kanta Sagar. *Seconder*: K. K. Ganguli.

(32) *Rock, Joseph F*, Ph.D., Research Fellow of Harvard, Yen-ching Institute, Cambridge, Mass., U.S.A.
Proposer: K. N. Bagchi. *Seconder*: D. Burman.

(33) *Swann, Robert Swinney*, B.A. (Cantab.), U. K. Foreign Service, United Service Club, Chowringhee, Calcutta.
Proposer: E. T. D. Lambert. *Seconder*: K. N. Bagchi.

While the balloting went on Dr. A. K. Sen submitted that in a previous meeting where the Chairman was not present, it was decided by the President that proposals for election of members should be brought before the Monthly Meeting, as the Council had no authority to hold them back.

The General Secretary pointed out that under Rule 5, the names recommended by the Council should only be placed before the General Meeting and not all the proposals received. He further pointed out that certain proposals had been referred back to the proposers, as the Council wanted to have further information about academic and other qualifications.

The General Secretary then mentioned the case of Avadh Bihari Lal, "Sahityacharya", M.A., B.L., whose name was proposed by Mr. M. Himatsingka and seconded by Mr. B. L. Sharma, and said that he had just received a letter from a certain member who questioned the title of "Sahityacharya" and asked for the production of a certificate. A discussion was about to start on this subject when the Chairman ruled that they were at liberty not to ballot for this name if they did not want to.

The ballot was then taken.

The following motions of which notices were given on 3-5-48 were disposed of under Rule 57(e) in manner noted below : —

(1) A. K. Majumdar.

This meeting request the Council of the R.A.S.B. to frame Regulations (under Rule 48(a)) relating to the election, nomination or appointment of Representatives or Deputies to represent the society to the various Boards, Committees, Congresses, Conferences, Commissions, Celebrations of other official, non-official, universities, bodies or Institutions and report them for the information of the August 1948 Monthly Meeting of the Society.

The Chairman informed that the Council had already considered the motion at their meeting of 13.5.48 and had asked him to say that it was not necessary to frame regulations. On Mr. Majumdar enquiring the reason for the Council arriving at such decision, the General Secretary said that it was due to the fact that the whole question had been referred to the Organisation Committee which was appointed to deal with all problems of Organisation. Dr. R. C. Majumdar asked if the resolution could now be formally moved when the Chairman said that that could be done if Mr. A. K. Majumdar was not satisfied with the explanation given by the Council. Thereupon Mr. A. K. Majumdar formally moved the resolution standing in his name. Dr. A. K. Sen seconded the resolution. Dr. R. C. Majumdar added that unless regulations were framed none of these bodies concerned would ever again ask the Society to send a representative. He did not therefore see any harm in framing regulations wherein it could be suggested that such and such a person should be selected. After some discussion the resolution, formally moved by Mr. A. K. Majumdar and seconded by Dr. A. K. Sen, was put to vote and passed.

(2) Mr. T. C. Das.

This meeting requests the Council of the R.A.S.B. to frame Regulations (under Rule 48(a)) relating to the selection, appointment, tenure, duties, allowances, salaries, and privileges, of the Research Fellows and workers of the R.A.S.B., and report them for the information of the August 1948 Monthly Meeting of the Society.

The Chairman informed the meeting that the Council had considered this motion at their meeting on 13.5.48 and had asked him to say that they had already decided to frame the necessary rules. Thereupon Mr. T. C. Das withdrew his motion, Dr. Sen remarking that the Chairman's announcement be made a part of the proceedings.

(3) Mr. U. P. Basu.

This meeting draws the attention of the Council of the R.A.S.B., to the fact that the Year Book of the R.A.S.B. for 1945, has been issued to the members of the Society in October 1947, and that such irregular and late publication of the Year Book of the Society, debars the resident, non-resident and Foreign Members of the Society from taking any intelligent and active part in the Scientific and Cultural activities of the Society, and requests the Council to issue the Year-Book for 1946 and 1947 by October 1948, in the interest of the Society and the members thereof.

The Chairman informed the meeting that the Council had considered the motion at their last meeting and had asked him to say that the publication of the Year Book would be taken in hand immediately. Dr. Sen called for a definite time limit within which the publication of the Year Books in question would be completed. The Chairman agreed to re-place the word "immediately" by "before the end of 1948", which amendment was accepted by Dr. Sen who said that it should be formally moved and passed. Dr. Sen then formally moved the resolution with the modification as suggested by the Chairman, namely instead of 1947 it should read "by December 1948", which was seconded by Dr. R. C. Majumdar. After some further discussion the Chairman promised personally to see to the publication of the Year Books at the earliest possible date provided the manuscripts were made over to him by the end of this month and the choice of a press was left to him. Dr. Sen also promised to help in compiling the materials for the Year Books and making them ready for the Press. The proposal was then put to vote and passed.

(4) Dr. Jitendra Nath Banerjea.

Whereas in 1945, the Council of the R.A.S.B., to celebrate the Bicentenary of the birth of Sir William Jones (1746-1946), Founder of the Society, prepared the following programme of cultural activities : —

    (a) *To publish a complete author and subject-index of all the important articles in the Asiatic Researches and the Journal and Proceedings of the Society up to the end of 1945;*

    (b) *Preparation of an annotated edition of Kalidasa's Sakuntala with the English Translation of Sir William Jones,*

*with a life sketch of the Founder of the Society together
with an account of his cultural activities and full Biblio-
graphy of his writings by Dr. Kalidas Nag;*

·*(c) Publication of a 'Monograph' on 'Fisher's Memoir on
Education' by Prof. A. N. Bose.*

*Be it resolved that this meeting of the Society regrets the non-
implementation of the above by the Council up till now and re-
quest the Council to find out ways and means so as to implement
them in the near future and not later than a year from date and
that the Council should communicate, at every Monthly General
Meeting of the Society, the progress of work done by the Council
in this direction.*

The Chairman informed that the Council decided to appoint a
Committee consisting of two philological Secretaries, Dr. J. N.
Banerjea, Dr. R. C. Majumdar, Dr. K. Nag, and three ex-officio
members.

Dr. Majumdar wanted to know if any committee was appointed
already for this purpose. He said that Sir Jadunath Sarkar was
asked three or four years ago to collect all articles for the medieval
period and somebody else was asked to collect articles for the earlier
period, after which the Council did not care to know what had been
done. Dr. Sen was of opinion that here also a time limit should be
fixed. In reply to the Chairman, who asked Dr. Banerjee if he was
satisfied with the decision of the Council, Dr. Banerjee nodded
agreement but remarked that in order that the work should be expe-
dited, a time limit should be set. After discussions Dr. Sen moved
a closure to this discussion, and the President put Dr. Banerjee's
motion to vote, and was passed.

(5) Dr. A. K. Sen.

*Budget Estimates for 1948 of the R.A.S.B. as submitted by the
Council to the Annual Meeting in February 1948, be taken into
consideration at this meeting of the Society and to facilitate dis-
cussion of the Budget, Council is hereby requested to place before
the meeting the details of the Budget under different heads of
expenditure, especially the details of the staff, their salary and
allowances.*

Dr. Sen formally moved that the consideration of this item be
postponed till the next meeting. He said that in the meantime all
information should be laid on the table and hung up in the Meeting
Room. The proposal of Dr. Sen was accepted.

The General Secretary announced that the Council proposed for
re-election as Associate Members the following persons for a period
of five years, in accordance with Rules 2 and 13: (1) Prof. P. C. Sen
Gupta, and (2) Mr. W. Birney. The attainments of both these gen-
tlemen were read out. After some discussions it was decided to place
these names for approval before the next meeting.

The General Secretary then reported that the Council have de-
cided to award the Dr. Bimala Churn Law Gold Medal biennially,
instead of annually, at the suggestion of the donor (Rule 48-a). Dr.
Majumdar enquired whether this would mean that the Society would

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not in future have to pay anything out of its own pocket, and wanted to be sure that no expenditure was incurred for this medal. He said it was his suspicion that the Council now at least had realised that it was spending a lot of money out of its own fund. The General Secretary replied that he was certain that there would be no expenditure of money from General Fund and, on the other hand, there may be a saving to the extent of Rs. 200/-. Dr. Sen submitted that according to the Rules and Regulations of the Society the amended regulation referred to by the General Secretary should be brought before the next Monthly Meeting.

The General Secretary then reported that the Council have nominated Dr. S. K. Chatterji, Philological Secretary, to represent the Society to serve on the Selection Committee of the Calcutta Unversity for recommending a person for the award of the Sarojini Basu Medal for 1948. While accepting the proposal Dr. Sen wanted to know whether these things were brought through the philological committee or by the Council of its own accord. The General Secretary replied that Dr. Chatterji was himself the Philological Secretary and added that that Committee was not in existence at that time, it was formed only lately.

The General Secretary then reported that:

> *The Council have decided to reconstitute the Specialist Sectional Committees, consisting of Cultural: (1) History and Archaeology; (2) Art, Architecture, and Regional and Town Planning; (3) Sanskritic Studies; (4) Islamic Studies; (5) Language, Literature, Religion, and Philosophy; and (6) Anthropology and Ethnology. Scientific: (1) Medicine and Public Health; (2) Botany, Forestry and Agriculture; (3) Zoology and Fisheries; and (4) Engineering and Industrial Development. (The list of members of these committees were placed on the table).*

Dr. Majumdar questioned the utility of these Committees. He pointed out that one of these Committees met three years ago and in that very first meeting a number of resolutions were passed recommending several things, one of them being the cataloguing of Coins. He said that not one of these items was carried into effect by the Council or the Secretary. Since the formation of this Committee Dr. Majumdar himself being the Chairman and Dr. Banerjee the Secretary but nothing could be done, and a sum of Rs. 100/- p.m. could not be found to make a catalogue of these Coins. Dr. Sen pointed out that it was the look-out of the Monthly Meeting to see that these expert Committee worked properly and that their recommendations were given effect to and implemented by the Council. Dr. Majumdar proposed that this should be conveyed to the Council.

. Dr. Majumdar enquired when was the stocktaking of the library to be completed. Dr. Roy replied that it was going on and he expected it would be completed by the 10th of July; he hoped to open it section by section. Dr. Majumdar said since it was not likely to be opened till the middle of July it would be convenient if members, accompanied by the Librarian or the General Secretary, were per-

mitted to make use of the Library as and when occasion arose, to which there seemed to be no objection.

Item No. 4 (confirmation of changes in the Council) on the printed agenda was then taken up. Dr. Sen wanted to know from the General Secretary whether these office bearers submitted their resignation properly in the Council Meeting. Another thing that became apparent was that the acceptance of the resignation lay with the Council and not with members present at the Monthly Meeting, because it was found under item 4(1) that the resignation of Dr. West had been accepted by the Council. The General Secretary replied that two resignations (viz: of Dr. West and Mr. Khaitan) were submitted in writing and the other three were verbal and not in writing. Dr. Sen then asked for a ruling from the Chair that if that was the case then automatically the meeting could proceed with the item. The Chairman replied that that was a ticklish question but he thought in this case if a number of office bearers resigned their letters of resignation would have to be forwarded first to the Monthly Meeting to be discussed there before their places were declared vacant. In view of the ruling by the Chair Dr. Sen was of opinion that the whole matter should be referred back to the Council. After further discussion on the point the Chairman framed the followng resolution, "That the members assembled at the Monthly Meeting listened to the letter read by the General Secretary of resignation submitted by Dr. West and resolved unanimously that Dr. Wst be requested to withdraw his resignation".

At this stage the minutes of the previous three meetings were confirmed.

The following paper was taken as read, as the author was not present :

(1) RIAZUL ISLAM.—*Ibahatiyas.*

The paper deals with the Ibahatiyas, a sect of people with promiscuous modes of worship and living. The author pieces together evidences from various sources about them and endeavours to prove that they were a Muslim sect.

The Chairman then announced the result of the ballot for the election of Ordinary Members and declared that all the candidates, including No. 27, were elected.

Monday, the 5th July, 1948, at 5-30 p.m.

(In the absence of the President and Vice-President Dr. B. S. Guha, a senior Member of the Council occupied the Chair, in terms of Rule 55(b)).

Members:

Auden, J. B.; Banerjea, Dr. J. N.; Bose, Dr. J. K.; Burman, D.; Biswas, Dr. K.; Basu, A.; Bhattacharya, N.; Basu, S. P.; Chakravarti, P.; Canoria, G. C.; Chatterjee, B. C.; Chatterjee, P. C.; Das, Tarak Ch.; Das, S. R.; Das-Gupta, Dr. C. C.; Das, J. N.; Ganguli,

K.; Guha, D.; Garg, Kamala Devi; Ghose, R. C.; Gupta, P. C.; Gupta, A. B.; Gupta, Omkar Shanker; Haldar, M.; Ishaque, Dr. M.; Job, Dr. T. J.; Majumdar, P. C.; Mukherjee, Bijay Bihari; Majumdar, J.; Majumdar, Dr. G. P.; Mookerjee, Mr. Justice R. P.; Mukherjee, N. D.; Mitra, Miss Eva; Roy, Dr. N. R.; Siddiqi, Dr. M. Z.; Sinha, S. N.; Sen, Dr. A. K.; Sen, J. M.; Singh, H.; Ukil, Dr. A. C.

The General Secretary read the minutes of the last Monthly Meeting held on the 7th June, 1948.

Dr. A. K. Sen : Before the Minutes are confirmed, I would like to raise a question, as to whether it is not desirable that the minutes should be in handwriting.

The Chairman stated that every page will be signed by the Secretary if the minutes are typewritten and the sheets pasted.

The General Secretary announced that he would go through the previous pages also and sign them.

Dr. A. K. Sen, arising out of the proceedings, enquired whether the Council Meeting, just after the Monthly Meeting, had taken into consideration the proceedings of the Monthly Meeting and come to a decision on any of the items, and the General Secretary also taken action accordingly.

It was announced that the General Secretary had taken action as per the direction of the Council.

Dr. A. K. Sen : Certain Committees are not meeting for the last two or three months. We are not circulating these proceedings to the members who are even residents of Calcutta. Our proceedings will not be published until nearly three years hence, and, therefore, the members who are not present at the meeting will not know anything of all the resolutions passed here.

Chairman : The question about circulation may be placed before the Council for consideration.

The minutes were then confirmed.

The General Secretary then reported the receipt of the following books received during May, 1948 : —

Krishnarao, B. V.—History of the early dynasties of Andhradesa. c. 200-625 A.D. Madras, 1942. *Presented by the author.*

Tirumalai-Tirupati-Devasthanam Epigraphical Series, Vols. 1-6, Tirupati, 1938. *Presented by the Tirumalai-Tirupati-Devasthanam Committee.*

Report on the Inscriptions of the Devasthanam Collection with Illustrations. Madras, 1930. *Presented by the Tirumalai-Tirupati-Devasthanam Committee.*

The following candidates were ballotted for election as Ordinary Members and declared as duly elected : —

(34) *Basu, Subodh,* M.A., B.L., Author, P58 Lansdowne Road Extension, Calcutta.

Proposer: P. C. Gupta. *Seconder:* S. K. Saraswati.

(35) *Bhattacharya, Asutosh*, M.A., Research Associate of the Department of Anthropology, Indian Museum, Calcutta.
Proposer: B. S. Guha.   *Seconder*: Miss J. Sarma.

(36) *Sarbahi, D. S.*, D.Sc., Assistant Fisheries Development Officer, 203 Ganga Prasad Road, Lucknow, U.P.
Proposer: T. J. Job.   *Seconder*: P. M. G. Menon.

(37) *Houlton, Sir John*, C.S.I., C.I.E., B.A. (Cantab), I.C.S., (on leave), Doranda, Ranchi, B.N. Ry.
Proposer: R. A. Dutch.   *Seconder*: C. C. Blagden·

(38) *Mukerjee, Rajendra Lal*, M.Sc., Assistant Controller, Stationery Office, 3 Church Lane, Calcutta.
Proposer: T. C. Das.   *Seconder*: A. K. Sen.

(39) *Gupta, Miss Bani*, M.A., B.T., Teacher, Lady Irwin School, Canning Road, New Delhi.
Proposer: S. K. Saraswati.   *Seconder*: N. Ray.

(40) *Guha, Satindra Nath*, Certificate of Apprenticeship in Textile Engineering, V.J.T.I., Bombay, 2-A Radhaprasad Lane, Calcutta 9.
Proposer: D. Guha.   *Seconder*: S. K. Saraswati.

Chairman: May I enquire under Rule 57(d) if any member intends to give any notice of motion for discussion at the next Monthly Meeting?

Mr. A. K. Majumdar submitted the following motion of which he gave notice to be moved at the next Monthly Meeting: "This Meeting requests the Council to change the Rules of the Society in such a way as to make it mandatory that the President of the Society must be a Fellow of the Society".

Dr. A. K. Sen when being called upon to move the following motion under Rule 57-c, which had been postponed from the last Monthly Meeting, asked for permission to move it at the next meeting

Budget Estimates for 1948 of the R.A.S.B. as submitted by the Council to the Annual Meeting in February 1948, be taken into consideration at this meeting of the Society and to facilitate discussion of the Budget. Council is hereby requested to place before the meeting the details of the Budget under different heads of expenditure, especially the details of the staff, their salary and allowances.

The request of Dr. A. K. Sen was put to the members and acceded to.

Chairman: I now call upon the General Secretary to make the following reports and communications from the Council to be submitted for the consideration of the Monthly Meeting, under Rule 57-g.

The following loss of membership, since the last meeting was reported:—

(a) Resignations:

(29) Sir B. P. Singh Roy	(Ord. Member—1946)
(30) E. H. Shuttleworth,	(Ord. Member—1946)
(31) G. B. Headley,	(Ord. Member—1945)

(32) H. D. Khandelwal,	(Ord. Member—1946)
(33) Rev. C. F. Ball,	(Ord. Member—1944)
(34) M. Ramabhadran,	(Ord. Member—1943)
(35) N. R. Das Gupta,	(Ord. Member—1946)
(36) D. Schlumberger,	(Ord. Member—1946)
(37) W. Taneja,	(Ord. Member—1947)

The General Secretary reported that the Council have nominated Dr. S. K. Chatterji, Philological Secretary, failing him Dr. S. Radhakrishnan or Mr. P. N. Banerjee, Vice-Chancellor of the Calcutta University, to represent the Society at the 21st Session of the International Congress of Orientalists to be held in Paris from the 23rd to 30th July, 1948.

The General Secretary then reported that the Council have nominated Dr. B. S. Guha, failing him Prof. K. P. Chattopadhyay or Dr. S. K. Chatterji, to represent the Society at the 3rd Session of the International Congress of Anthropological and Ethnological Sciences to be held in Brussells and Tervuren in August, 1948.

Dr. A. K. Sen: As regards the procedure, I would like to know whether the Council, before nominating these eminent persons have taken the advice of the Cultural Advisory Board or Scientific Advisory Board of the Royal Asiatic Society.

General Secretary: When this communication was received for information there was no such board formed. Meetings could not be convened for want of quorum. That is the reason why the Council selected these members.

Dr. A. K. Sen: So, in future, if it is a function of the Cultural or Scientific Board, the Council will take their advice.

Chairman: That is up to the Council to do.

The General Secretary then reported that the Council considered the question of withholding applications for membership (Rule 5) at their meeting held on 23-6-48 and they are of the opinion that the Council has power to withhold recommendation for election of a candidate by the General Meeting.

The General Secretary then read the following opinion of Sir B. L. Mitter:—

> "*Question is whether the Council has power to withhold the candidature of a person for membership of the Society from a General Meeting. It clearly has the power. Recommendation for election of a candidate is conditional upon approval of such candidate by the Council. The words "if approved" in Rule 5 give power to the Council to approve or not to approve. If the contention that all candidature must be placed before the General Meeting the interposition of the Council would have been unnecessary. The rule clearly contemplates that the Council should exercise its judgment before it makes a recommendation for the election of any candidate*".

Rai Bahadur M. Haldar: Why use the word "withhold"? It is unnecessary, because the Council have the power to approve or disapprove. I do not think the question of "withholding" arises.

Mr. Justice Mookerjee: The Council have the power to recommend or to withhold approval.

Chairman: That is the reason why Sir B. L. Mitter was consulted.

Dr. A. K. Sen: This point had been raised at previous meetings, and at one such meeting the President gave a certain ruling. If the Council want to communicate any legal opinion obtained, it is better that it should be included in the agenda itself.

Dr. A. K· Sen then enquired as to how this question was referred to Sir B. L. Mitter for opinion ?

General Secretary: The matter was discussed by this house on two or three occasions. When I was reading the Minutes on the last occasion Dr. Sen stated that the Council had no authority over election of members. That was placed before the Council and the Council decided to take legal opinion.

Dr. A. K. Sen: Dr. West gave a certain ruling which was in my favour.

Dr. Roy: The question was raised at the very first Monthly Meeting in 1948, and Dr· West, as President, gave a definite ruling which must be in the Minute Book. Does the legal opinion of Sir B. L. Mitter supersede the President's ruling on that point? If it does, then we should not raise this question. Cases have happened when long lists of members were withheld and members with similar academic qualifications were passed. That is why we had made a definite suggestion, which was agreed to by the President of that meeting, that the entire list of members, which had been disallowed by the Council, would be placed before that Monthly Meeting. This was never done. Unless it had happened like this that names with similar qualifications were held back, we would not have brought it at all. If the Council can assure us that this will not happen again we are prepared to abide by the legal advice of Sir B. L. Mitter, but before that the Council must assure us that no such distinction will be made.

Dr. V. Elwin: Quite apart from the legality, it is absolutely common-sense reading of the rule· It seems to be if we want to change that, the proper thing would be to wait for the next Annual Meeting and then to put up a proposal for changing the rule.

Mr. Justice R. P. Mookerjee: I think there is a misapprehension in the minds of some members. Here is a report which was called for on an interpretation of the rule. At the General Meeting it was thought that all names proposed should be placed before the General Meeting. Whatever might have been done or not done by the past Councils, let us look to the present acts. It is no use going into the past in this matter. We wanted to know whether according to the rules as they stand the past practice was a correct one, or whether the opinions expressed by some members at the General Meeting were correct. On a reading of the rule there cannot be any two opinions. It is the Council and the Council alone which can recommend and unless there is that recommendation by the Council it is not competent for the General Meeting to consider any application for membership. You may question whether such a rule should be there or be amended but only at the proper time. Certain sugges-

tions were made that the past Councils had not been fair and just in their recommendations for membership. There may have been some difference of opinion with the decision of the Council but no one should suggest that the members did anything actuated by any motive.

Mr. Sreedan Gupta: On a point of order, many of us present here are more interested in hearing the reading of papers. Such things as we are witnessing at our Monthly Meetings were never heard of before. If in the Monthly Meeting there should be discussions of this nature, a time limit should be set for these discussions.

Chairman: That is perfectly right, we will have to do that, as otherwise our main purpose will not be accomplished.

Dr. Elwin: May I request the President, for the rest of the meeting to insist on the application of Rule 55-f that a member should speak only once ?

Chairman: There is no point in voting on this resolution.

General Secretary: The motion moved by Dr. J. N. Banerjea at the Monthly Meeting held on 7th June 1948, re: the programme of the Bi-centenary Celebrations, the Council considered at their meeting held on 23-6-48 and have passed an order to invite a committee constituted by the Council for this purpose on 13-5-48, to function. The Members of the Committee are: (The 2 Philological Secretaries—Dr. S. K. Chatterji and Dr. M. Ishaque), Dr. J. N. Banerjea, Dr. R. C. Majumdar, Dr. K. Nag, Dr. N. Roy, and the three ex-officio members (President, General Secretary and Treasurer). It has been decided that Dr. J. N. Banerjea will be the convener of this meeting.

The General Secretary reported in accordance with Rule 48(d) that the Council have decided that the conveyance allowances to the General Secretary is attached to the post and is sanctioned every year up to the month of February.

The question regarding the appointment of Mr. P. O. Matthai as Asstt. Secretary was then taken up.

General Secretary: Mr. Matthai was appointed as Asst. Secretary to carry on till the appointment of a full time Secretary. The Council in view of his long administrative experience of the Society have decided at their last meeting to reaffirm their decision to appoint him as Asst. Secretary. When we are trying to do a lot of things for the improvement of the Society, Mr. Matthai's presence will help us immensely. In the last meeting there was some questions raised by certain members as to his educational and cultural attainments. I may inform them that he is an M.A. of the Calcutta University in Ancient Indian History and Culture, a Bachelor of Divinity of Serampore University, 1921; Holder of Certificate in Librarianship (1938); knows Hebrew, Greek and German; possesses Reader's License from the Lord Bishop of Calcutta for conducting church services in Calcutta and Serampore. Literary contributions are—The Syrian Christians, their peculiar Marriage customs (a paper read before Monthly Meeting of the R.A.S.B. in April, 1930); he is the author of a book entitled "Queen of Sheba" which has been

a text book for intermediate studies of the Calcutta University for Malayalam since 1944.

Dr. Roy: That is a book of compilation.

General Secretary: Then "Life of early European Settlers in Bengal, Parts 1 and 2, Centenary Number, ("Statesman" 1925); Bird Stroke, A South India Superstitution, "Times of India", March 1934; The Ringed Bird, "Navabharati", Kottayam, April 1934; The Witch-doctors, "Statesman", October 1947; The Witch-Doctor in Southern India, "Statesman", January 1948; Reviewed a number of books in the 'Modern Review': and many others.

He possesses testimonials for his efficiency and devotion to duties from Dr. M. N. Saha, Dr. R. C. Majumdar, Sir John Lort-Williams and Dr. Kalidas Nag.

Dr. Roy: The proposal was turned down by the Ordinary Monthly Meeting. Before they turned it down they must have given due consideration to all the qualifications of Mr. Matthai. Not one single information that the General Secretary has read out to you is anything new. We know the qualities of his work, we know what he has done, we know also what he has done to the Society for the last 22 years. The whole history is before us. We are not new members.

The proposal had once been turned down by the General Meeting. No new information has been placed before the meeting by the Secretary which we did not know. The Council, which has been created by the general body of members, have requested reconsideration of a decision which had been turned down by the Ordinary Monthly Meeting twice. Who made the request for a reconsideration? If it was at the request of Mr. Matthai himself, it is one matter: if it was at the request of members, it is another matter. I understand that Mr. Matthai tendered his resignation, and I suppose that when his resignation was being considered the matter came up before the Council. This is not the first time that Mr. Matthai has threatened resignation from the Royal Asiatic Society. To my knowledge this is the fourth time and each time the Council has acted under that threat. Is it up to the Council to always act under threats of resignation? I would like to be told about the questions I have put forward, and then only we shall be prepared to discuss this item.

Dr. A. K. Sen: On a point of order, I want a ruling from the Chair whether the Council is in order, after the Monthly Meeting refused it, to sanction anything or to bring it again before the Monthly Meeting within, say, two or three months.

Chairman: There is no rule, as far as I know, which prevents the Council from reconsidering a decision. The Council has only requested the Ordinary Monthly Meeting to reconsider the decision.

Mr. J. M. Sen: I was just going to say one simple thing, namely the Council may have made a certain recommendation. We do not know what the recommendations are whether Mr. Matthai was appointed Assistant Secretary for a definite period or an indefinite period, or the rate of pay he was to get as Assistant Secretary and not as Superintendent. Some one on behalf of the Council should

first of all make a definite proposal regarding the recommendation which we are to consider. I believe even the General Secretary has not done that. I submit there is no motion before us, and that this is merely a question, noted in the Agenda. Mr. Matthai has continued in the post in which he has been acting so long, and in an acting appointment surely the Council can sanction, or pay him, such remuneration as the Council consider fit. At to-day's meeting there is no definite substantive proposition from the Council in the precise terms of a resolution.

General Secretary: Mr. Matthai was appointed by the Council as Assistant Secretary with an allowance of Rs. 50/- per month, in addition to his own grade pay. That was the decision of the Council and was placed before the Ordinary Monthly Meeting for confirmation. This was not confirmed and was therefore placed again before the Council. The Council went through the case once again and was of opinion that since his services were very important at this stage of the Society when a lot of improvements are going to be effected, he should continue as Assistant Secretary, and that is the reason why this matter is placed here. One of the conditions is that he should remain as Assistant Secretary so long as a permanent Secretary is not appointed, and that he should get Rs. 50/- per month additional allowance, i.e., in addition to his substantive pay.

Dr. Roy: I have not got any reply to the question I have asked.

Dr. A. K. Sen: One point of order raised by Professor Sen is raising of these matters by way of resolution at future meetings. In spite of the assurances given by the General Secretary to this effect so many times, at this meeting even it is not done. I think it is better that a ruling is given from the Chair whether they are in order to appoint anybody as Assistant Secretary without a formal resolution and inclusion of that resolution in the agenda itself.

Chairman: Mr. Justice Mookerjee will acquaint us with the rules.

Mr. Justice Mookerjee: The rules on this point are quite clear but the practice is not in accordance with what Dr. Sen has pointed out. I think he is correct. The informal manner in which we carry on the proceedings of a general meeting is not the way which is countenanced under the rules. Therefore, if you ask as to what should be done, I would suggest that you defer consideration of this item till next meeting. It is a question of procedure raised by Dr. Sen.

Chairman: Is it the opinion of the House that this matter should be deferred for consideration till the next meeting?

The house agreed to adjourn this item of the agenda.

The following persons whose names has been proposed for election at the last meeting were balloted for election as Associate Members of the Society for a period of five years in accordance with Rules 2 and 13 :—

(1) Prof. P. C. Sen-Gupta.
(2) Mr. W. Birney.

The following changes made in the Council since the last Ordinary Monthly Meeting (7th June, 1948) were confirmed under Rule 45:—

(1) *President*—The Hon'ble Mr. Justice R. P. Mookerjee vice-Dr. W. D. West.

(2) *Honorary Treasurer*—Dr. K. P. Biswas vice the Hon'ble Mr. Justice R. P. Mookerjee.

(3) *Member of Council*—Dr. M. Z. Siddiqi.

The following change made in the Council since the last Ordinary Monthly Meeting (7th June, 1948) was placed before the meeting but was not confirmed:—

(1) *Natural Science Secretary (Biology)*—Dr. B. S. Guha vice Dr. K. P. Biswas.

The following changes made in the Council since the last Ordinary Monthly Meeting (7th June, 1948) were placed before the meeting but were adjourned till the next meeting:—

(1) *Library Secretary*—Dr. N. R. Ray vice Dr. B. S. Guha.

(2) *Member of Council*—Dr. W. D. West.

The Chairman announced that Prof. P. C. Sen Gupta was duly elected as an Associate Member of the Society and Mr. W. Birney failed to secure the required number of votes.

The following papers were taken as read as the authors were not present:—

(1) Dr. D. C. Sircar.—*Two Stone Inscriptions.*

In this paper two small stone inscriptions, one from Barhut and another from the Patna District, have been edited with translation and notes. The Barhut epigraph refers to a new pious deed of the Buddhist nun Pusyadatta who is already known from the published records of Barhut. The second inscription is written in the proto-Bengali script and Sanskrit language, but it was found on the wall of a mosque in the Patna District of Bihar. There is little doubt that the stone bearing the epigraph in question originally belonged to a Hindu temple the material of which were utilized in building the mosque. The author has tried to show that this temple stood somewhere in Bihar and not in Bengal. It has been pointed out that the record bears a date in V.S. 1553 (when the temple was built) and that the date falls in the reign of Sultan Sikandar Lodi of Delhi who is known to have followed an anti-Hindu religious policy.

(2) Dr. (Mrs.) Bina Chatterjee.—*Geometrical Interpretation of the Motion of the Sun, Moon and the five Planets as found in the mathematical Syntaxis of Ptolemy and in the Hindu Astronomical Works.*

A detailed chronological study of the achievements of the ancient Hindus in mathematics and astronomy is very difficult, because so many of their ancient works, references to which are found in their later literature, are lost and also because the dates of some of their old extant works are still objects of great dispute. The subject, however, has been unnecessarily made more complicated by those scholars, who in their exaggerated admiration for the Greek mathematicians

and astronomers have tried their utmost to establish an ultimate Greek origin for practically everything that is found in the Hindu mathematical and astronomical works. Consequently, it is their firm belief that the planetary system of the Hindus represented by the epicyclic and eccentric methods, is bodily borrowed by them from the Greeks. The object of this thesis is to discuss to what extent this view is tenable, with special reference to the mathematical Syntaxis of Ptolemy, the famous Alexandrian astronomer of the second century, and to the great Hindu classics on mathematics and astronomy.

Monday, the 2nd August, 1948, at 5-30 p.m.

Present:

The Hon'ble Mr. Justice R. P. Mookerjee, the President in the chair.

Members:

Basu, J. P.; Bhattacharyya, A.; Biswas, Dr. K. P.; Bose, Dr. J. K.; Burman, D.; Das. S. R.; Das, T. C.; Das Gupta, J. N.; Ganguly, K.; Ghose, R. C.; Guha, D.; Gupta, O. S.; Gupta, P. C.; Journot, C.; Majumdar, P. C.; Majumdar, Dr. R. C.; Mukherjee, A.; Mukherji, B. B.; Neogy, Dr. B. P.; Saraswati, S. K.; Sen, Dr. A. K.; Sen, J. M.; Sen Gupta, S.; Shaha, A. K.; Waddington, H.

Before the President took the Chair he appealed to the members for their assistance and co-operation to enable him to carry out his very onerous and responsible duties, and it was his hope and trust that the last few months remaining in this current year would prove fruitful and result in real work being done. It was no use, he said making promises or looking into the future except with the hope that useful work would be done.

The consideration of the confirmation of minutes of the last meeting was agreed to be adjourned till the next Monthly Meeting.

The General Secretary reported the receipt of the following books as presentation to the Society in June, 1948:—

Annual Report of the Mysore Archaeological Department for the year 1945. Mysore, 1946. *Presented by the Government of Mysore.*

Antrobus, H. A.—A History of the Jorehaut Tea Company, Ltd., 1859-1946. London, n.d. *Presented by the Company.*

Barker, Ernest.—British Universities. Illustrated. (British Life and Thought Series, No. 24.) London, 1948. *Presented by the British Council.*

Chattopadhyay, K. P.—Municipal Labour in Calcutta. Calcutta, 1947. *Presented by the Author.*

Chattopadhyay, K. P.—Report on Santals in Bengal. Calcutta, 1947. *Presented by the Author.*

Sir Albert Howard Memorial Number.—Soil and Health. London 1948. *Presented by Lady Howard.*

The following candidates were ballotted for election as Ordinary Members and were declared as duly elected:—

(41) *Danuta, Mrs. Halina-Danuta*, B.Com., l'universite de Grenoble (France), writer, 11 Hunbroiler Street, Calcutta.
Proposer: F. F. Rossetti.   *Seconder*: K. N. Bagchi.

(42) *Chatterjee, Kaliranjan*, B.Sc., L.M.P. Medical Practitioner, 32 Gobra Road, Calcutta 14.
Proposer: K. Nag.   *Seconder*: V. B. Trivedi.

(43) *Chakravarti, Pramatha Kumar*, M.A., B.L., Advocate, High Court, 1/2A Hazra Road, Kalighat, Calcutta.
Proposer: K. N. Bagchi.   *Seconder*: V. B. Trivedi.

(44) *Ismail, Mohammad*, Professor of Arabic and Persian (Offg.), Presidency College, 5 Phulbagan Road, Calcutta 14.
Proposer: V. B. Trivedi   *Seconder*: S. C. Law.

(45) *Brocke, Alfred George*, Dr. Phil. Nat. (Jena), Scientific Adviser, Capco Ltd., 9 Clive Street, Calcutta.
Proposer: K. N. Bagchi.   *Seconder*: S. C. Law.

(46) *Bhattacharya, Amullya Ratan*, M.B.B.S., (Bombay), Physician, Naya Bazar, Ajmer, Rajputana.
Proposer: A. Das Varma.   *Seconder*: Miss U. Chowdhury.

(47) *Datta, Gita*, B.A. (Hons.), Vedatirtha, c/o Dr. J. K. Datta, 88 Chowringhee, Calcutta.
Proposer: K. N. Bagchi.   *Seconder*: R. C. Majumdar.

(48) *Chaudhuri, Sunil Kumar*, M.A., Professor, Charuchandra College, Sarat Chatterjee Avenue, Lakes, Calcutta.
Proposer: R. C. Majumdar   *Seconder*: K. N. Bagchi.

The President enquired if there was notice of any intended motions for the next meeting (Rule 57-d).

Dr. A. K. Sen enquired whether he could give notice of a motion standing in the name of another member who was not present at the meeting. He asked for a ruling from the Chair. The President said that he would not give a ruling before notice was given. The Rules indicate notice to be given personally at a meeting.

Dr. A. K. Sen then gave notice of the following motion to be moved by himself:—

"As the unfinished business of item No. 8 of the last Ordinary General Meeting of the 5th July, 1948, has not been brought into the programme of this meeting, it is requested that it be brought for consideration at the next Ordinary General Meeting."

The following motions, notice for which had been given at a previous Monthly Meeting was disposed of:—

Dr. A. K. Sen:

Budget Estimates for 1948 of the R.A.S.B. as submitted by the Council to the Annual Meeting in February 1948, be taken into consideration at this meeting of the Society and to facilitate discussion of the Budget, Council is hereby requested to place before the meeting the details of the Budget under different heads of

expenditure, especially the details of the staff, their salary and allowances.

President: I will arrange for a special meeting in the course of the next few weeks when the Budget Estimates will be taken into consideration and members given an opportunity to express their views by way of a general discussion. I request members to come ready on that occasion, so that constructive suggestions from different members will be taken note of for future action.

The suggestion was approved by the House and the item was adjourned for consideration at a Special Meeting.

(2) Mr. A. K. Majumdar:

"This meeting requests the Council to change the rules of the Society in such a way as to make it mandatory that the President of the Society must be a Fellow of the Society".

President: The form in which the proposal is placed before the house is not in order. This is a request to the Council to change the rules, but the Council has no authority to do anything of the sort. In its present form I rule it out of order.

The General Secretary reported the following loss of membership:

Resignations:

(38) L. L. Hodgson	(An Ord. Member 1940)
(39) P. Norton-Jones	(An Ord. Member 1946)
(40) H. P. Bagaria	(An Ord. Member 1945)

The President drew the particular attention of the members that "In view of his resignation, the resolution of the Council reaffirming the appointment of Mr. P. O. Matthai as Assistant Secretary has been rescinded." He said this was in item before the last Monthly Meeting, but in the meantime the resolution which was before the meeting had since been rescinded by the Council, and therefore that item is not included for this meeting. In reply to Dr. R. C. Majumdar's query whether Mr. P. O. Matthai had resigned and his resignation had been accepted, the President said that the resignation of Mr. Matthai had not been previously accepted. He had resigned previously and although there was no formal withdrawal of resignation by him, before the recommendation from the Council came on the last occasion, his views had been ascertained and now he has intimated his resignation to take effect, the Council has resolved that he might continue till September, 1948, if the Council did not fill up the vacancy caused by his resignation before that. Dr. Majumdar took it that that meant that his resignation had been accepted with effect from September 1948 or earlier. The President said that as far as he remembered no formal resolution has been passed accepting his resignation from any date but he had been asked to continue in the office till September pending filling up the vacancy.

The President then took up the matter regarding "The existing procedure of the Council in withholding candidature of persons proposed for membership is to continue in future."

President: There is a point made and there was ruling also by a past President of the Society that every name proposed be brought up before the general meeting, whether it was recommended by the Council or not. At the last meeting it was reported to the house that legal opinion had been taken that it was not only competent but it was the duty of the Council to scrutinise the applications, and only such applications as were recommended by the Council were to be put before the general meeting. The question raised at the last meeting was whether the ruling which had been given previously was to prevail or the legal opinion taken was to prevail. The Council decided on the latter. That was on the advice of Sir B. L. Mitter. Legal opinion having been accepted it was that which had to be followed, and that fact was now reported to the house for their information.

Dr. A. K. Sen: It is high time that the Council laid down a procedure for taking legal opinion.

The President ruled that there should be a separate motion for raising a discussion as to the procedure for obtaining legal opinion.

The General Secretary reported that the Reading Room of the Library has been opened from Monday, the 26th July, under certain conditions, and that the Rules and conditions, as placed on the table, were those which, the Council, on the advice of the gentleman who had been asked to superintend the stock-taking, as also the Library officials thought, ought to be enforced immediately

In reply to a query by a member whether these rules would be circulated the President said that these were the usual rules which were to be found in most libraries and copies of which had been placed in the Reading Room. The Library, he added, had not been opened for those who wanted to take out books; it was open to those members only who came into the library to consult the books.

The General Secretary placed before the house the following list of Members who are to be removed from the Membership list according to Rule 38:

1. J. C. Bhattacharya.	12. L. C. Finch.
2. A. Brahmachari.	13. H. C. Gupta.
3. Sir A. Chatterji.	14. H. M. A. Hai.
4. Asoke Chatterjee.	15. P. D. Law.
5. Capt. P. Claque.	16. J. C. Mukherji.
6. J. M. Chaudhuri.	17. G. H. Mason.
7. Dr. B. N. Chatterjee.	18. Sir K. Nazimuddin.
8. H. G. Chatterjee.	19. H. R. Patel.
9. B. B. Chatterjee.	20. K. R. Sararia.
10. J. C. De.	21. P. K. Subramayan.
11. S. L. Dugar.	22. Mowdadoor Rahman.

The President: I request the members to co-operate with the General Secretary in looking into the lists and finding out whether any particular member or members mentioned therein could be retained. If the Society were to lose 150 to 200 members in the course of the next few months with such large arrears, the financial position of the Society would be very much affected.

The General Secretary reported that the tenure of all Specialist Sectional Committees and of their office bearers will continue till new Committees are constituted by the Council, the Chairman and Secretary are elected and taken over charge.

The General Secretary reported for confirmation under Rule 45 that Dr. K. P. Biswas will carry on as Natural Science Secretary (Biology) in addition to his own duties pending the final recommendation of the Council for filling up the vacancy.

Mr. J. M. Sen proposed an amendment to obviate the difficulty under Rule 4, paragraph 2, by deleting the words "in addition to his own duties" and "for filling up the vacancy." Mr. R. C. Ghose seconded this proposal.

This was accepted by the House.

The President: There is a provision in the Rules that unless there was reason for calling a meeting in one or both the months, i.e., September and October, being recess months for the Society, no meeting will be held. I intend to call a meeting next month in the ordinary course, as the recess had changed this year and does not begin till October and going on to the middle of November, and do not think members will object to that. Notice for the next Monthly Meeting will be sent out in due course.

Monday, the 6th September, 1948 at 5-15 p.m.

Present :

The Hon'ble Mr. Justice R. P. Mookerjee, the President, in the Chair.

Members:

Agarwala, T. N.; Banerjee, K. K.; Banerjee, Dr. J. N.; Biswas, Dr. K. P.; Chakravarti, P. B.; Chatterji, P. C.; Chatterjee, P. P.; Chatterji, Mrs. Bani.; Chatterji, Mrs. T.; Chatterji, S. K.; Datta, Gita.; Das Gupta, Dr. C. C.; Gangooly, O. C.; Ganguli, K·; Gupta, O. S.; Majumdar, G. P.; Majumdar, P. C.; Mitra, (Miss) E.; Mukherjee, B. B.; Sarbadhikari, Dr· P. C.; Sen, Dr. A. K.; Sen, J. M.; Sen Gupta, S.; Siddiqi, Dr. M. Z.; Sircar, Dr. D. C.; Upadhaya, R. N.

Visitors:

Chatterji, S. R.; Deb, Harit Krishna.; Karamdrandran, K. M.

The General Secretary read the minutes of the Monthly Meeting of the 5th July and 2nd August 1948. After the minutes were read Dr. A. K· Sen raised a point about the adjournment of item 8(6) for which he said he formally moved the proposal which was formally seconded by Dr. Ukil and against which no decision of the meeting had been recorded. As far as he remembered, that proposal passed and then the meeting proceeded with the other items. The President replied that the record was suggestive that there was a proposal by

Dr. Sen that "Consideration of item 8(6) be adjourned till the next meeting," but then there was another motion by Professor J. M. Sen, which was duly seconded, that "Item 8(4) & (5) be referred back", which latter motion was carried, and in consequence, he thought, that both the proposals could not have been passed at the same time as the two resolutions would be contradicting each other. As a matter of fact, there were various discussions that day with regard to the filling up of the vacancy under 8(4) & (5) which did not appear on the record. It was not necessary, he pointed out, that every spoken word should appear on permanent minutes. Professor Sen remarked that in any case the minutes were correct. Dr. Sen then asked if he could make a proposal to which the President replied that he could make a substantive proposal, as there was not much time left for the business of the meeting. With regard to Rule 57-a, page 13, to which Dr. Sen drew the attention of the President, the President said that as he read the rule there was no room for discussion, and if any suggestion was made for any correction that should be moved formally and voted upon. Rule 5-J, page 13, to which Dr. Sen also referred did not apply so far as the present matter was concerned and it had no concern with the objection which Dr. Sen had raised. That rule gave rise to another right which may or may not be availed of. The confirmation of the minutes was then put to the vote and carried *nem con.*

The minutes of proceedings of the Ordinary Monthly Meeting held on the 2nd August, 1948, were then confirmed and signed.

The General Secretary reported the receipt of the following books:

Conference on International Cultural, Educational, and Scientific Exchanges.—American Library Association, Chicago, 1947. *Presented by the American Library Association.*

A History of Sanskrit Literature, Vol. 1, Gen. Ed. S. N. Dasgupta.—University of Calcutta, 1947. *Presented by the University of Calcutta.*

Elwin, Verrier.—The Muria and Their Ghotul. Oxford University Press, Bombay, 1947. *Presented by the Oxford University Press, Calcutta.*

Libraries in the United States, 1940-1947.—American Library Association, Chicago, 1948. *Presented by the American Library Association, Chicago.*

Pithawalla, Maneck B. and Martin-Kaye, P.—Geology and Geography of Karachi and its Neighbourhood. Parts I and II. Karachi, 1946. *Presented by the Trustees of the Parsi Punchayet and Funds and Properties, Bombay.*

Sanjana, J. E.—Zoroaster and His World. Bombay, 1947. *Presented by the Trustees of the Parsi Punchayet and Funds and Properties, Bombay.*

Statistical Abstract West Bengal, 1947.—Government of West Bengal Provincial Statistical Bureau. Calcutta, 1948. *Presented by the Government of West Bengal.*

Yazdani, G.—Bidar. Its History and Monuments. Oxford, 1947. *Presented by the Oxford University Press, Calcutta.*

The following candidates were balloted for election as Ordinary Members and all were declared as duly elected:—

(49) *Mohiuddin, G.*, Curator, Royal Botanic Garden, P.O. Botanic Garden, Howrah.
Proposer: K. Biswas. *Seconder*: K. N. Bagchi.

(50) *Abu Tyeb, Abu Jamal*, Professor of English, Islamia College; 20 Colonel Biswas Road, P.O. Ballygunge, Calcutta 19.
Proposer: K. Biswas. *Seconder*: K. N. Bagchi.

(51) *Chakraverti, Mani Mohan*, M.B·, Capt. ex I.M.S., Medical Practitioner, Assistant Medical Officer, Royal Calcutta Turf Club; 130 Raja Rajendra Lal Mitter Road, Calcutta 10.
Proposer: K. Biswas. *Seconder*: K. N. Bagchi.

(52) *Banerji, Sri Jyotirmoy*, B.Sc., B.Com., Dip.For. (Dehra Dun), I.F.S., Project Officer, Soil Conservation, Central Waterpower, Irrigation and Navigation Commission; 17 Safdarjung Road, New Delhi.
Proposer: K. Biswas. *Seconder*: K. N. Bagchi.

(53) *Bose, Samarendra Nath*, M.A., Research Worker, 22/1 Bally gunge Circular Road, Calcutta.
Proposer: N· Ray. *Seconder*: K. N. Bagchi.

Mr. P. C. Chatterjee handed in a written notice of a motion which he intended to move at the next meeting. Replying to the remarks by some members that they had come to listen to the very interesting paper which was to be read and that if they had known that the time of the meeting would be taken up in the way it was, they would not have come to the meeting, the President agreed that a long time was spent on reading the minutes which, he said, under the rules they were bound to read.

The following motion of which notice was given at the meeting of 2-8-48 was disposed of under Rule 57(e):—

Dr. A. K. Sen.

As the unfinished business of item No. 8 of the last Ordinary General Meeting of the 5th July, 1948, has not been brought into the programme of this meeting, it is requested that it be brought for consideration at the next Ordinary General Meeting.

The President thereupon ruled that in view of the minutes as confirmed, the motion as drafted by Dr. Sen was not in order.

The General Secretary reported the following loss in member·ship:—

Deaths:
(4) S. Das Gupta   (An Ord. Member, 1944)

Resignation:
(41) U. S. Rao   (An Ord. Member, 1945)·
(42) K. N. Mukherjee   (An Ord. Member, 1946).
(43) K. B. Roy   (An Ord. Member, 1945)·

The General Secretary announced that there was no removal of names from the members' list of the Society under Rule 38.

The General Secretary reported that the Council had advertised in two papers in Calcutta for filling up the post of Office Superintendent. The Council had appointed a Sub-Committee consisting of the President, Secretary and Treasurer to scrutinise the applications in the first instance and then to make the recommendations, and it was expected that the recommendations would be made soon. There were about 200 and odd applications received.

The General Secretary reported that the Council had interpreted Rules 49(c), 50(h) and 52 with regard to the ex-officio membership of the President, the Hony. Treasurer and the General Secretary on all Committees and Boards, etc. as:

"The President, Treasurer and General Secretary are, in terms of the relevant rules, ex-officio members of all boards and Specialist Sectional Committees as they are constituted by the Council."

The President remarked that the members of the Specialist Sectional Committees as constituted by the Council were in no enviable position, because that after this decision was made known by the Council he had been receiving notice after notice of so many different Committees which made it physically impossible either for the President, Secretary or Treasurer to attend all those meetings, but the rules provided for that and there was no escape from that provision.

The General Secretary then reported as under :—

"It would be remembered that certain amended rules had been proposed by the Council about 14 months ago. Those resolutions came up before an Extraordinary General Meeting as required under the Rules. The meeting was not held due to the prevalence of curfew and also the various disturbances. The Council then last year made further alterations to these rules which came up again before an Extraordinary General Meeting in February this year. On that date also the members agreed that owing to the change in the constitution consequent upon India becoming independent and also to some of the rules requiring further alteration it be adjourned for a further period of six months. In the meantime the Organisation Committee was appointed this year according to the recommendations of the General Meeting and they were requested to go into these rules once again. Although under the rules, strictly speaking, the meeting ought to have been called on the date fixed, even though it would be an infructuous meeting, the Council thought that in view of the decision arrived at the General Meeting to have these rules considered once again by the Organisation Committee, it was no use issuing a formal notice and adjourning the meeting again, as issuing notices to members entailed not only costs but so much office labour which if it could be avoided, ought to be avoided. It was also advertised in three papers announcing that an Extraordinary General Meeting could not be held on that the Council was of opinion that if the Organisation Committee was in a position to recommend new changes, these could be made at the special Extraordinary General Meeting to be called. If that was not possible, then it would

be for the Council to consider whether or not the Extraordinary Meeting would be called to consider old rules. He thought that the Council would be able to place something which could in turn be brought before the General Meeting.

The General Secretary announced that Dr. K. N. Bagchi was away for a week from Calcutta, having proceeded to Bombay on leave, during which period Dr. S. K. Mitra was nominated by the President to officiate as General Secretary in Dr. Bagchi's place as required under the rules.

The following paper was read : —

Harit Krishna Deb.—*Vedic India and the Middle East.*

Opinion is not yet unanimous in assigning absolute dates to various strata in Vedic literature. Scholars, however, agree in placing the Satapatha Brahmana at the lower end of the series commencing with the 'family books' of the Rigveda.

In this paper, the author has endeavoured to show that the Satapatha Brahmana mentioned the rulers of Egypt, Assyria and Babylon who flourished early in the seventh century B.C. and also alludes to Sisunaga of Elamite origin, who ruled about the same time in Magadha according to Puranic testimony.

The matter discussed in this paper is exceedingly suggestive and is of very great importance in the history of ancient Indian culture.

Such speakers as Dr. D. C. Sircar, Dr. C. C. Das Gupta, Mr. K. Ganguly, Mr. P. P. Chatterjee, Dr. N. Ray and Dr. K. Biswas gave their conceptions and rendering of the paper from various points of view, i.e. archaeological, philological, literary and naturalistic.

The President, summing up the points raised by the speakers on the subject of Mr. Deb's paper, said whatever they were, constructive or destructive, it was dependent upon the particular individual who was in a position to receive what was stated in the spirit in which every scholar ought to accept every new statement. He felt encouraged especially by the interest taken in the paper read by Mr. Deb and felt sure that it was not the last but only the first and the forerunner of many more interesting papers that would be read at the Monthly Meetings of the Society. He did not know anything about the subject himself but he would commend that paper for the anxious consideration of all experts, like a philologist archaeologist, naturalist, or literary or science critic. There was room, he said, for honest differences of opinion, and in conclusion, he thanked the author and particularly those who took part in the discussion of this paper.

Monday, 1st November, 1948, at 5-15 p.m.

Present:

Dr. A. C. Ukil, a member of the Council, was in the chair.

Members:

Bagchi, Dr. K. N.; Basu, J. M.; Biswas, Dr. K. P.; Chatterjee, P. P.; Chatterjee, R.; Fawcas, L. R.; Jacob, K.; Majumdar, A. K.; Majumdar, Dr. G. P.; Majumdar, P. C.; Sen, J. M.; Sengupta, P. C.; Sengupta, S.

The minutes of the meeting held on the 6th September 1948 were read and confirmed.

The following books presented to the Society during August and September were exhibited:

(1) *Bhattacharyya, Asutosh*—An Introduction to the Study of the Medieval Bengali Epics. Calcutta, 1943. *Presented by the Author.*

(2) *Bhattacharyya, Asutosh*—Bangla Mangal Kavyer Itihasa (in Bengali). Calcutta, 1346 B.S. *Presented by the Author.*

(3) *The Mahabharata*—Fascicle 16: *Bhismaparvan* (2); ed. by V. S. Sukthankar and S. K. Belvalkar. Poona, 1947. *Presented by the Bhandarkar Oriental Research Institute.*

(4) *Somasundaram Pillai, J. M.*—Tiruchendur. Madras, 1948 *Presented by the Author.*

(5) *Menaria, Moti Lal*—Rajasthan Men Hindi Ki Hastalikhit Grantho Ki Khoj—Part I (in Hindi). Udaipur, 1942 *Presented by Sri V. B. Trivedi.*

(6) *Miharban Parrastani Aharstani*—Iran-Pahlair. Bombay, 1945 *Presented by the Trustees of the Parsi Panchayet.*

The election of the following candidates to membership who had been duly elected under Ruler 7 by the Council at its meeting held on 27th September, 1948, were confirmed:

(54) *Chopra, Hiralall*, M.A., formerly Professor of Persian and Urdu, S.D. College, Lahore, and Member, Board of Studies in Arabic Persian, Urdu and Pushtu. Punjab University, 2 Ram Lochan Mullick Street, Calcutta 1.
Proposer: B. Ch. Chhabra. *Seconder:* S. L. Hora.

(55) *Tewari, Ramesh Chandra*, B.Com., B.L., Merchant, Director of Northern India Agencies, 29 Lake Avenue, Calcutta.
Proposer: V. B. Trivedi. *Seconder:* T. N. Agarwalla.

(56) *Tewari, Mrs. Someshwari* M.A., Authoress, 29 Lake Avenue, Calcutta.
Proposer: V. B. Trivedi. *Seconder:* T. N. Agarwalla.

(57) *Bhattacharyya, Bhupendranath*, M.A., Vyakaranatirtha, Samkhyatirtha, 102 Surendranath Banerjee Road, Calcutta.
Proposer: V. B. Trivedi. *Seconder:* P. Chakravarti.

(58) *Singhal, Harish Chandra*, M.Sc., M.A., Lecturer, Delhi University,, Smriti Kunj, 705 Sahukara, Bareilly.
Proposer: K. Chattopadhyaya. *Seconder:* Buddha Prakash.

(59) *Lahiri, Rai Bahadur Sachchidananda.* Retd. Dy. Accountant-General Bengal, 58/A/1 Lake View Road, 2nd Floor, P.O. Rash Behari Avenue, Calcutta.

Proposer: S. K. Saraswati. *Seconder*: Monotosh Mukherjee.

The General Secretary reported the following loss in membership:—

1. Resignation:
   (44) Sashi Bhusan Mandal   (Ord. Member 1946).
   (45) Amiya Kumar Ganguli   (Ord. Member 1945).
   (46) Arun Ganguli   (Ord. Member 1945).
2. Lapses of election:
   (5) Sarabjit Singh   (Elected 3.5.49).

The General Secretary announced that His Excellency Dr. K. N. Katju, Governor of West Bengal, has kindly consented to be the Patron of the Society.

The General Secretary reported that the Council decided to transfer Rs. 6,000/- to the Book Purchase Account of the current year from the Government of India grant. The amount, the General Secretary said, was in addition to Rs. 2,700/- which is the Budget Allotment for 1948.

The General Secretary also reported that the Council decided to send henceforth Monthly Meeting notices to non-resident and foreign members.

The General Secretary reported that the Council decided to issue an appeal to members to donate for the portrait of Dr. Rabindranath Tagore.

The following matters were reported under Rule 48-d:—

(1) Mr. Rakhahari Chatterjee, M.A., B.L., has been appointed for six months with effect from 18-9-48 as Superintendent on Rs. 300/- per mensem plus D.A. vice Mr. P. O. Matthai resigned.

Mr. Chatterjee was presented to the members. The Chairman remarked that Mr. Chatterjee was a distinguished scholar, a member of this Society since 1922 who has utilised the Library for many years and once belonged to the Bengal Civil Service. The General Secretary read out a statement of his qualifications and experience. The Chairman then added once more that the Society was fortunate in securing the services of a man who has a genuine interest in the work of the Society but only hoped that he would take that interest all along and develop it to make the Society larger and more useful in years to come.

(2) Revised scale of D.A. to the Clerical Staff from 1-4-48 (minimum Rs. 40 and maximum Rs. 60 p.m. according to rate of D.A. in Government offices which is in force throughout West Bengal since 1st April 1948).

The above two decisions of the Council were confirmed.

The Chairman next took up the confirmation of the filling up of the following vacancy on the Council (Rule 45):

Dr. J. L. Bhaduri, D.Sc. (Edin.), as a member of the Council and Natural Science Secretary (Biology), vice Dr. K. P. Biswas (Hony. Treasurer) officiating as such in addition to his own duties.

This item also was confirmed.

7. The following papers were read:—
   (1) Dr. D. C. Sircar—*A Stone Inscription in the Patna Museum.*

A stone pedestal of a broken image was purchased for the Patna Museum from Mathura sometime before 1927. It bears an inscription dated in the 16th year of the Kaniska era which is often identified with the Saka era starting from 78 A.D. The actual date of the record seems to be the full-moon day of the lunar month of Sravana in the year 94 A.D.

The inscription records the installation of an image of the lord Advitiyapurusa (i.e. the Buddha) which belonged to a man of the Pravarika (manufacturer of or dealer in 'woollen cloth' or 'mantles or cloaks') community of Mathura. The author received estampages of the inscription from Dr. R. C. Majumdar.

(2) C. T. Rajagopal and A. Venkataraman—*Sine and Cosine Power-series of Hindu Mathematics.*

The paper serves to complete an investigation first undertaken by Mr. C. M. Whish, and announced (in part) by him in the *Transactions of the Royal Asiatic Society,* Vol. 3, 1835. This paper is not only a continuation of Whish's theme but also breaks fresh ground by bringing to light materials so far locked up in certain Sanskrit and Malayalam works. The paper, taken along with the addendum by Prof. K. M. George of the Madras Christian College and a special note by Prof. P. C. Sengupta, is complete in itself and as regards essentials it presents no lacunae to its readers (be they mathematicians or orientalists).

Monday, the 6th December, 1948, at 5-15 p.m.

Present:

The Hon'ble Mr. Justice R. P. Mookerjee, President, in the Chair.

Members:

Bhattacharyya, A.; Bose, Dr. J. K.; Chatterjee, P. P.; Chatterjee, R.; Chatterji, (Mrs.) Bani.; Chatterji, Dr. S. K.; Chaudhuri, Sunilkumar.; Chopra, Hira Lall.; Majumdar, Dr. R. C.; Mukherjee, B. B.; Mukherjee, N. D.; Sen, J. M.; Waddington, H.

Visitors:

Chatterjee, (Miss) Gitanjali.

The minutes of the last Monthly Meeting held on the 2nd November, 1948, which were confirmed.

The General Secretary announced the receipt of the following books presented to the Society during October, 1948:

(1) *Jaeger, W.*—Paideic, Vols. 1 to 3; tr. by G. Highet. Oxford University Press.

(2) *Gipson, L. H.*—British Empire before the American Revolution, Vols. 1 to 3. Caxton Printers.

(3) *Cassirer, E.*—Essay on Man. Yale University Press.

(4) *Gipson, L. H.*—Zones of International Friction, Vols. 4-5.

(5) *Leyel, Mrs. C. F.*—Elixirs of Life. Faber & Faber, Ltd.

(6) *Salter, A.*—Personality in Politics. Faber & Faber, Ltd.

(7) *Butler, H.*—Peace or Power. Faber & Faber, Ltd.

(8) *Marlio, L.*—Aluminium Cartel. Brookings Institution.

(9) *Asian Relations Organization.*—Asian Relations. Asian Relations Organization, New Delhi.

> (*Note.*—Books Nos. 1—4 have been presented by American Library Association, and Nos. 5—9 have been presented by Mr. Vithaldas Binani).

The following members were ballotted for election as Ordinary Members and were declared as duly elected:

(60) *Kousik, Sharad Chandra*, M.A., Author, c/o. Jagannath Bros., 2 Ghusuri Road, Salkia (Howrah).

Proposer: H. Singh. *Seconder*: V. B. Trivedi.

(61) *Majumdar, Chunilal*, M.A., Principal, Shri Ganesh Intermediate College, Kasganj, Dist. Etah, U.P.

Proposer: K. N. Bagchi. *Seconder*: Rakhahari Chatterjee.

(62) *Raghavan, Dr. V.*, Sanskrit Dept., University of Madras; Kuppaswami Sastri Research Institute, Madras; Correspondent, Journal of Oriental Research, Madras; Secretary, The Music Academy, Madras; Editor, Journal of the Music Academy, Madras; Literary Secretary, Madras Sanskrit Academy.

Proposer: Rakhahari Chatterjee. *Seconder*: Dines Ch. Sircar.

(63) *Biswas, Sudhish Ranjan*, M.A., Secretary, Bengal National Chamber of Commerce, 7/2 Dover Lane, Calcutta 29.

Proposer: Rakhahari Chatterjee. *Seconder*: K. N. Bagchi.

(64) *Kundu, Balai Chand*, M.A., Ph.D., F.N.I., Director, Jute Agricultural Research Institute, Hooghly.

Proposer: K. N. Bagchi. *Seconder*: Rakhahari Chatterjee.

(65) *Sarkar, Kshitish Chandra*, M.A., B.L., Lawyer; Hony. Secretary, Varendra Research Society; 21/C Mohanlal Street, Shambazar, Calcutta.

Proposer: S. K. Saraswati. *Seconder*: J. N. Banerjee.

(66) *Park, Richard Leonard*, S.B., M.A. (Harvard), Professor; Research Fellow 1948-49, Social Science Research Council, Washington, D.C., U.S.A.; Temporary Address: c/o American Consulate General, 9 Esplanade Mansions, Calcutta, West Bengal; Permanent Address: 11859 Edgewater Drive, Lake Wood, Ohio, U.S.A.

Proposer: Rakhahari Chatterjee. *Seconder*: K. N. Bagchi.

(67) *Reid, Cecil Philip*, B.Eng., Grad.I.E.E. (Lond.), Construction Engineer, Calcutta Electric Supply Corpn., Victoria House, Calcutta.

Proposer: Rakhahari Chatterjee. *Seconder*: K. P. Biswas.

The General Secretary announced the following loss of membership:—

(a) By death

    (5) Lt. Col. Ambuj Nath Bose, I.M.S (Retd.)   (Ord. Member
                                             since 7.12.36).

    (6) The Hon'ble Mr. Justice John Clough   (Ord. Member
                                             since 2.2.31).

The Chairman expressed deep sorrow at the loss of these two members and said if any obituary notice was intended to be given by any member, it could be sent to the Secretary for placing before the next meeting.

(b) By resignation :

    (47) Subodh Chandra Bose
    (48) H. F. Mooney
    (49) C. O. Tattersall   All Ordinary Members since 1946
    (50) T. N. Banerjee   Ordinary Member, 1947.
    (51) Wm. C. Patton

The following cases of lapses of election, all elected on 7-6-48, were announced :

    (6) R. M. Choubey.
    (7) Rajani Mukherjee.
    (8) Makhan Lal Sen.
    (9) Shin Kelasa.
    (10) Sibdas Banerjee.

In this connection the Chairman pointed out that in proposing names for election, the members should see that names of those who are really anxious to be members are proposed.

The General Secretary announced the decision of the Council to award the S. C. Roy Memorial Medal triennially in future. The income from the total corpus of Rs. 4,000/- was not sufficient to award a Gold Medal every year and, therefore, in consultation with, and with the consent of the donor it was decided to award the medal triennially.

The General Secretary further announced that the Council had nominated Dr. W. D. West and Dr. B. S. Guha to represent the Society on the Council of the National Institute of Sciences of India as Vice-President and Member respectively for 1949.

The General Secretary informed that "Bhalesi Dialect" by S. Varma and "Humayun in Persia" by S. Roy had been lately printed and published. These are the 5th and 6th books in the Monograph Series.

The House was further informed that the Regulations regarding the Provident Fund and Leave Rules had been revised and the new Regulations would be given effect to from January, 1949. He said that the Regulations regarding Provident Fund and Leave which were in force were wholly unsatisfactory. The recommendations of the Committee appointed by the Council to revise these Regulations were considered and approved by the Finance Committee and the Council, and the changes effected in the regulations, he thought, would ensure more regular attendance and much better work on the part of the staff.

The General Secretary announced that the services of the **Library** bearer, Manmotha Guchait, were dispensed with from 1st of January, 1949, after paying his full pay for the whole period from the date of his arrest and detention to the date of 'his release and then up to 31st of December, 1948.

This action proposed by the Council was confirmed by the members (Rule 48-d).

The following papers were read:—

(1) A. C. Roy—*Haemolysis by Bile Salts.*

The paper reveals several original points, viz. the peculiar relation between the sodium salts of taurocholic acid and glycocholic acid with regard to haemolysis. Its bearing on the surface tension is another, and a few more. Besides, an experiment of this nature which requires such an elaborate arrangement and high skill and simultaneous studies of so many variables like PH, surface tension, time factor, resistance of the erythrocytes, etc-, is really an ingenious one and only a few in this country.

(2) Dr. D. C. Sarkar—*Two Pillar Inscriptions.*

    I.   Benares Stone-Pillar Inscription of the time of Budhagupta—Gupta year 159.

    II.   Nalanda Stone-Pillar Inscription of the Time of Rajyopala—Regnal year 24.

The first of the two inscriptions is published for the first time. It records the erection of a votive stone-pillar by a lady in the Gupta year 159 corresponding to 478 A.D. during the reign of Maharajadhiraja Budhagupta. The second inscription was published by the late Mr. R. D. Banerjee, but his reading and interpretation differ considerably from those of the author of the paper. According to the author's reading and interpretation, this inscription also records the erection of a votive pillar by a merchant in the Jain temple at Nalanda. The author received estampages of the above inscriptions for decipherment and publication from Rai Krishnadas, founder of the Bharat Kalabhavan, Benares, and Mr. D. P. Ghosh, Curator, Ashutosh Museum of Indian Art, Calcutta University.

(3) Dr. A. Halim—*Kol Inscription of Sultan Altamash.*

The paper is on an inscription of the reign of Sultan Shamsuddin Altamash (607/633/1210-1235). The inscription was discovered by incident by the author of the paper in the house of a local Muslim gentleman whose father or grandfather purchased heaps of masonry, stone and other building materials from the vicinity of the present Juma' Mosque, in Bala-i-Qila' near Aligarh in a public auction. As in the inscription there is a distinct reference to both the Sultan and his Chief Wazir, Khwaja-i-Jahan, Nizamul Mulk, there cannot be doubts about its date though in the inscription in its present state there is no specific date. The great antiquity of the inscription is itself the main reason why it should attract attention of antiquarians.

The following exhibits were shown and commented upon by Pandit P. B. Chakravarti:

I. P. Chakravarti—*A Manuscript of a hitherto unknown commentary on the Pancartha Bhasya of Kaundinya.*

Ms. No. Im. 7163. It forms a fragment of the Commentary on the Kaundinya-Bhasya of Nakulisa-Pasupata System of thought. Of the vast literature belonging to this school, only the Bhasya and the Ganakarika are available to scholars. The Commentary is replete with quotations from ancient teachers of whom very little is known elsewhere. It frequently refers to one Mahabhasya which is distinct from the Bhasya of Kaundinya.

II. P. Chakravarti—*A Manuscript of a hitherto unknown Commentary on the Kiranavali by Bhatta Vadindra.*

Ms. No. Im. 9262. It is a Commentary on the Kiranavali of Udayana. The author is Bhatta Vadindra whose Maha-vidya-vidambana is well known to scholars. One or two leaves in the beginning as well as in the end are wanting. No notice of this important MS. has so far appeared anywhere else.

The Pandit explained the special features of both the manuscripts which created a lot of interest among the members present.