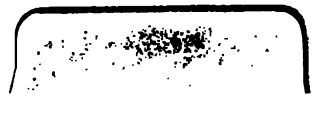

THE

MADRAS JOURNAL

OF

LITERATURE AND SCIENCE,

PUBLISHED UNDER THE AUSPICES

OF THE

MADRAS LITERARY SOCIETY

AND

AUXILIARY OF THE ROYAL ASIATIC SOCIETY.

VOL. IX.

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ROBERT COLE, Esq.

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AND

C. P. BROWN, Esq.

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MADRAS JOURNAL

OF

LITERATURE AND SCIENCE.

No. 22—January 1839.

I.—*Fourth Report of Progress made in the Examination of the* MACKENZIE MSS., *with an Abstract Account of the Works examined.—By the Rev.* WILLIAM TAYLOR, *Member of the Madras Literary Society, &c. (Continued from the last No.)*

B :—TELUGU.

a. Palm-leaf Manuscripts.

The following manuscripts are portions of a version of the *Mahábhárata.*

Adi-parvamu, or the first book of the *Bháratam,* No. 1.—Countermark 161.

This copy contains from the beginning down to the 241st palm-leaf, without intermediate defect; but all the remainder is wanting. The manuscript is very old; the hand writing somewhat antique; and the leaves are damaged, in several places, by the eating away of the edges; so that portions of the nearest line have words eaten out.

2. *Adi-parvam*, No. 2.—Countermark 162.

This copy is complete at the beginning, and down to the 208th palm leaf; the remainder is wanting. It is a comparatively recent copy; but the leaves are perforated by insects in several places; so as occasionally to destroy some letters, but not so as to destroy legibility.

3. *Adi-parvam*, No. 3.—Countermark 163.

This copy wants the 1st leaf, it is then right down to the 22d leaf; deficient afterwards to the 190th and thence to 114th: right afterwards to the 114th: so far very old. A more recent hand writing follows, beginning with the 185th leaf; right thence to 188. No. 189 is wanting. From 190 to 214 is right: defective to 217: right thence to 227. No. 228 is wanting; thence right to 226, defective to 242, right thence to 245, and defective to 254. The remainder complete down to 288, the end.

This manuscript is very old. The former portion more so than the other, which is in a different hand writing. It is also damaged; not so much by insects, as by the wear and breaking of the leaves by decay.

4. *Adi-parvam*, No. 4.—Countermark 164.

Of the eight *asvásams* (or sections) into which this *parvam* (or book) is divided, there are in this copy the 5th, 6th, 7th and 8th: there are nine leaves wanting from the beginning of the 5th: the other sections specified are complete. The leaves were not numbered: causing so much the more trouble in the examination: the Nos. of the pages have been inserted; and the contents compared with another copy, not belonging to this collection.

This MS. (No. 4) is but lately written; both palm-leaves and hand writing being quite recent in appearance.

5. *Sab'ha parvam*, or the second book of the *Bhàratam*, No. 5.—Countermark 265.

In this MS. the 9th palm-leaf is wanting; thence it is complete to the 59th leaf, which is the end.

This copy is very old; injured at the edges, but not inside.

(The third book, or *Vana parvam*, is not in the collection).

6. *Viráta parvam*, or the fourth book of the *Bháratam*, No. 6.—Countermark 266.

The beginning is found in this copy to the 20th leaf, with a chasm thence to the 50th leaf. Thence right to the 146th leaf. The MS. is old; though apparently not quite so old as the last. It is a little worn at the edges; and very slightly touched by insects inside; neither amounting to injury.

7. *Udyoga-parvam*, or fifth book, No. 7.—Countermark 267.

This copy is complete from the beginning up to the 139th leaf, which is the end; or, in other words, it is a complete copy, save only, that the wearing or breaking away at the edges, and the breaking off of a few leaves inside, occasionally destroys the coherence of the versification, and meaning. The copy is rather old.

8. Another copy of the same, No. 8.—Countermark 268.

This is a recent copy, as to palm-leaves, and writing; but not finished; from the beginning to the 36th leaf is found herein; the rest is wanting.

9. *Bhishma parvam*, or ninth book, No. 9.—Countermark 269.

This copy is right from the beginning to the 89th leaf. There is then a mistake in the numbering of the leaf, 100 being written for 90; but the connection of the composition is uniform. It is then right to 136, the end: by consequence a complete copy, save only that the 21st leaf is broken off, and part of it wanting. The book is slightly worn at the edges, and touched by insects: but these do not affect or injure the meaning. The copy is a little old.

10. Another copy of the same, No. 10.—Countermark 270.

The first ten or fifteen leaves are seriously damaged, by insects. The copy is otherwise complete; containing 146 palm-leaves in all. There is attached a copy, not perfect, of the *Dasarathi sataca*, by *Rama-dasa*, containing a eulogy of *Rama-Chandra* as *Vishnu*, appearing under ten metamorphoses, or incarnations.

Both MSS. are rather old ; and both injured by insects.

11. *Dróna parvam*, or seventh book, No. 11.—Countermark 271.

This copy is complete in 227 palm-leaves; but these are old, especially the first 45 leaves; which are also injured by insects. The remaining, and seemingly more recent, portion, is not touched.

12. *Kerna-parvam*, or the eighth book, No. 12.—Countermark (wanting).

A complete copy in 90 palm-leaves; old, but notwithstanding in good preservation.

A few palm-leaves are appended, containing panegyrical stanzas addressed to the consort of *Siva*.

13. *Kerna-parvam* (another copy), No. 13.—Countermark 273.

This MS. is complete, as regards the *parvam* itself; though the paging is from 228 down to 362, as part of a fuller copy of the *Bhúratam*. This copy is a little old; but in very good preservation.

14. Another (imperfect) copy of the same, No. 14.—Countermark 274.

The two first palm-leaves are wanting; but from p. 3 to p. 16, the leaves are regular; the remainder is wanting. A few loose leaves follow, apparently belonging to the *Adi-parvam*, of some copy different from those in this collection. What remains of this fragment is in tolerable good order.

15. *Salya parvam*, or the ninth book of the *Bhàratam*, No. 15.—Countermark 275.

This copy contains from page 138 to 332; the intermediate leaves being regular: and the numbering indicates that the MS. is part of a larger one, since the *Salya-parvam* is herein complete. The manuscript is rather old; slightly worn at the edges; and but slightly touched by insects inside. It may be considered to be in moderately good preservation.

16. Another copy of the same, No. 16.—Countermark 276.

This copy is also complete; though the numbering is from page 363, down to page 507, the end. It is much older than the preceding copy. It is also more worn, and injured inside: particularly in a few leaves at the end; and appears to have formed a part of one entire copy of the *Bháratam.*

17. *Sauptica-parvam*, the 10th book, No. 17.—Countermark 277.

The copy is complete as regards this *parvam* itself: though the numbering of the pages is from 252 down to 296, indicating it, as before, to be a part of a fuller copy of the *Bháratam*. This MS. is a little old, and somewhat worn at the edges; but in good preservation inside.

(The eleventh book is not found in the collection).

18. *Santi-parvam*, the twelfth book, No. 18—Countermark 278.

This copy is complete in itself; but the paging is from 152 down to 348. This MS. is old; worn at the edges; discoloured inside; damaged at the beginning; and more seriously at the end, by insects.

As regards the entire work of the *Mahabhárata*, an abstract of its voluminous, and multifarious, contents will not be expected, or required from me in this place. In the original Sanscrit, especially, it is a work of first rate consequence; and has received, as such, attention from all enquirers into Oriental literature. It is one of the *Itihasas*; and secondary in esteem only to the *Vedas*; in some instances to the *Puranas*. There is much of early history contained in it; though not satisfactory

in character, because fact and fiction cannot be easily disentangled. The Telugu work is a translation from the Sanscrit by *Nannaiya Bhatt*, and his disciple *Balasarasvati*, according to one account; according to another account by *Tikana-Somayáji*, completed by *Potaiya*, or *Bommana-pota-raja*. A third account, that of Professor Wilson, states the translation to have been by *Nannaiya Bhatt*, down to part of the third book: completed by *Tikana Somayáji*. Possibly there are two or three different versions.

It will be seen by attention to the foregoing details, that a complete copy could not be made of the MSS. in this collection, without extraneous aid. The idea of forming such a copy has occupied my mind; but time and expense seem to forbid the doing so; and need does not urge it, just at present; for the copies will not suffer much further injury, for a year or two, and whenever the formation of one complete copy may be attempted, other copies, to collate with these, must be procured. One copy, uniform with the other restored MSS., would probably fill two folio volumes, at least. I have already incurred expenses for restoration of MSS. considerably beyond my allowance for copyists: and the time required to form such a collated copy would seriously interfere, with the successful, and timely, discharge of my obligation in the other, and more important, parts of my engagement. Hence so laborious a work, with regard to one poem (however valuable), is not my present duty. Should any ulterior process arise out of the present examination, I would then recommend the making such a restoration as a good record copy.

The following four manuscripts are portions of a version of the *Bhágavata puránam*.

19. *Panchama-Scandham*, or the fifth book of the *Bhágavatam*, No. 22—Countermark 284.

This is a complete copy of the fifth book of the *Bhágavatam*; but the numbering of the pages, from 221 to 253, shews it to have belonged to a complete copy of the whole work. This MS. is neatly written; is rather old: but in good preservation. The version is poetical by *Bommana-pota-raja*.

20. *Saptama Scandham*, or the seventh book of the same. No. 21—Countermark 282.

This portion is complete, as a distinct book. It is quite recent; slightly touched by insects at the beginning, but of no consequence, as to extent of injury.

21. *Ashta-Scandham*, or the eighth book of the same, No. 23—Countermark 283.

This copy is imperfect, both at the beginning, and at the end. It wants 20 leaves at the beginning, and how many at the end cannot be determined. A recent marking of the leaves in *ink*, would imply a complete work from the 1st page, which is deceptive. The fragment is not very old, as to leaves and copying. It is also but slightly injured.

22. *Dasama Scandham*, or the tenth book of the same, No 21.—Countermark 285.

This is a complete copy of the tenth, and also of the eleventh book. The manuscript is neatly written, is not very old, and in perfectly good order.

An abstract of the *Bhagavatam* being in progress, nothing further is here necessary to be added. It may only be expedient to mention, that in Sanscrit, *Candam*, and *Scan'ha* alike denote a book, section, or chapter. The Tamil translator adopted the former word, as better suited to the Tamil orthoepy; the Telugu translator has employed the more usual term, as the Telugu alphabet contains representatives of all the Sanscrit letters and sounds.

22. *Ranganát'ha Ramáyana* a version of the *Ramáyanam* by a *Brahman* named *Ranganát'ha*, No. 99.—Countermark 399.

This manuscript is very old, and exceedingly injured; not so much from the ordinary cause, that is insects, as from wear and tear by use. The leaves are broken off in the middle, a half only remaining; or broken partly, a larger part remaining: many entire leaves are wanting; and the whole so very deficient, that a particular enumeration of defective parts would be equally tedious and useless.

23. Another copy, No. 100.—Countermark 400.

This is a very small, and still more imperfect, manuscript. wants the beginning, and the ending: is not regular in the midd and though not so much broken by use, as the last copy, yet injured in this way, chiefly at the two ends. It is not touched insects. It does not seem any way possible to form one comp copy from both of these fragments. Being a popular book, it always be procured, as it is very common northward of Madras. I the production of the aforesaid *Brahman* composed in the *dvi-p* measure; and written under the patronage of *Buddhana Siddha-r* a chief in the Cuddapah district, who bestowed money very liber on him. As it is a version from the well known Sanscrit p an abstract of the contents is not required.

Note.—Both MSS. are entered in Des. Catal. vol. I. p. art. 51. One copy is termed incomplete, implying the complete of the other one; an inference that would be ill founded.

24. *Sarangadhara Charitra*, tale of *Sarangadhara*, No. 61.—Cou mark 407.

This is a fragment of a poem by *Chamakuri-Vencatapati*; a of romance or fiction; the hero being *Sarangadhara* son of *Ei devendradu*. The incidents are not of a kind to be abstracted l and I therefore refer to the very sufficient notice of them in liv. page 337, vol. I. of the Des. Catalogue. This fragment the appearance of being very old, and is a very small part, of w understand to be properly a large work.

The subject is that of the two Tamil manuscripts, noticed in foregoing portion of this report. A. *a*. 24 and 25. Nos. 117 and 118

According to the Des. Catalogue there should be another co prose, on this same subject, in Telugu, which manuscript appar is not now in the collection.

25. *Bhoja-raja-Charitra*, the tales of *Bhoja raja*, No. 68—Cou mark 351.

The book is a fictitious work on the plan of the *Pancha-tantra* similar productions. It is not concerning *Bhoja-raja* himself; bu

different tales are represented as having been narrated to him by *Sarpata Siddha*. One of the tales at the commencement relates to a great hunting match, made by a king of the *Anga* country to destroy the wild beasts by the advice of his ministers; and other tales are of a like artificial structure: the object in view is to teach stratagems, artful devices, and cunning, adapted to outwit others. It is in good Telugu; but with orthographical faults. The book is complete, and in very good order.

Note.—It is entered in the Des. Catal. vol. 2, p. 321, art. xi. at least I suppose it to be the same work; though in the Catalogue it is stated to be imperfect.

26. *Nala Charitra*, the story of king *Nala*, No. 35.—Countermark 385.

This is an old manuscript. Palm-leaves are wanting from 13 to 28, the remainder continues in regular order forwards; but it is not complete at the end; where besides it is especially damaged. It contains a poetical account of the fortunes of *Nala-rája*, founded on an episode in the *Mahabhárata*. Versions of the tale are found in all the languages of the Peninsula. There is no need of abstracting it here; and the complete restoration of the manuscript is impracticable, without possessing another copy of the same poem, I therefore pass it by; seeing that the mere local poetry, or *belles-lettres* of any section of the *Hindus*, is not the object of my enquiries.

Note.—It is briefly entered in the Des. Catal. vol. 2, p. 332, art. xxxix. "The story of *Nala* and *Damayanti*, as taken from the *Mahabhárata*."

27. *Sesha-dherma*, or *Hindu* morality, No. 20.—Countermark 280.

This is a poem divided into seven sections, each one entitled a *satakam*; the usual name of a distinct work of one hundred stanzas. These sections are as follows:—

1. *Mukti Canda-satakam.*
2. *Parámanda-satakam.*
3. *Rama-shadácshari-mantram.*
4. *Dattátraya-satakam.*

5. *Sampanga-mana-satakam.*
6. *Sesha-dherma.*
7. *Sesha-dherma shashta-másvásam.*

The first contains various formularies used by *Brahmans*, and relate to the qualities of the soul, and especially to the homage paid to *Siva.*

The second is an epitome of the meaning of the *Sastras*, and meaning of the doctrines of spiritual preceptors, still according to the *Saiva* system.

The third contains the various *mantras* on the *Vaishnava* system. The repetition of these formula is marked and numbered by certain gestures on the hands, members of the face, and head; and the repetition, when bathing, and at other times, is a part of the manual, and mental, devotion of *Vaishnava* votaries.

The fourth proceeds on the example of an elephant, when seized on by an alligator, praying to *Vishnu*, who hurled his *Chacra* and killed the alligator: whereon is founded the instruction that votaries who in time of trouble call on *Vishnu* will be delivered, by his sending down his *Chacra*, or effecting some marked interposition, on their behalf.

The fifth contains explanations on the nature of *Vishnu*, as to his spiritual form; the said form pervading the universe. It inculcates truth and spiritual homage, and appears to contain the *esoteric* doctrines of the *Vaishnavas.*

The sixth relates to gift of food, of place, of land, of a cow, &c. with a comparative estimate of the relative value of different donations.

The seventh contains narratives of different individuals; notices of sacred places; special days of peculiar virtue, and merit of bathing thereon; merit of charitable gifts on Sundays and Mondays, as narrated by *Bhishma* to *Dherma raja.*

The first *sataca* contains 196 stanzas, the second 111 stanzas, the third is a continuous series of formularies. The fourth contains 103 stanzas, the fifth 123 stanzas, the sixth and seventh are irregular, and without any specification of number.

At the beginning four palm-leaves are wanting, and I have not the means of restoring them at present. The book is damaged by reason of insects having eat away the edges; forming, so to speak, the small margin, but leaving the writing uninjured. The work is partly compiled from the *Mahabharata*, by *Kondia Srinivasa* who lived in a village of the *Rajahmahendri* district. The leading title of the work is taken from the two last sections. *Sesha* is shortened from *Adi-sesha*, the

thousand headed serpent, on which *Vishnu* is fabled to repose, as some say an emblem of eternity; and *dherma* is a word which signifies, justice, equity, benevolence, morality, alms, or ritual observance. The reader may thence frame his own translation of *Sésha-d'herma.*

The book is a valuable one. A literal translation would be of great use towards a full acquaintance with the *internal* system of the *Vaishnavas*; which is not the one commonly inculcated on the people.

Note.—It is entered in the Des. Catal. vol. 1, p. 270, article xii; with an error as to the contents being derived from the *Bhagavat*, most probably an oversight or misprint, or possibly a mistake of the ear; the borrowed part of the contents is from the *Bhâratam.*

b. MANUSCRIPT BOOKS.

Manuscript book, No. 36—Countermark 286.

The *Vishnu-Upa-puranam.*

This is a version in Telugu of the above *Upa-purana.* There are eight books or sections; of which the sixth is incomplete. The most remarkable portion is the 5th and 6th books, containing the *Surya*, and *Chandra vansas.* The opening part is stated as if received from *Pulast'hya*, one of the seven great *rishis.* It relates to primal matters; being little more than a repetition, or summary, of subjects contained in other *Purânas.* The different *Manuvantaras*; the seven *dwipas*; the measures of time; the incarnations of *Vishnu*; and connected topics; are adverted to. The seventh, and eighth books, or sections, relate to the birth, adventures, and public acts, of *Crishna.* In this part, and indeed throughout the whole, there is a great apparent resemblance to the contents of the *Bhágavata puranam.* In the early portion especially, there is, I am persuaded, much enigmatical, or symbolical, writing and when such a veil is studiously employed, as seems to be the case in all early *Hindu* writings, it may be inferred, that the earliest colonists of India wished to conceal their true descent, or to falsify something concerning themselves; as all the researches which have been made, or are now being carried forward, seem to render abundantly probable.

Note.—The writing of this book is very legible; and the paper but very little damaged. Its restoration by consequence does not seem to be urgent. As to translation such might be best made from a copy of the

original Sanscrit work. Should however no such translation be lik to appear, then it might be desirable to give the contents of this ma script. an English rendering, after matters more strictly relating to the ninsula-history have been attended to, and dismissed.

Manuscript book, Nos. 37 and 38.

It is necessary to class these two books together, as their subjec the same; that is local accounts of villages in the Northern Circ with a special reference to the settlement of the *Viyogi*, or sect *Brahmans*, as village accountants. They relate to the cleaning of wa or forest lands, location of colonists, and the consequent buildin villages, with fanes, and *mantapas*, the excavation of water reserv and other details.

Both books are so greatly damaged from the effects of damp, or of water, and of the attacks of termites, as to be *irrecoverable*. It se probable, that the restoration, were it practicable, would not be a ma of much consequence; but whether so, or not, the sense is so prevaili lest, that nothing now can be done with the books, in the way of rem

From looking over the whole of the sections, wherever any sense be made out, the following seem to be the general indications; as fa historical matters are concerned.

There are references to *Visvambara-deva* a *Gajapati* prince. The *napati* prince is described as his offspring, and the date of Sal. Sac. 1 (A. D. 1134), is given, as that of his installation. He made gift waste lands to *Gopa-raju* and *Ramana*, descendants from the *Aru viyogi*-race, or secular *Brahmans*. These again subdivided the country to smaller districts among other *Viyogi-Brahmans*: and the country this way, became peopled, and civilised. The preceding state of vernment gave way to that of the *Reddi*-s, which was superseded the *Carnatacs* rule. This was followed by the ascendancy of *Ca rajahs*. His power yielded to that of the Mahomedans; and these w superseded by the Honorable Company.

Note.—These two books are entered in the Des. Cata. vol. 2, and 19, art. xxxvii. and xxxviii., with a copy of the tables of contents prefixed in English to each of the books, which from what remains those indices can be ascertained to be the same. As the books are severely damaged, a reference to the Catalogue may now suffice, without copying those indices in this place.

Manuscript book, No. 18.—Countermark 911.

Report of the progress of *Ni'ala Narrayan* through the *Malayalam* and *Conga* countries from 1807 to 1813.

The book is endorsed as among *Malayalam* papers; but these reports, in a series of papers, are in the Telugu language and character. The book is in a state of indifferent preservation; but does not require further notice.

Manuscript book, No. 19.—Countermark 912.

A continuance of reports from the same person in the Telugu language and character from 1816 to 1821. It is damaged by insects.

Manuscript book, No. 50.—Countermark 740.

Report of progress of *Narrayan rao* through the *Vencata giri* district, for 1814.

This book is endorsed as among Telugu papers. The first half of the contents are in Telugu; the latter half in Mahratta. The subject a journal of operations like the foregoing. It is slightly injured by insects.

Manuscript book, No. 51.—Countermark 741.

Report of progress of *Narrayan rao* in the *Vencata giri* district from April 1814 to May 1815.

A continuance of the journal from the last mentioned document, wholly written in the Telugu language; and in tolerably good preservation.

Note.—Journals of this kind do not seem to me to be of permanent interest, or importance. Hence I dismiss them with the simple mention.

Manuscript book, No. 4.—Countermark 694.

This book according to the English heading of contents (partly destroyed) once contained copy of an ancient record of *Kondavir*, and

its rulers, with a notice of the village accountants, and limits of cert districts in the Telugu country.

The book however is now so seriously injured, that it may be s if not to be destroyed by insects, yet to be so damaged as to leave no legi meaning. As such the book is of necessity passed by as *irrecovera* There is I think an account of *Kondavir*, in another paper belongi to the collection.

The book is entered in Des. Catal. vol. ii. p. 3, art. iv. simp copying the English table of contents.

Manuscript book, No. 9.—Countermark 699.

This book, like the last one is *irrecoverable*; being, if possible, i worse condition. The first section referring to the *Comti*, or *Bani* class of people at *Pennaconda*, might have been prevailingly recover had there not been two leaves at the beginning wanting, rendering t remainder destitute of value. The second section is most to be regre ted as, according to the Des. Catalogue, it contained accounts* o the *Konda vandlu*, *Kcya vandlu*, and another wild tribe, residing on th mountains, and in the woods, of the *Rajahmahendri* district. Th remaining four sections would have been of less consequence. Fro the book itself, quite irrecoverable, nothing can be made out. A l that can be done is to refer to the Des. Catalogue, vol. 2, p. 5, art. i

Manuscript book, No. 25.—Countermark 281.

This book contains the remnant of two sections.

1. "*Sesha-dherma-ratna-carum*, or rules supplementary to the *Mahabharata*."

This title, in the English table of contents prefixed, is erroneous.

2. *Rangha rao charitra*, or account of a sanguinary battle between *Rangha rao*, a zemindar of the *Velmavar* family of *Bobili* in the *Calinga Circar*, with the chief of *Pusa-pati* named *Vijaya-rama raz*, and Monsr. Bussy, a French general under *Nizam ali Khan* of Hyderabad.

* Perhaps the loss is remedied by similar notices in a following book.

The former section is entered as a paper MS. in Des. Catal. vol. 1, p. 270, art. xii under the same title with the *Sesha D'herma* (before noticed) but is described as an introductory fragment, giving only the genealogy of *Timma raja*, zemindar of *Peddapur*. From an examination of the remains it appears to be a eulogy of *Vencata Crishna Raja* composed by *Timma raz*. A genealogy is connected with the panegyric. *Vencata* is merely an epithet, and it seems to me that the poem relates to the famous *Crishna Rayer*. Indeed I can have no doubt of it, inasmuch, as *Timma raz* was one of the eight celebrated poets of *Crishna Rayer's* court.

The other section is entered in the Des. Catal. vol. 1, p. 315, art. xxi. with some brief indication of its contents, and a reference to Orme's History, vol. 2, part 1, p. 254.

The contents of the book are now *irrecoverable*: they were written on thin country paper, in which large lacunes, in various parts of each page, are completely eaten through by termites, or other insects, and the leaves are in some places so glued together, in the manner common with these insects, that they cannot be separated without tearing: the loss is apparently not of grave consequence. From an examination of the 2d section it appears that the notice in the Des. Catalogue is sufficiently accurate. There is I understand a very long poem on the subject.

Manuscript book, No. 67.—Countermark 864.

This book contains three reports, or journals, of *Ráma dasa*, in his journeys through the Ceded Districts, in search of the antique and curious, from June to December 1809, from January to September 1810, and from October 1810, to May 1812. The paper is only a little injured; the ink good; and, as it is, the book will last many years, with only common care.

I do not make such journals the subject of abstract, or special observation.

Manuscript book, No. 10.—Countermark 700.

Section 1. Account of *Vira Crishna deva* the *Gajapati* prince of *Bárâbatti*, or *Cattacapúri*, in the *Udiya* country.

In early times *Vira Narasimha Gajapati* ruled in the above mentioned town; conquered the king of *Calinga-desam;* and subdued other countries. He built, and had set apart, a fane to *Varaha Narasimha swami. Vira Capiléswara Gajapati* built an *agraháram* and a fane, on the banks of the Godavery river. *Purushóttama Gajapati* built a village, and an *agraháram* on the sea shore, bearing his own name: he also built and had set apart, the fane of *Jaganát'ha.* His son was *Pratapa-rudra Gajapati.* His rule to the westward, especially over certain fortresses and villages, was rather more extensive than that of his predecessors. While so ruling *Vira Crishna Raya maha rayalu,* coming from the west, drove away the said *Pratapa-rudra;* and, after remaining some time, returned. The fugitive prince took refuge in the town, or village, called *Andhramanémam.* After some lapse of time, *Vira Crishna-deva* of the *Gajapati* race ruled. He gave his eldest daughter in marriage to *Bálu Balendra Vira Mukunda-raju;* and his youngest daughter to *Basava raju* son of *Mádhaverma,* of the *Pusapatti* race, of the town of *Bezaválà.* These two sons-in-law he kept in his own palace. The latter being the most handsome of the two, the marriage on the part of the king's youngest daughter, was one, on her part at least, of affection; and, by her means, the young man became a favourite with her father. The king at all times wore a sword, on the possession of which his kingdom, and authority, were considered to depend. The young man *Basava,* abusing the confidence reposed on him, contrived by stealth, and in a way which the manuscript styles mean and unworthy, to get possession of the sword, expecting the kingdom to follow. A great disturbance arose: but the king at length regained the valuable heir-loom of his race. He then sent away the said son-in-law to his own town: together with wife and dower. He caused an illegitimate son to be installed as his heir to the kingdom: to the prejudice of three legitimate sons. Disgusted at this preference, the eldest of the two legitimate sons went away to *Jaya-puram,* and established a rule over nine *pálliyams,* or districts. The second son established a rule over nine districts in the *Kimedi*-country. *Bhimadeva,* the third legitimate son, laid the foundation of *Vijayanagarum* (that is what is commonly written *Vizianagarum* in the Northern Circars, not Bijnagur on the Toombodra river). He there established a rule over twelve *pálliyams,* or districts. After the death of the aforesaid *Vira Crishna déva Gajapati,* the husband of his youngest daughter: that is to say *Basava raju,* killed *Balendra,* the husband of the eldest daughter: and took possession of the district which had been given to the said *Balendra* as a marriage portion. At this time the *Mléchch'has* (barbarian foreigners) took possession of the aforesaid town of *Cattaca-puri* (Cuttack).

The before mentioned *Bhimadeva-Gajapati* leaving no offspring, six of his *Palliyams* were united with the *Kimedi*-country, pertaining to his elder brother. The remaining six districts were united with the *Jayapur* sovereignty of the eldest brother. *Sita-Rama-Chandralu*, of the posterity of the before mentioned *Basava*, conquered the two countries of *Jaya-pur* and *Kimedi*; and also levied tribute from them, in acknowledgment of his sovereignty. This *Sita-Rama-Chandralu* had no offspring: he adopted one of his own *Pusapatti*-race, who was named *Venkatapati-raju*, who succeeded him on his death. His manager, or minister, named *Bandi-Jaga-rao*, took possession of the kingdom, and put the said young man, *Vencatapati* in prison. While himself ruling in his usurped authority the younger brother of the one imprisoned, who was named *Ananta-raju*, and was in the service of the Golconda Nabob, with troops of the latter overthrew, and killed, *Nilacontha-raju*, the general of *Jaga rao*, and also *Jaga rao* himself. He then re-instated *Vencatapati* as king, and became his second in authority. They relinquished *Portnur*; and built another *Vijayanagaram*, forming a fort, and residing therein. This *Vencatapati* had a son named *Sita-Rama-raju*; and *Ananta-raju* had a son named *Vijaya-Rama-raju*. These two children disagreed; and ruled separately, until *Sita-rama-raju* died. His son *Ananta-raju* was brought up by *Vijaya-rama-raju* who conquered *Timma-raju* of *Peddapuram*, putting his son in the father's place, he also killed *Nagaji Hussein Khan*. He also took tribute from Cuttack and other places. The Mahomedan ruler of Golconda thenceforward acquired an ascendancy; and established different rulers, by his firman, or edict. The name and influence of Monsr. Bussy the French general is subsequently introduced. Hyder Jung was his agent in the management of French affairs, in the Northern Circars. The ruler of *Bebulli Cotta*, whose ancestors from the time of *Ananta-raju* had been adversaries, and had introduced the Mahomedan ascendancy, was now oppressed in return. Soon after the country was conquered, from the Bengal side, and became subject to the Honorable Company. The rule of chieftains, under them, continued down to *Narrayana Gajapati*, who ruled at the time when the manuscript was written.

Section 2. Account of the *Cóndu vandlu*, a wild tribe residing in the *Jayapur* district of the Northern Circars.

A distinction is to be noted between the *Cóndu Cóthu* (or *Kondoo*), *vándlu* and the *Conda* (*Konda*)-*vándlu*; the former class of people form the subject of this section; the *Conda-vándlu* of the next one.

The *Cóndu-vándlu*, dwell in hills and passes of hills: in rude huts, like cow-sheds. They are very careful of water-springs. They beat, and plunder, solitary travellers: some use brass vessels; some dry gourds; some earthen vessels. In every house two or three dogs are reared. Their chief has the title of *Nayak*; inferior chiefs are termed *doralu*. The villages pay from six to thirty rupees, as tax. The *Nayak*, on receiving the tax, points out, and assigns lands to different individuals. They cultivate *Cholam* (Holc. Sac.) and other dry-land grains; as also rice in the wet lands: the poorer sort, sell a portion of their grain, to pay their tax, and live on the rest, as also on the proceeds from tamarinds produced on their lands. Both sexes labour in the cultivation of grain. They labour in their fields, from day break till noon; when, from their position, it is very cold. At noon the power of the sun produces great heat, and thirst, which induces them to cease from work: they make large use of butter-milk, and other beverage, the effect of which, according to the manuscript, is to make them pot-bellied, with small legs and arms, and causing unhealthy aspects. In the hot season they sleep wherever they please. In the rainy season they sleep on couches within doors, having stoves, or similar things, inside to warm their dwellings. They place a watchman at night on a stage in the fields, to protect the corn from beasts. The *Paindu-vándlu*, a class of *pariars*, weave their garments; which, as worn by the men, are a cubit and three quarters in breadth, and sixteen or seventeen cubits in length. The women's cloth is not quite so long. As they are very uncleanly in their persons, so they emit an offensive smell. The men wear a crown-tuft of hair. They wear finger rings of brass, or other mixed metal; some have them of silver. Their language is distinct; and if they speak Telugu, it is with an imperfect utterance. Their marriages are fixed, as to time, by an astrologer whose influence extends over from forty to fifty villages. Some specification is given of their marriage-ceremonies; the eating of flesh, and drinking strong liquor, being a part. They have some other ceremonies, connected with the age of their female offspring. Their *pusari* is termed *Jani vándu*; the *numen* worshipped is called *Jacara*, a sylvan god. In order to promote the growth of grain in their fields, they give a portion of grain from a former crop to the *Jani*, who then performs a ceremony, by offering some leaves, and anointing the image of *Jacara*. The same thing is practised, through fear of tigers, for the sake of protection. The caste-thread is not worn by any among this people: with one exception, in the case of *Vencatapati raju* of *Púla-cónda-vira Gottàm*; who, exercising kingly power, puts on the thread, but without any attendant ceremony. The *Cóndu vandlu* are also termed *Játápa doralu*;

and it is immaterial whichsoever of the two names is used. They are one and the same people.

Section 3. Account of the *Conda-randlu* people, in the *Jayapur* district.

They wear a tuft of hair on the top of the head, in the form of a ball; some wear mustachios, and some use the *Saiva*-burnt ashes, on their foreheads. They do not speak good Telugu. They dwell on hills; are of disagreeable appearance; cultivate grain in suitable places; pay taxes; watch the grain on platforms. Some wear a dagger in their girdles; carry muskets; tie a handkerchief on their heads; and do the work of peons, or soldiers. They receive pay in an allowance of grain, so much per diem. They dwell in sheds, like cow-sheds. They chiefly use earthen vessels; a few people only have vessels of brass. A specification of dress is given; and of some customs of the females. The chief with the title of *raja*, wears the *punnal*, or caste-thread. Other chiefs are called *Doralu*. Before marriage they go to some distance to consult a Telugu *Brahman*; and by his means fix on the *muhurtam*, or minute, proper for the ceremony. If there is no *Brahman* near at hand, as usually there is not in places in, or near, the woods, then they call an astrologer named *Succadiri*, one of their own class. Fixing, by his aid, the proper time, they bring him to the ceremony; and he, partaking with them of flesh and ardent spirits, is afterwards dismissed. However they do not eat raw-flesh. If a husband dies, the widow may marry again. A few of the people are votaries of *Vishnu*; others of *Siva*. The women do not plough, nor use the large agricultural hoe; but they gather tamarinds, and sell them. Those persons who are employed as peons permit their wives also to engage in the same trade of gathering, and selling, tamarinds.

Section 4. Description of the boundaries of the *Jayapur* district.

It is not necessary minutely to follow in this place the details of the circumference, or boundary line, further than to mention that the district is in the proximate neighbourhood of Vizagapatam, Kimedi, and Ganjam. A variety of small chiefs, with little districts, were spread around; one being termed *Sanniyasi-raju*. On one quarter *Kirata* (or wild savage) people are mentioned; and also the *Savaralu*, a distinct people; one of whom is described as a common pest, and incendiary. The

section is not without use. It seems to me that the *Hindus* had but imperfectly penetrated the mountain-fastnesses; still possessed by aboriginal mountaineers.

Section 5. Account of the *Maliyasavarulu*, in the neighbourhood of the *Jayapur* district.

These are a people with small eyes, noses, ears, and very large faces (Hun, Tartar, or Calmuc, class). Their hair is thickly matted together. They bind either a cord, or a narrow bit of cloth around their head, and in it stick the feather of a stork, or of a peacock, and also wild flowers, found in the forests. They go about in the high winds and hot sun-shine, without inconvenience. They sleep on beds formed of mountain-stones. Their skin is as hard as the skin of the large guana-lizard (rough, indurated, not delicate). They build houses over mountain-torrents, previously throwing trees across the chasms: and these houses are in the midst of forests of fifty, or more miles, in extent. The reason of choosing such situations is stated to be, in order that they may the more readily escape by passing underneath their houses, and through the defile, in the event of any disagreement, and hostile attack in reference to other rulers, or neighbours. They traffic with the grain which they raise; and purchase tobacco leaf, and various other trifles, in return. They cultivate independently, and pay tax or tribute to no one. Each one has a very small field: and they are obliged to make up their subsistence by other means: among which catching hares is mentioned. If the zemindar of the neighbourhood trouble them for tribute, they go in a body to his house, by night; set it on fire, plunder, and kill: and then retreat with their entire households into the wilds and fastnesses. They do in like manner with any of the zemindar's subordinates, if troublesome to them. If they are courted, and a compact made with them they will then abstain from any wrong or disturbance. If the zemindar unable to bear with them, raise troops, and proceed to destroy their houses, they escape underneath, by a private way as above mentioned. The invaders usually burn the houses, and retire. If the zemindar forego his demands, and make an agreement with them, they rebuild their houses, in the same situations, and then render assistance to him.

In their marriage ceremonies they consult the *Succu-divi*, or astrologer, and these are similar, on the whole to those detailed with reference to the two former classes, in the two last sections. They seem to be only a variation of the same species.

Note.—This section, concerning this wild and indomitable people, to me seems a curiosity.

Section 6. Account of the *Conda Savaralu*, or people of the hills of the *Jayapur* district, in the province of *Rajamahendri*.

The women of this tribe get wood from the forest, which they afterwards sell, and exclusive of this small commerce, they also labour in the cultivation of grain in the fields. After child-birth the women are under regimen for three days only; and, on the fourth, they go out to work in the fields. There is no washerman-caste among them; hence the women wash the clothes of their households. In the hair lock, on the crown of the head, and other circumstances, they have peculiarities. They pay some small tribute; assist the chiefs in times of trouble; and dwell, not in thick forests, or mountain-fastnesses; but on the edge of the former, and near to the villages of the low country people, or *Hindus*. Hence they are a degree more civilized; and have acquired the distinctive name of *Conda Savaralu*. They hold however with the *Maliya savaralu* that kind of intercourse which consists in mutually giving to each other daughters in marriage; marking affinity of tribe. When they go to war they stick the feathers of a fighting cock, or of a stork, in their hair; and then wear garments hanging downwards to their knees. They wear a dirk or knife; carry bows and arrows; and use the horn of a kind of deer, for a trumpet. They fight only in bushes; but decline any combat in the open plain. They make night attacks; and they burn down houses. It is said that they do not regard the *wound* of a musket ball, as they have a remedy for it: they are afraid only of a cannon ball: for which, of course they have no remedy. They have no internal distinctions of tribes, or castes. Both men and women labour in the fields. The writer here says that since they have the *Janivandlu*, as hierophants, and are accustomed to eat flesh, and drink ardent spirits, at their sacrifices, they appear to *him* to be of the *Sacti*-class (an opprobrious sect among the *Hindus*). The *Janis* allow no one to approach, or to hear, while repeating their *mantras*, or formularies.

Note.—This I apprehend to be the class described by Mr. Stevenson's paper, translated by me, and printed in No. 16 of the Madras Journal of Literature and Science. Discussion and difference of opinion having arisen on the subject, I am happy to meet, in the Mackenzie papers, with documents to elucidate, and I think set the question at rest. The derivation of the word *Savaralu*, seems to be the Sanscrit word *Savara*, a barbarian or savage, with the addition of the Telugu plural *lu*.

Section 7. Account of the villages of *Chellur* and *Catéru* in the *Rajamahendri* province.

The origin of *Chellúr* is dated in the time of *Agastya*, who is said to have planted a garden, and formed a tank, with a *Saiva* fane, and a *Vaishnava* fane; at first called *Chendlúr*, and in the *Cali-Yuga* shortened to *Chellùr*. After the rule of the kings of *Ayodhya* was finished, one named *Vijaya áditya* ruled 48 years, and had a son named *Vishnu-Verddhana*. From him is deduced a line of *Chalukiya* chiefs of the *Rajamahendri* circar or province; which, if it can be depended upon, is of great value, and consequence, in an historical point of view, as to this particular.

The *Chola* conquest by *Kulottunga Cholan* is recognized. Afterwards the *Vemana* family ruled. The *Reddivaru*, and other chiefs, are specified.

The subject does not admit of abstract; but merits full translation, as a document affording historical matter, to be then judged of, by comparison with others, as to value and authority.

GENERAL REMARK. As regards the condition of this book it may be observed, that it was originally written in a fine intelligible hand, with good ink, but unhappily on thin country paper, which is greatly injured by insects. Had the hand-writing been smaller, the whole would have been irrecoverable; as the case is a restoration has been effected with tolerable success; yet not without omissions of words, in some places. That the sense is preserved may appear from the abstract given.

The paper on the *Chalukiya* kings of *Rajamahendri* is valuable; but will require to be compared with section 4 of MS. No. 12, next following. The valuable labours of Walter Elliott, Esq. in fixing, from inscriptions, the dates of some of the *Chalukiyas*, will, aided by these two papers, and other details to come, render historical deductions concerning the *Rajamahendri* principality comparatively easy, and to some degree certain.

Manuscript book, No. 12.—Countermark 702.

Section 1. Account of *Sitandam*, in the district of *Rajamahendri*.

Reference to *Rama Chandra*, who lived in privacy in the country near the Godavery-river, and had his wife *Sita* abducted thence by

Rávana. In consequence of a particular symbol having been formed of mud in this place, it acquired the name of *Sitandam*, from *Sita*. A fane of *Rama-svami* was, at a later period, constructed. In the time of the *Chalukiyas*, they had the festivals therein regularly managed. In the time of the *Chola kings*, and in Sal. Sac. 1024, these having conquered the *Andhra* and *Calinga* kingdoms, had servants, female slaves, &c. added to the fane. Under *Pratapa-Rudra* of *Orankal* (or Warankal) all matters were carried on, in the said fane, as before. The periods of reign of three *Reddis* are specified, as follows: The *reddis* of *Condavir Polaiya-vema reddi* 12 years, *Annapota vema reddi* 30 years, *Dherma vema-reddi* 12 years. The statement follows of a *Brahman* from Golconda, on whom a daughter of a forester of the *Billa-jana* (Bheels?) fixed her affections; and, by consent of her parents, was married to him. After two or three years residence the *Brahman* asked her to shew him any thing special in the forests. She took him to a particular place and shewed him what is termed *rasam*, or the agent in alchymical operations. He, knowing its quality, afterwards went secretly, and concealed a quantity of it in the hollow of a bamboo-cane, which he deposited in the house of a *Chetti*, or petty trader. The latter, discovering its value, stole it, and absconded; setting fire to his house in order to cover his proceeding, with a plausible pretext. The *Brahman* came to ask for his property, all knowledge of which was denied, and the *Brahman* going into the house to seek for it, perished in the flames. The trader soon after died. Of his race an old woman remained. *Dherma vema Reddi* obtained from the said matron the contents of the bamboo; and by means of it procured great wealth; but in return was troubled by the spirits of the aforesaid *Brahman*, and trader, as evil demons. Unable to bear the annoyance he, at the instance of those demons, built a fane; together with all the usual adjuncts. He also affixed their names to his own son. *Conti-Raja-vema reddi* ruled 27 years. *Raja-vema reddi* 4 years. *Cumara-giri reddi* 14 years. After a few changes, the Mahomedans from Golconda, under Ibrahim Padshah, came and conquered the country, in Sal. Sac. 1495. A few other particulars are given; relating solely to repairs, or additions to the village fane.

Section 2. Account of the village of *Boyana-pudi* in the *Rajamahendri* district.

In the opening of the *Cali Yuga*, *Mukundi isvara* ruled in *Darani-cota*. When bathing in the *Godaveri* he had a vision of *Bhima-isvara*, and

another local *numen;* and soon after discovered a symbolic image, in midst of a wood, over which he had a small fane built. He maintai one *Siddha muni* a *Jaina Brahman*, who assembled several of his c and constructed a *Jaina* fane, with images inside. The king w great patron of the said *Brahman*. A dispute took place between l self, and his wife, as to the respective merits of the *Jaina Brah* and the Telugu (i. e. *Saiva*) *Brahman*. In order to test their skill, chief put a large snake in a pot, and secretly hid it under ground then called on the two *Brahmans* to tell him what he had done; sta that whichsoever failed to declare it, should be put to death in an mill. The *Jaina Brahman* told the king he had put a snake in a pot, and buried it. The Telugu *Brahman* said the king had hidd valuable necklace in a pot. On digging the vessel out of the gro the Telugu *Brahman* was found to be right. In consequence the c punished all the *Jaina Brahmans*. His son was *Rama Bhim esv* who placed one of the *Boyana* class, otherwise called *Nilam vandlu* charge of this village and fane; which thence acquired the name of *I ani pùai*. He assembled many of his tribe. Things proceeded, witl interruption, down to the time of *Kulottunga Chola*. The *Gajapati* followed, in amity with the Mahomedans; but, enmity arising betw them, one of the parties went to Golconda, and brought troops th which took this village. During Mahomedan rule, the privileges of fane, and of the *Nilam* people, were taken away; but the latter, un ling to relinquish their birth-place, took to cultivation. The *N Brahmans*, at a subsequent period obtained exclusive privileges.

Section 3. Account of the forest of *Chinna puru tena*, in the *Raja hendri* district.

Reference to an extensive forest of twenty Indian miles (about English) in extent. Not far off is the sea. There are vacant spots the said forest, where cattle were fed. Various particulars are ad as to the production of the forest; especially a particular kind of hon produced by bees feeding on the *Chinna puru*, a kind of flower. T district is under the zemindar of *Pit'ha-pur*.

Section 4. Account of the *Amildars* (or rulers) of the *Rajamahe* Circar (the *Chalukiyas* and others).

Anciently the *Chalukiyas* ruled: of whom *Cubja-Vishnu-Verddhan* first specified. Thenceforward is deduced, in brief, the following:

List of Chalukya, and other Kings.

Vijaya aditya, 48 years.

Vishnu Verddhana, 12 years.

Vijaya aditya Chalukya, 44 years, founder of *Rajamahendri* fort, &c.

Bhima, son of Vicramaditya and nephew of Vijaya aditya.

Amma-raja, 7 years.

Vicramadityan, son of Bhima, 11 months.

Chalukya raja, 7 years.

Bhima maha raja, 18 years.

Amma raja, a short time.

Dhana Bhupati, 3 years: in his time the Chola king came and captured the *Vengi desam*, and ruled 27 years. Afterwards of the Chalukya race—

Kirti verma raja, 12 years, re-conquered *Vengi desam*.

Vimaladitya, 7 years.

Raja Narendra, 40 years, Sarangadhara was his son, concerning whom the Sarangadhara Cadha was written.

Rajendra Chola, 15 years.

Vicrama Chola, 5 years.

Kulottunga Chola (no time stated), name of dynasty.

Pritisvara maha raja, 35 years.

Mallapa devá, of the Chalukya race 10 years (SS. 1124).

Annaiya deva, of the Surya race, 30 years.

Annaiya deva bhupalan, 30 years.

The Reddi-race followed.

Potaiya vema reddi,	Comti vema reddi,
Anupota vema reddi,	Raja vema reddi.
Dherma vema reddi,	

These ruled during 100 years; the country then came under the *Gajapati* ruler, in the time of *Vira Narasinha Langula*.

Pratapa Rudra.

Mukunta deva.

Raja vidyádhara.

Notice is then given of an extensive grant, by way of privilege, made by the *Gajapati* prince to a *Niyogi Brahman*, leading to an extensive diffusion of that tribe in the *Rajamahendri* district. A few minute details bring the account down to the Mahomedan conquest of Warankal.

Remark. This list is not so full as that in section 7, of M. S. book No. 10 foregoing. Both lists require to be translated, and compared.

According to the index of contents prefixed to the book, there should be a fifth section, containing an account of *Vamagiri*, a hill fort in *Rajamahendri* Circar, but this paper is not now contained therein. The

name of *Yoma giri* appears in section 4, as that of a capital or fortress of the *Chalukyas*; but the whole account is contained in one paper.

GENERAL OBSERVATION.—This book was so much injured by insects that I doubted the practicability of its satisfactory restoration. The patient labour of a copyist has however been tolerably successful. In a few places, of necessity, words are lost. The contents are of value; chiefly so the 4th section. The 3d section is of the least consequence.

Manuscript book, No. 41—Countermark 731.

Twenty five tales of the *Vetala*, related to *Vicramaditya*.

This is a version of these popular tales, stated to have been obtained in the Telinga country. It is superfluous to make any abstract, because sufficient notices, or full translations, of them have been already published. This book is damaged at the edges, by damp and termites; but the writing within is only very slightly touched, and the ink is good. It will last for some years; though its preservation is not of consequence. The book is entered in Des. Catal. vol. 2, p. xxiii.

MS. Book	No. 14,	C. M. 704, Des. Catal. vol. 2, p. vii	art. 14.
Ibid.....	„ 16.....	„ 705 Ib. vol. 2, p. vii,	art. 16.
Ibid.....	„ 17.....	„ 707.....	art. 17.
Ibid.....	„ 18.....	„ 708.....	„ 18.
Ibid.....	„ 20.....	„ 710.....	p. ix, art. 20.
Ibid.....	„ 23.....	„ 713.....	p. x, art. 23.
Ibid.....	„ 24.....	„ 714.....	art. 24.
Ibid.....	„ 25.....	„ 715.....	art. 25.

These books are thus briefly classed together, because their contents are similar, and of trivial or no importance; being merely minute lists of accounts, or revenue proceeds from various *caranams*, or local subdivisions, of various districts in *Telingana*. The reference to the Des. Catal. will afford the respective indices of contents, prefixed in English to the several books: only in making any such reference care must be taken to observe, that the English having been written by a native, the phrase "particular account" must not be misunderstood to mean any connected statistical narrative; but merely detached lists of places, and revenue, as an accountant would make entries in a ledger, or similar book. Any attempted abstract would be impossi-

ble: if possible, useless. In general the paper and ink are in sufficiently good preservation.

Manuscript book, No. 33.—Countermark 723. Des. Catal. vol. 2, p. 16, art. xxx.

Account of allowances to the fane of *Calahastri isvara* in Telingana.

This, like the preceding, is merely a list of numerical accounts, differing only in subject; which, in this instance, relates to allowances made from revenue proceeds to the *Saiva* fane at *Calahastri*; a place of considerable repute about 40 miles N. of Madras. The paper is in tolerable preservation, the ink good: the document will last several years.

Manuscript book, No 52.—Countermark 742.

It contains a journal of *Mallaiya*, from January to December 1814, in his journey through the Ganjam district; is written in Telugu; and is in tolerably good order, though touched here and there by insects.

Manuscript book, No 53.—Countermark 743.

A continuance of the same person's journal, in the same neighbourhood, for the year 1815. It is a little more injured by insects, than the foregoing; but perfectly legible throughout. Neither of these two books require any further observation.

C. MAHRATTI.

Manuscript book, No. 61.—Countermark 858.

Ancient record of *Nandivaram*, containing an account of *Nandan Chacraverti*, and of the thirteen tribes of *Nandivani Brahmans*.

To the north of the *Vindhya* mountains is the *Ariya bhumi*, or sacred land: in it are the Ganges, the Jumna, and other rivers; it was the residence of *Brahma*. The *Brahmans* came from his face. To the

south of the *Vindhya* mountains is the *Dandacáranya*, in which *rácshas* and others, resided. As the *Dandacáranya* was vicious (*pára bhú* opposed to *punya-bhúmi* before specified), so it was very lofty, or el vated. The *Vindhya-asura*, by severe penance, had acquired gre power, so as to trouble gods and men: and the *Brahmans* co plained of the interruption of their daily sacrificial ceremonies, *Agastya*, who carried their complaints to the presence of *Brahm* further representing that since there were no *Brahmans* in the *Da dacáranya* it would be expedient to create more of them, and loca them in that land. In consequence of this request, *Brahma* created th following classes of *Brahmans*. 1 *Andhra*, 2 *Mahrashtra*, 3 *Drávid* 4 *Carnata*, 5 *Gujra*; these forming the *pancha Dravida* (or southern class) were directed to go with *Agastya*, and remain in the strange land while the 1 *Mánava*, 2 *Cúbjaya*, 3 *Canójja*, 4 *Ragada*, 5 *Gauda* forming the *pancha Gauda* (or northern class) were to go with *Agastya*, but to return. *Agastya*, accompanied by the *Brahmans*, proceeded to the *Vindhya* mountain, where the *Vindhya asura*, with his disciples came to pay him respects. *Agastya* told him that he himself was going to the south on pilgrimage; and directed him (the *asura*) to stay in this place, with his people. *Agastya* then, holding his water vessel in one hand, struck the mountain with his pilgrim's staff held in the other hand, and by doing so levelled it. He then directed the northern class of *Brahmans* to return: and, taking the southern class with him, he proceeded to the south. From that time the *Dandacaranya* ceased to be the abode of *Racshasas*. The five divisions of the southern class of *Brahmans* gradually filled the southern countries, and many towns were built therein; while the northern class of *Brahmans* retained their possessions in the north.

* * * * *

(In this place three leaves are cut out from the book).

In Cali yuga 2604 *Nandana Chacravarti* reigned over a vast extent of country, in a town called *Vallabhar*. One day a religious person from the company of *Agastya*, came to that town: and, in consequence of civilities received from the king, taught him a *mantra* (or charm) by the use of which he possessed the power of proceeding whithersoever he wished in a short space of time. Possessed of this power he daily visited *Gaya* (the celebrated place of pilgrimage): and his wife, after some time, also accompanied him. Receiving some civilities from a *Brahman*, at a place where they halted by the way, he made the *Brahman* a magnificent present, and encouraged him to expect more, should the said *Brahman* visit the king's territory. The *Brahman*, encouraged by the promise, engaged five hundred other householder-

Brahmans to accompany him; and, with them, proceeded to the presence of the monarch, claiming a performance of the promise; which the king was disposed to refuse; but on the *Brahman* bringing the *Swami* (*Siva*) and *Devi* (*Parvati*) as witnesses, the king joyfully fulfilled his engagement, by giving a large town, in free tenure, to the *Brahman* and his associates. As the *Brahman* considered the favour of *Devi* to be the cause of this splendid acquisition, he built a fane, with the usual accompaniments to her honour, and, for her worship. While the *Vedas*, and other books, were being read in that *agraharam*, as usual, a young *Brahmachari* went from it, and asked from "the *Rayalu*" a marriage-present. The king told those around him to examine, and report, on the circumstance; and these, stating that the residents in that *agraharam* were all stupid people, recommended a public examination of the young man's learning. In consequence he performed penance to *Devi*, who satisfied therewith, directed him to go to the examination without fear. He did so; and having passed it, received from the monarch the present which he had sought.

(Here the book ends; apparently without a proper close. It is in tolerable good order; and does not call for immediate restoration).

Remark. By means of this book I have been enabled to understand the *pauranical* fable of *Agastya* having "humbled the pride of the *Vindhya* mountain." It is nothing more, nor less, than a symbolical statement of the first immigration of the *Dravida Brahmans* into the Peninsula, from the north; where they had earlier obtained a footing. Once understood the symbol is easy and natural. It is a subject of frequent allusion, in various *Hindu* compositions. Originally the *Brahmans* were most certainly foreigners to the Peninsula. To know that, is one important step in tracing their remoter origin.

The cutting out of three leaves, containing an account of "the obscure *Nandi-varam* dynasty" is a fault attaching somewhere; and it greatly deducts from the value of this manuscript.

Manuscript book, No. 20.—Countermark 932.

Section 1. Account (or local legend) of the fane of *Sri-kétha tanda* at *Pandarpur*.

Reference to the fault committed by *Chandra* (according to the *Puranas*); in consequence of which his preceptor denounced on him a punishment of loss; and upon *Chandra*, enquiring when the fault would be

expiated, his preceptor gave him a staff (*Kéthatanda*) with directions to dip it in the *tirt'has*, or sacred pools, which he might visit in his pilgrimage; and in whichsoever it should remain, so as not to be capable of being drawn out again, in that pool, by means of bathing, the fault would be removed. According to these instructions, *Chandra* acted; and on dipping his staff in the pool at *Válimarjuna*, in the *Dandacaranya*, it remained immoveable; and he was released from his spell-bound situation. The writer of the legend refused to call the pool the *Chandra tirt'ha*, but named it *Kéthatanda tirt'ha*; and sung its praises in the twelfth *adhyaya* or section, of the local *purana*. At that time there was a small village near the spot: in which a *Brahman* named *Pundarica* had built a small hut of dry-grass and reeds; and lived therein, with his relatives and family. As many people passed by, going on pilgrimage to the Ganges, he became affected with a desire to do so too; and proceeded from home, for that purpose. He came as far as a place called *Chittra cúdam*, where he lodged in the house of a *Brahman*; and asking him how far it was to the Ganges, the latter replied he did not know. In the morning the Ganges, Jumna, and *Sarasrati*, in the shape of three females, came and performed all needful household work for the *Brahman* host; and, learning from the pilgrim his purpose, told him that they came hither every day. (A mere allegory to imply the use of water in household affairs). The pilgrim-*Brahman* now judged it his best course to return home, and provide for his aged father and mother. On returning, he found them fainting for want of nourishment; but they revived on his return. While engaged in supporting them, *Nareda*, unknown and unobserved by the *Brahman*, came and saw his filial piety, which he reported to *Crishna*, then residing in *Dwaraca-puram*, who was so much struck with it, that he went himself to see it. Soon after he had witnessed the *Brahman's* filial care, the parents of the latter died; and then *Crishna* identified the body of the *Brahman* with himself (i. e. the *Brahman* died). In consequence of *Crishna's* absence his wife *Rukmeni* sought him in many places; and at length found him at this one. Fanes, shrines, &c. connected with them having been built, *Crishna* then took leave of absence; saying he was going away to perform the *Varáhavataram*, and in consequence of his leaving the place for that purpose, it became termed both *Panri-nat'ha*, and *Pundiri nat'ha* (the latter apparently indicating the *Brahman's* name, and *Panri* meaning, in the common dialects of India, "*a pig*;" *Panri-nat'ha*, being equivalent to *Varaha-swami*).

A Nizam made great benefactions to the fane; and, at a later period when the country had come under Mahomedan rule, the revenues of the fane were assumed by them, and required to be paid into their

treasury. One of the guardians of the fane, having neglected to do so, was followed by the Mahomedans, seized in the fane, and imprisoned. The god offended at this ill treatment of his votary, withheld rain for twenty-four years from the country of the Moghuls: in consequence of which visitation they gave a jaghire for the purpose of providing the customary articles for its service; and then the god sent rain in abundance. *Sivaji*, and other Mahratta rulers, made large donations in land for the benefit of the fane, which thus became very prosperous.

These particulars concerning *Pundri-púr* were written, to the best of their knowledge and information, by *Malla-hara Bhatt*, and *Lacshmana Bhatt*, at the desire of Colonel Mackenzie, in May 1807.

Remark. This paper is curious, chiefly in a mythological point of view; but it indicates a low standard of intellectual attainment. The indirect contempt of pilgrimage to the Ganges, and the preference given to domestic piety, are however observable. The anachronism and contradiction of making *Crishna*, the so-termed eighth *avatara* of *Vishnu*, go away in order to become the fourth, as *Varaha swami* or *Panrinal'ha*, is of a different and much inferior kind.

Note.—The document is written on stout Europe paper, in unfading ink: and being also untouched by insects its restoration is not required.

Section 2. Statistical account of *Ahmednagar*.

Commodities imported and exported, periods of cultivation, and of rain—times of harvest—productions of the soil: these are minutely specified, as far as the document proceeds.

Remark. The English heading of the section also promises an account of beasts and birds; but the document in the book is not complete; and how many leaves, at the end, are wanting cannot be ascertained. It is written on very thin country paper, with indelible ink; but has been severely injured by insects. As however the subject matter is not of importance; and as the document is not complete; its restoration has not been thought needful.

Section 3. Account of *Comaradee-Shah* inhabitant of *Wastarra* 1805.

Such is the heading of the paper itself, which by the native writer of the table of contents, has been made—"Account of Camaraully Sahan of Hindoostan."

The real contents of the paper are a genealogical notice of the Ajmeer-ruler, with his pedigree, from an early period.

NOTE.—One part of the document is complete: another one follows, on the same subject, having three leaves at the beginning but wanting the remainder. The former document, written on inferior country paper, and much damaged by insects, I have had re-copied; since its details, such as they are, assume the shape of local history: the other fragment does not claim the same attention.

Section 4. Account of *Gujirat*, and its *rajas*.

This paper was restored in the 3d volume, and abstracted, in my third Report; which may be consulted.

Section 5. Account of *Vicrama-raja* of *Uchchani*, or Ougein.

A mythological tale. *Parcati* is represented as enquiring from *Siva* an account of the manner in which *Vicrama* acquired the throne of *Indra*. *Siva* states that an inhabitant of *Indra's* world having offended his chief was sentenced to come to earth, in asinine form (symbolical) in which form the *Gandharra* married the daughter of the king of Ougein, and became father of *Vicrama*, and his brother *Bhirti*. It narrates the visit of *Vicrama* to *Indra* to adjust a dispute there: for the doing of which he received from *Indra* a jewelled throne, which he brought down to earth (symbolical). After the death of *Vicrama* his conqueror *Salivahana*, attempted to ascend his throne: but was prevented by the statues which supported the throne acquiring the power of speech, and narrating actions of *Vicrama*, which shamed his successor, and prevented him from taking his seat there.

REMARK. This is a Mahratta version of the popular tale found, under variations, in all the vernacular languages of India. The acquisition of *Indra's* throne is a mere allegory to imply the possession of great prosperity. The parentage of *Vicrama* is variously told: in this tale it is put into as degrading a form as possible: but still under an enigma. In other versions of the tale, *Bhirtiraja* is represented as succeeding *Vicrama*, and shaking out of the idea of sitting on that prince's throne. Here the name given is that of *Salivahana*: concerning whom other versions of the tale offer very opposed accounts. The probability is that *Salivahana* and *Bhirtiraja* are only different names of the same

individual: this conjecture was originated by documents heretofore examined, and reported on, and may yet be confirmed to certainty. Both (if distinct persons) were of another religious system, with reference to Hinduism proper; probably of the *Jaina* persuasion; and hence much of the mystification of *Hindu* writings concerning them. The not sitting on *Vicrama's* throne is an allegory to designate building and ruling in another town than Ougein: which fact, together with a coincident change of dynasty, has been historically ascertained in the course of the preceding researches.

Note.—This document is damaged by insects; and the series of tales is not complete. Being so very common and popular a tale, many versions of which are in the collection; it has not been judged needful to have this paper restored.

Manuscript book, No. 10.—Countermark 922.

Account of Enams and Jaghires granted to the Silladars of the Mahratta army in lieu of payment for fusly year 1204 (A. D. 1795-6).

The covers of this book are much damaged, but the paper inside very slightly so, by insects. The writing is in Persian ink, and indelible. There is however very little writing on each page; and the nature of the contents, as above indicated, is such as not to claim any further notice.

Manuscript book, No. 16—Countermark 923.

"Estimate of the Aurungabad Soubah, with an account of its purgunnahs, circars, mahls, villages, revenues, &c., in the Deckhan."

This is a large book in good preservation, written on French paper, which, as appears from various specimens, insects do not seem to touch, or but very slightly. The contents might have been written in a book one third of the size of this, if filled. In this book there is merely a column running down one side of each page, which contains names and numbers. It is quite irrelevant to the leading object of my enquiries: though in itself a statistical document of some value.

Mahratta Bakheer, a roll of country paper, No. 29.

Fable of *Surpanac'ha* "a giantess."

This is a tale formed on an episode in the *Ramayana*. It is much injured by insects, and could not be successfully restored; even if it were worth the pains, which perhaps it is not.

Mahratta Bakheer, No. 31.

Account of the marriage of *Rucmeni*.

This is a larger roll of similar material, in better preservation but not complete. *Rucmeni* was a princess carried off by *Crishna*; and afterwards married to him; the tale is told in the *Bhàgavata*, in the supplementary portion, and needs no further notice here.

Mahratta Bakheer, No. 32.

Another copy of the same tale; also incomplete, and in not so good preservation.

Mahratta Bakheer, No. 33.

Account of *Sudhauma*, a poor friend of *Crishna*, enriched by visiting him.

A roll apparently complete, but damaged. It is not of a kind claiming restoration; being a mere tale or romance.

Mahratta Bakheer, a roll of country paper, No. 27.

It is entitled in an English heading—"Modes of discourse between *Cali* and *Paricshit maha raja*:" which would erroneously lead to suppose *Cáli*, or *Durga*, to be meant.

The title in the Mahratta is—A detail of the rulers in the *Carnatacadesam*, from the earliest times.

The following is an abstract of the contents.

Mana Paricshitu of the *Pándava*-race ruled down to the year 46 of the *Cali-yuga*. While so ruling, a cow, in a certain forest, was weeping on account of having three of its legs broken. A *Kirata* man (wild savage) going up to the cow, and considering that its three legs had been broken in the three preceding ages, thought it right to break the remaining leg

in the present age (or *Cali yuga*). The above king, then doing penance in the forest, saw the *Kiratan* breaking the cow's leg, and had him put into prison. He said to the king "since I am come by divine appointment why do you molest me?" The king enquiring who he was, he replied "I am *Cali* (or a personification of the *Cali-yuga*). The king said "while I am alive I allow you to do nothing." *Cali* then requested a place wherein to remain, and the king said, go dwell with * *Himsa* † *Asatyam*, ‡ *Dherma-virodha* and § *Visvásapátaca* While the king lived *Cali* gained no entrance, or ascendancy. The king had four sons, *Janamejaya*, *Sruthusena*, *Bhimasena*, *Ugasena*, who, according to this manuscript, all exercised sovereign power alternately.

Details of their rule are given, and to the second *Bhima sena* is ascribed the killing of the *racshasa*, *Jarasandha* (*Jarasandha* of the race of *Sudherma* is otherwise stated to have been killed by *Crishna*). Twenty descendants of *Bhima-sena* are enumerated, filling a space of one thousand years; they all bore the epithet of *Brahma-hatti*, from the above crime. (Possibly the writer being a devotee of *Crishna*, may have wished to shift the guilt. Moreover the names appear to be given at random, several of them belonging to a later period, and some even subsequent to *Chandragupta*). The minister of *Ribanjaya* named Munica (by *Sir* W. Jones, or by a misprint, *Sunaca*) killed his master, and placed his own son *Prudyota* on the throne. (This event belongs to the *Mágadha* kingdom). Five successions of this dynasty occurred. In a metaphorical manner *Nanda* is said to have had no child; and his wife, in consequence, threw herself into the *Srarna-nadi* (or golden river), and by reason of doing so produced eight sons. (We know otherwise somewhat of the deposition of *Nanda*, by his minister, leading to the accession of *Chandragupta*, and by the way we may gather from the MS. in hand a useful hint as to the mode in which metaphor and allegory are made to cloud either ignorance, or the truth, as may suit the writer's convenience or caprice. To write the simple truth in simple language, does not by any means appear to have been at any time the *Hindu*-method of composition). The said eight sons, ruled during 137 years. Afterwards a female named *Sada Vrihadra* reigned, and was killed by her minister named *Chacrati*, who placed his son *Sruga* on the throne, which he held for 45 years. (This must designate the *Sunga dynasty*). The minister of *Sruga* named *Canna*, who

* Slaughter, violence, malice. † Want of truth or integrity.

‡ Opposition to equity and mercy.

§ Falling from trust or confidence; the sin of treachery.—All the terms are Sanscrit.

killed his master, and reigned in his stead, was killed in turn by *amas* (otherwise *Susarman*) who ruled 456 years (designating hi his whole dynasty, otherwise stated to have consisted of 21 king servant killed him (his last descendant) and ruled the kingdom, a him is given a period of 334 years. In his time (or that of his dy the kingdom was reduced to great distress. About that time fo females of the four colours (castes) came to the *Triveni* (or conjunc the Ganges, Jumna,* and Sarsoostee rivers) at *Prayaga*, o: Allahabad. while bathing as an act of devotion, each one had a secret wish was sought to be accomplished. The wish of one of them was th might have a son who should be emperor of the world. At the time a poor *Brahman* formed the wish, while bathing and meditati *Pranava* (or sacred name), that the said woman might be his wife. wish was accomplished; and their son was born at *Uchchini* (O being the famous *Vicramaditya*, who married the aforesaid four fe and ruled 2000 years. (Here again we have the *Hindu* mystic or matical mode of writing; it seems to denote, what is more directly in other books, that *Vicrama* was the son of a *Brahman*, by a wo inferior tribe, the daughter of the king of Ougein. The marri *Vicrama* to the four females, being disentangled from the possibly tional absurdity, means that he married wives of the four tribes). quently *Salivahana* fought with, and killed *Vicramaditya*. *Sali* ruled, on the north side of the *Narmati* (or Nerbudda) and had named *Mani-vahana*, and the son of the latter was *Avad'harina*: others of the race ruled on the southern side of the Nerbudda. A time a Rajpoot named *Gunt'hivi pati* ruled on the other side of th river, and the Mussulmans began there by degrees to acquire power

Subsequently *Bhoja raja* ruled in a large town (*nagara*) named *nagara* (in a Telugu account by *Ravipati*, the name is written *Dar* —The names of eight of his decendants are given as follows:—

1. Nanda-rayalu 5 years
2. Uchita-raja 5 years
3. Dor-rayalu 3 years
4. Kerula rayalu 4 years
5. Malata rayalu 9 years.
6. Varada rayalu 6 years.
7. Vishnu palacu 7 years.
8. Tiruvapi rayalu 8 years.

These ruled over the whole of the southern kingdom; and after t was divided into two parts. In the *Purva Bhaga* (or northern part†)

* *Ganga, Yamuna, Saraswati.*

† Any mention of the southern division does not appear.

Pratapa maha deo ruled over a country called *Ada malun.* The Mahomedan ruler at Delhi, acted perfidiously with the son of *Pratapa,* and took possession of the country. Some descendants of *Bhoja-raja* ruled in the country to the west, as follows:—

Pauna màli rayalu	1 year	Vil parti rayalu	15 years
Narasimha rayalu	3 years	Krivégal	
Podhi rayalu	5 years	Paratu nàma chalu rayalu	6 years
Hari-hara raye	5 years	Trimisha rayalu	8 years
Ana purna raye	9 years	Chera rayalu	10 years
Yelagevi raye	11 years	Vishnu rayalu	12 years
Namivise raye	13 years	Alata giri rayalu	14 years
Chàulata raye	15 years		

in all fifteen reigns: they ruled 138 years in the town called *Baganagara.*

Subsequently some persons descendants of *Bhoja raja,* such as *Nandi rayalu* and others, ruled as follows:—

Nanda rayen,		Kanda rayal	6 years
Rama rayen,	11 years	Sauma rayal	26 years
Vira rayalu,	3 years	Kanda lada rayal	4 years
Rama rayalu,	5 years	Irávata rayal	7 years
Cutta-nadi rayen	8 years	Sindhi d'hana rayal	
Chaya muttu rayen	10 years	Vira vasata rayal	12 years
Chanda rayen	13 years	Búka rayal.	14 years.

In all fourteen persons, who ruled in *Dara nagara,* but at the same time suffering from insufficient means and privations. At length many other persons took away different portions of their kingdom. The violent partition occurred in Sal. Sac. 987. A. D. 1065.

Afterwards one named *Vindhya ravu* performed a penance on the hill of *Sri Sailam* to *Devi* in order to obtain wealth; whereupon the said goddess appeared to him, and told him his wishes could not be accomplished in the present life; but would be granted in a future birth. He increased the severity of his penance, when *Devi* again appeared; and gave a small district around the site of *Vijayanagaram.* The names of his posterity (being the *Rayer* dynasty) are given as follows:

Deva rayal	1 year	Gopa rayal	4 years
Hari hara rayal	3 years	Chokanda rayal	
Buka rayal	5 years	Hatti-rayal	6 years
Képa rayal	7 years	Chaimutu rayal	8 years
Cumal keta rayal	9 years	Kumbalata rayal	10 years

Being in all ten rulers; the termination of their dynasty was in Sal. Sac. 1350 (A. D. 1428). They ruled in all 350 years.

Afterwards *Vira Baktala raye* was seated on the throne at *Vijayanagaram*, in Sal. Sac. 1391. Subsequent to him the country came under the rule of the Mahomedans, and other various persons. Here the manuscript refers to a former communication, and adds that the account was drawn up in compliance with the wishes of MajorMackenzie; but it has no date, and does not give the name of its author.

NOTE.—This document being a mere roll of country paper, already partially damaged by insects,and liable to early and rapid destruction was restored, on ascertaining the nature of its contents. The absurd English heading could have induced no one to suppose those contents to be of any value. As the case now is, the question is as to authenticity. Some matters at the outset throw a doubt upon the subject. We have accounts of the *Mágadha*, and subsequent, dynasties, in which there are minor differences from this; still the main outlines are preserved, and are in both the same. The list of kings of *Vijayanagaram*,a few names being excepted, differs from the more usual lists, and the names are fewer in number. These considerations are stated because of the very great importance—if authentic—of the middle portion of this manuscript. Of that portion, from the mention of *Salivahana*,down to the violent partition of the *Dara-nagara* country, the account herein given is a translation. Should this portion be authentic, and be proved to be such by other documents, then, so far as my knowledge extends,a chasm in a part of the past history of this country will be in some measure filled up. But I hesitate as to resting more weight of confidence on the document; previous to further confirmation of its statements. The Mahratta language is calculated from the locality of its usage to give more information on that period, and concerning that neighbourhood, than any other; the Gujeratti, or Hala Canada, perhaps being alone excepted.

Manuscript book, No. 10.—Countermark 876.

Section 1. The *Sthala-puranam* or local legend of *Sangama-Cshetram*, at or near *Chunchuna* in the division of *Yeli* in Mysore.

In ancient times a *rishi* named *Trinabindhya* was doing penance, when *Vishnu* appeared, and told him he could not yet obtain beatification; but that when he *(Vishnu)* came hither as *Rama* then that gift should be bestowed. About the same time a *Kirata-man* (or savage) was labouring to get wealth, when the *rishi* advised him to cultivate the *tulsi* plant, that when *Rama* came it might be used in his service. The *rishi*, and savage, both received gifts from *Rama*. The *rishi* obtained leave to remain at this place, and to build a shrine, with an image of *Rama*, which he accomplished.

A *Pandiya* king having greatly troubled the "divine *Brahmans*," and being greatly afflicted in consequence, travelled to different places on pilgrimage, to get rid of his visitation; and at this place the god met him in the form of an old man, and directed him to build a fane, which he did. This fane having gone to decay was repaired by *Hari-hara-rayer*.

Nareda having visited many places went to *Cailasa*, and there enquired of *Siva*, an account of their origin. Some *Pauraunic* references are introduced, as if stated by *Siva*. There would seem to be a reference to a *Saiva* fane at this place; but the reference is not clear, owing probably to the legend not being complete.

Note.—Though the paper on which this section is written is damaged, yet it does not seem to be worth restoration.

Section 2. Account of *Periapatnam*.

Such is the title in the English heading of the section, and a similar one is written at the commencement of the manuscript. The cause of such a title seems to have originated in the manuscript having been copied (as stated at the end in the Mahratta subscription) from earlier documents by *Narrayana Bhatt*, and *Capavi-Bhatt*, living in *Periapatnam*, and supplied through their instrumentality to the collection.

The contents of the document trace the genealogy of *Raja-Crishna-Udiyer* of Mysore, up through the *Rayer* dynasty, and some intervening races, to *Bhoja-raja* and preceding kings as high as the era of *Yudishst'hira*. But in its order it follows the descending series.

It commences with the mission of *Agastya* from *Cailasa*, his reducing the *Vindhya* mountain, with an obscure reference to the king of the country southward, whom he rendered harmless; * and his going on pilgrimage towards the south. The subject is then confined to the *Cali-yuga*. The era of *Yudishst'hir*, with inclusive reigns, is given. The era

* Compare with abstract of No. 27 in the Mahratta portion of my 3d Report.

of *Vicramaditya*, and of *Salivahana*, down through *Bhoja-raja*, the *Chalukyas*, the rulers of *Deva-giri*, the *Rayer* dynasty, to the royal line of the native *Hindu* sovereigns of Mysore.

NOTE.—The chronicle is but brief: though relating to a great extent of time. Being damaged, through damp and insects, I have had it restored; since it is a document of some considerable importance; and as such it ought to be fully translated.

Section 3. Account of the *Gorucknath* religion in the Mysore country.

This paper offers nothing, beyond some local regulations for different classes of people, in visiting the shrine of a local *numen*, at a place termed (by accommodation) *Curucshetram* in Mysore. It is not in very good order; but does not seem to be worth restoration.

Section 4. Account of the *Cápála* religion in Mysore.

This paper relates to the shrine of a goddess named *Copala-matri*, in the same neighbourhood, being a local form of *Devi*, or *Durga*; and is chiefly occupied with panegyric on the said image. It is of no valuable consequence.

Section 5. Account of the fortress of *Balala-rayadurga*, at *Coppakobhalli* in Mysore.

This is a short account of *Roydroog* (or Royacottah as we now commonly term it). Its origin, in this paper, is ascribed to one named *Bakhtala-raya*, under the following circumstances. A *Jaina* ascetic greatly troubled the people of the neighbourhood: and the said *Bakhta'a*, professing to become his disciple, did homage at a shrine of *Rama*, and by virtue of that penance acquired the power of killing the ascetic; and, for so doing, the people gave him rewards. With the measure of wealth so acquired, he gathered people around him, and plundered: by the accession of means so acquired, he further strengthened himself; conquered an extensive district: and first built the fortress of *Rayadurga*. He was named *Deva-ri'a-athi raya*: and he had three sons named *Bakhtala-raya*, *Vishnu-verdhana*, and *Deva-rina-raya*, of whom the first

was a *Saiva*, and the second a *Vaishnava*. At an early period the place seems to have been subjugated by the Mahomedans; and some mention occurs of changes under their rule.

Note.—This paper appears to be an imperfect account of the origin of the *Oyisala* dynasty, which ruled at *Hobhalli*; and was at one time of considerable consequence. The paper is brief; complete as far as it goes; and being somewhat damaged, has been restored, for its better preservation.

Section 6. Account of *Chandragupta-cshetram*, in the province of *Bidanur*.

A legendary reference to the sacrifice by *Dacsha*; the self immolation of his daughter: the anger of *Siva*, her husband; and the formation of *Vira-bhadra* in consequence. The paper is incomplete, and seemingly worthless.

Section 7. Legend, or *St'hala-purana* of *Killadi*.

This is a mere local legend; apparently of little or no consequence.

Section 8. Account of *Halla-bede* in *Bidanur*.

This paper entitled as above, in the English heading, is another, and fuller, account of the *Balala* rulers at *Rayadurga*. The like account, as in a former paper, is given of the killing of a *Muni*, herein termed a *Saiva*. The account of the posterity of the founder of the dynasty is more full, than in that paper (sec. 5), and it is herein stated that as one part of that posterity was of the *Saiva*, and the other part of the *Vaishnava* persuasion, they fought with each other. One of the race was cured of leprosy by building a great many *Saiva* fanes. Another of the race, marrying a Mahomedan woman, was driven away by his father. He went to the Padshah, who came and took Roydroog; and, causing the before expatriated son, to be crowned at *Vijayanagaram*, he placed him as feudal chief at Roydroog. A list of his descendants, and details of their wars, with other proceedings, follow.

NOTE.—This paper being much damaged by insects, and damp, has been restored; and it merits full translation, as a valuable document, relative to the *Oyisala* kings.

Section 9. Account of *Copam* in *Bidanur.*

A reference to the anger of *Siva* in consequence of the self immolation of his wife, at the sacrifice of *Dacsha;* the place receiving its name from that circumstance, as if it had occurred there. A *Saiva* named *Cópa*, built there a hut; and afterwards *Jina Danda-raja* made it a metropolis, building a fort there. Having no offspring he gave it to a *Brahman. Siva-danda-nayak*, afterwards ruled. A few other names are mentioned; who, by their cognomens, would seem to have been *Brahmans.*

NOTE.—The document is much damaged; and, as it may have some historical value, it has been restored.

Section 10. Account of the *Cáveri*, in the *Cannaba* district.

The account of the *Caveri* is only promised, but not given. It is little better than the legend of a fane; chiefly having reference to a leprous king, who, it may be anticipated, was to lose his disease by bathing in the *Caveri;* but the document is unfinished, and appears to be of no importance.

Mahratta Bakheer, No. 23, a roll of paper.

This document is incomplete, both at the beginning, and the end. From the remaining middle portion of the fragment it is found to relate to revenue, and other, details of the Peishwah. His treasurer had made false accounts; and, these being detected, he was summoned to follow the Peishwah to a place whither the latter annually went on pilgrimage. The treasurer did not do so; and forcible measures were resorted to, in order to compel his attendance. There are further some details of marches, and mention of some towns, or places, taken.

The document is damaged by insects and damp; but as being a mere fragment, and without matter of permanent interest, its restoration has not been deemed requisite.

Manuscript book, No. 5—Countermark 917.

CONTENTS. A short account of the revenues of the fifteen Soubahs in Hindustan, under the government of Acbar, Padshah of Delhi.

This book has but a slender proportion of matter compared with its size. It is written on French paper, and is in good preservation. The subject of course is incapable of being abstracted; and the contents in themselves are brief. As a statistical document it can at any time be referred to, if requisite.

Mahratta Bakheer, No. 28.

A large roll of paper "Genealogical account of *Malogi* and *Vitogi Bhosala*, princes of the Mahratta dominions."

This document has the beginning; but is not complete at the end. As far as it proceeds it contains a somewhat full and curious detail of the origin of the Mahratta chiefs from *Babaji Bhosala;* whose two sons *Vitoji*, and *Malogi*, were soldiers of fortune. Their adventures and services are mentioned, especially under the Delhi Padshah; until, by an adroit use of circumstances, their descendants became princes.

The important part acted by the Mahrattas might perhaps render the genealogical detail worth full translation. The document is in tolerably good preservation, with a slight exception at the beginning; and its restoration does not seem to be urgent; though it may possibly hereafter claim attention.

Mahratta Bakheer, No. 8—Countermark 920.

A roll of country paper, entitled "Genealogical account of *Nanah Saheb* of the Peishwas."

This document contains a rather full historical detail of the branch of the Mahrattas, established at Poonah. At the beginning *Appaji* Saheb is represented as enquiring into the past history of his race; which is narrated to him by the author. At the close, a copy of this document is said to have made, by special request, for Major Mackenzie. The roll of paper is a large one; and it is surprising that the matter should have been written on such a fragile material. It is damaged in various places, and words are eaten away by insects. The matter however is for the greater part recoverable, and the document is complete. For these rea-

sons, and especially from viewing the details to be of considerable consequence, the document has been restored; and I am of opinion that it merits full translation.

Manuscript book, No. 19—Countermark 885.

Account of Hyder-Nayak.

This is a small book, and contains chiefly statistical details. It gives a statement of the towns, or places, conquered by Hyder Ali; amounting to one hundred and twelve. There is a detail of the strength of his army, with the number of his cannon and muskets. The names of his ministers, and officers holding official or revenue charges, are given, and a statement of the districts, or towns, wherein they exercised the various employments. It is dated in April of the *Crodhana*-cycle-year; but without a more definite date.

The book is somewhat injured by damp, and a very little by insects; but the writing throughout is perfectly legible, and restoration does not seem to be required.

Manuscript book, No. 12—Countermark 878.

Section 1—Memoir of Hyder Nayak.

This paper contains a somewhat lengthened account of the life and actions of Hyder Ali; but it is not complete, breaking off abruptly.

His origin—family connections—rise from obscurity, in being made a commander of 2,000 cavalry—are mentioned; and the various steps are then detailed by which he acquired additional power, and set aside his former master; the wars in which he became engaged are specified. The abrupt breaking off is at the period of an interference with the Coimbatore province; at which time he was sixty years of age.

It does not seem necessary to make a minute abstract, seeing that the general events of Hyder's life are tolerably well known. A translation in full might nevertheless be curious. The document is written on French paper, which insects do not touch, and the ink is permanent; consequently nothing further is needful to be done with it for the present.

Section 2.—Account of *Siva Samudram*. This is a legend of a district, with its fanes, not very far distant from Seringapatam.

The origin is dated beyond the era of *Rama-Chandra* who, it seems, visited the spot, when dwelling in the wilderness. There does not appear to be in it any thing of importance. The papers concerning Mysore seem to agree in stating, that *Rama* went by way of the Mysore country to *Lanca*.

The document is in sufficiently good preservation ; but it is not complete, and breaks off abruptly. A pencilled memorandum by Colonel Mackenzie dates its receipt by him in 1800.

Section 3.—Memoir of Tippu Sultan.

This paper commences with a reference to the siege of Trichinopoly. The presence of *Nanda raja* of Mysore—the capture of a province—the power acquired by Hyder—the intention of the latter to capture the town of Madras—his negociation with the Mahrattas of the Peishwa to keep them off—and the pecuniary terms on which they consented to be bought off—are narrated. The document is then somewhat full in its details of Tippu's operations; chiefly against the English. His conduct at Vellore—his ill-treatment of his prisoners—alliance with the French—are stated. Affairs at Trichinopoly are detailed. The document breaks off abruptly, without a proper close.

Note.—It is written with permanent ink on French paper, is quite uninjured, and can be easily made the subject of reference. By consequence it claims from me no further attention. It is endorsed in Colonel Mackenzie's hand-writing—"Life of Tippoo Sultan from Colonel Close, September 7, 1800."

Section 4. Account of Budda Ballapur in Mysore.

This document relates to a district locality, of which the proper name seems to be not Ballapur, but *Bakhta-puri*. In fusly 948 (A. D. 1539-40) three individuals of the *Canchi* district, unable to support the distress (cause not stated, but most probably the *Rayer's* invasion) fled from that country, and went above the *Payinghat*, where they constructed huts to live in. While there some other individuals, subjects of the *Rayer*, returned from a pilgrimage to *Ramiseram*, and lodged with the new settlers. Three boxes came down the river; on opening which they were found to contain images of *Nandi*, *Narayana* and *Gopàl*. The finders made their supplications; and, in the night, a vision appeared

directing them to abandon these huts; pointing them to a place where buried treasure was to be found; and directing them, with it, to build a town and fanes. They followed the directions given; obtained the treasure; and came to an open plain where formerly a *Jangama* shrine had been. Here they determined to remain. They accordingly built a (mud) fort, with a town, and repaired the old *Jangama* shrine. The leader was termed, *Baktipuri*-sultan, who acquired the power of a local chief, and transmitted his authority to his descendants. After some time the place was captured by the Mahomedans: subsequently by the Peishwa's Mahrattas: and still later by the English.

NOTE.—The locality is I believe on the western border of the Mysore country. As a local paper it is of some value. It is in a perfect state of preservation.

Manuscript book, No. 9—Countermark 875.

Section 1. Account of *Asuljah* (Asuphjah) Nizam-ul-moolk, collected in Mysore.

This paper wants eight half sheets at the beginning, and is not complete at the end. It contains a statement of the Nizam's proceedings at Delhi, and in the south: mentioning the places subdued, or brought under him, and paying tribute. There is a full specification of his officers, civil and military, and of the districts controlled by them. Mention is made of Monsr. Bussy, and of the interference of the French in the affairs of that part of the country. A combination of various powers was formed: in which Hyder, the Peishwa, the Guicowar, and others, were concerned: who fought with the Nizam, and took Hyderabad. Some other affairs with Delhi, and wars: in the midst of an account of which the document abruptly breaks off.

NOTE.—It is written on good French paper, with permanent ink; and is in perfect preservation, though incomplete.

Section 2. Some account of *Anagundi*, collected in Mysore.

This paper relates to a period subsequent to the overthrow of the *Rayer's* power. A Mahomedan collected a few people; and pretended that he was authorized from Delhi to assume the feudal principality of

Anagundi, of which the shadow of royalty there, being afraid, bought him off with a sum of money. On a subsequent reference to Delhi, the ruler there disclaimed any knowledge of the transaction, and any intention to disturb, the *Hindu* prince in the possession of his fief. On learning this circumstance, the said *Hindu* ruler became greatly incensed, and, wreaked his vengeance on all whom he could lay hold of, that had been concerned in the plot, and imposition, practised upon him. A list is given of the persons whom he put to death.

Note.—The document is uninjured.

Section 3. Account of *Hastinavati* or Delhi.

This is a brief statement, commencing with the era of the *Cali yuga*, and coming down to the time when the name was changed to Delhi, with the mention of some kings. *Salivahana* and *Bhoja-raja*, are adverted to, as distinct persons; and, after the latter, *Kailasa-raja*, which seems to be a titular name.

Note.—The document does not appear to be of much consequence; and it remains uninjured.

Section 4. Account of the arrival of Tippu Sultan, at *Devanahalli*.

A very short, and unfinished, paper; containing a memorandum of some of Tippu's proceedings; but breaking off abruptly, and of no value.

Section 5. Account of a tobacco contract with Tippu Sultan.

Notice of a farming transaction. *Tippu* leased out lands to cultivators of the tobacco plant, on certain conditions; whereby he obtained a considerable revenue.

Section 6. Some account of the settlement of Tippu Sultan.

According to this document an attempt was made to establish what is now called the *ryotwar* system of cultivation, which failed; so that the system of *mirasidars*, or *zemindars*, was re-established. Some

other mention of revenue transactions; in the investigation of which Tippu was greatly incensed, and hanged two of the principal persons concerned.

Section 7. Account of *Bijnajara* collected in the Mysore country.

The commencement is legendary. A Brahman unable to sustain the pressure of a famine which prevailed, did penance with a view to obtain wealth. The god at first refused his request, but afterwards granted it, when he had no longer any desire for it; so that he bestowed it on a *Cshetriya*, or *Rajputra*, who built a town, and made himself a district chieftain. At a later period transactions in which Mahratta generals were concerned occur: but the narrative breaks off abruptly.

NOTE.—This document is written in pale ink, and is slightly damaged. As there is something of real history contained in it, I have had it recopied.

Manuscript book, No. 22.—Countermark 934.

Section 1. Account of *Calikapuri*, and of *Bhoja raja.*

Reference to the *Pandava* race, down to Sal. Sac. 58, when *Bhoja-raja* ruled. He conquered in the north, and erected a pillar of victory (*jaya stamb'ha*). To the south the *raja* of *Cambhira* averted an invasion by submission. *Bhoja-raja* ruled in *Calikapuri*, and made great addition to its fanes, and other buildings, including seven *Saiva* fanes. He ruled down to Sal. Sac. 124, with great celebrity. Subsequently *Ranga-Yadava rayalu*, with his successors, and the Delhi Padshahs, with their successors, are given in detail. The narrative comes down to the period of a war between the Delhi Padshah, and Hyder Nayak; with the mention of which the document ends.

NOTE.—This manuscript appears to be of considerable value, and meriting full translation. At present the writing is in good preservation. The material written on is country paper, which insects have begun to attack chiefly in the margin. The document will require to be kept in view, and to be looked at occasionally; but its restoration is not at present of urgent necessity.

Section 2. Tale of *Vicrama*, prince of *Uchchini.*

This is one of the popular tales concerning *Vicramaditya.* It is in a rather more deteriorated condition than the preceding section; but there is nothing in the tale to merit the process of restoration.

Manuscript book, No. 36.—Countermark 948.

Contents. Another copy of the 25 tales of the *Vetala.*

With a few slight exceptions at the beginning, and at the end, this book is in tolerably good preservation. It is a version of the tales of *Vicramaditya's* attendant-demon, or *Vetala.* They deserve no serious notice in researches of the present kind, and it is to be regretted, that the commonness and popularity of such kind of tales, have a tendency to detract from the general value, such as it is, of Hindu literature. A vitiated, and morbid, taste can alone be gratified by such kind of productions; and they convey a low estimate of the people among whom they are popular.

Manuscript book, No 5.—Countermark 871.

Section 1. Account of *Muluvacal* in Mysore.

The account was written in May 1837, from the statements made by *Annas* the *Amin*; *Kalla rao* the *Serishtadar*; and others. The statement is wildly legendary. The ancient name of the place was *Mal'hapur.* It was visited by *Rama* and *Sita*; and was chosen as a suitable place for the penance of *Valmica.* In the time of the great war, *Hanumàn* assisted *Arjuna;* and the latter greatly admired the former's bravery. The hill in the vicinity afforded a refuge to the *rishis* during that war. At a later period many fanes were built here, as the spot was esteemed sacred. Its subjection to a native prince is stated; and its subsequent assumption by the Mahomedans. Towards the close of the paper there is a reference to the war against Tippu, conducted by General Harris, Colonel Close, and others; in which war Tippu was slain by a cannon shot, and his country was taken.

Remark. The paper being written down from verbal statements, and being of a legendary character, does not seem to offer much of conse-

quence. It is very legible; and the paper but slightly injured. Hence it is passed by, without any further attention.

Section 2. Account of *Chandradrona* hill, or *Vayvu-parvatam*, in *Bidanur*.

During the residence of *Rama* and *Sita*, in the wilderness, *Hanumàn* went as far as *Nasica* (Nassuck), to see them. After the abduction of *Sita*, the said *Hanumàn* sought every where through the south, in the caves, and hills, in order to find her. Among other places he came to this hill; and gave it a name. During the war, when *Hanumàn* carried a mountain through the air he let fall a portion of it here, which hence became named *Chandra-drona*, after its original name, in its former site. The sound as if of singing is heard within it. It was waste during the *Dwapara-yugan*. At a later period it became a *Jangama* fane. There is some similar legendary matter, about *Crishna* and *Arjuna*.

Another account of the same hill.

The same tale of the falling of a portion of the mountain carried by *Hanumàn*.

NOTE.—The damaged state of this paper would have indicated its restoration, if worth it, which seems not to be the case. As a passing remark, the great influence exercised by the *Ramayana* and *Mahabharata*, may be noted, and must frequently have been observed in foregoing portions of these abstracts. The wildest inventions, when grounded on incidents mentioned in those poems, seem, every where in the south, to be received with implicit credulity. No doubt this hill, termed *Vayavu-parvatam* or "the hill of wind", must have something remarkable about it. I regret the want of local knowledge concerning it, on grounds quite different from this legendary fable.

(*Section* 3. to 6, in the Canarese language; omitted under the head of Mahratta writings).

Section 7. Account of *Shahuni* or *Hossein-pur*.

The original and legendary formation of the place is ascribed to *Shakuni*, a woman of the *Caura* tribe, who provided curds for the five *Pandavas*. At a much later period a chief, named *Vira-bhadra-nayak*, cut down the wood, cleared the ground, and established a colony, building a

fane to *Vira-bhadra*, the titular *numen* of his tribe. Still later the town, and district, came under the government of Tippu; when its name was changed to Hossein-pur.

Note.—The document is in sufficiently good preservation.

Section 8. Account of *Vitala-pur*.

A reference to *Magada-desam*, and the mention of a few names and incidents, when the document abruptly breaks off, without the promised account of *Vitala-pur*, which it may be conjectured, was to arise out of it. That *Magada-desam* (not *Mágadha*) was above the ghauts, in the province now called Bidanur, is a little point of geographical information, helping towards an explanation of the fifty-six countries of the *Hindu-puranas*.

Section 9. Account of *Nanda-ram*, an aged man of the *Rajputra* caste at the village of *Tanchar* in *Bidanur*.

He was originally of *Joudhpur;* his family being gold and silver smiths. He followed the army of a Padshah, as a sutler; supplying pease and wheat, for horses, and men. He afterwards became employed by Hyder Ali, and was sent to Masulipatam. Some mention of Hyder Ali's relations is added.

Note.—It is difficult to say what could have led to suppose a biography of such a person to be of any consequence. It seems to be of no value.

D.—SANSCRIT.

A Palm-leaf Manuscript, without label or number.

This very old, and greatly damaged, MS. on examination was found to be a fragment of a Sanscrit work in the *Grant'ha* character, composed by *Bava Bhupati*, one of the poets of *Bhoja-raja's* court. The leaves are eaten, in many places, by insects, others are lost: two sections, and part of a third, are found. The subject is of no historical consequence; and, as far as can be ascertained, contains merely poetical panegyric, as a sort of epithalamium.

Manuscript book, No. 50.—Countermark 1019.

Detached inscriptions at Conjeveram and *Sri Permatur*, in Sar
Grant'ha character. No. 90. Dated in Sal. Sac. 1436. A long
meration of the titles of *Crishna rayer* of the *Yada vamsa*, with the
tion of some of his ancestors, deduced from the usual lunar-line. 1
panegyric is bestowed on his munificence, to many other fanes;
at the end, it is stated that he erected a magnificient cupola ove
shrine of *Deva-raja*, or *Varada-raja*, at Conjeveram, in which there is
gold employed in the workmanship.

Remark. The cupola was taken down some years since, as I am in
ed, and has not been rebuilt; because of the great expense which
be required.

No. 100. Commemorates the munificence of *Laschmi-Cumara-ach*
in causing a large and magnificient tank, or reservoir, to be excavated
the fane of *Hanumân*. Some panegyrical stanzas are added.

No. 101. Dated in Sal. Sac. 1591. Commemorates an endowment by
Muthaliyar for the purpose of certain chants, and ceremonies, perf
at the first offering, or using, of water from the *tirt'ha* (or pool) i
washing, or bathing, of the image in the fane of *Varada-raja*.

No. 135. Dated in Sal. Sac. 1432. It commemorates the gra
free tenure, of several large, and valuable, villages to the *Saiva* f
Yecambesvara, by *Crishna rayer*.

No. 136. Dated in Sal. Sac. 1536. Commemorates donations
by *Tattâcharyar*, which are specified; but of which the detail, i
place, seems not to be required.

CONCLUSION.

This Section of my general report here finishes. The necessity o
further remark seems to be obviated, by the observations offered, at
step of progress.

Madras, *June*, 30*th* 1838.

II.—*Notes on Ryotwar, or Permanent Annual Money Rents, in South India: and on the duty of Government in Periods of Famine.*—*By* JOHN F. THOMAS, *Esq. of the Madras Civil Service.*

To estimate the effects of a system of fixed annual money rents, in the present state of Southern India, it would appear necessary to keep the following points prominently in view The peculiar circumstances of the agriculture of the country, the character, and present condition of the ryot, or landholder, and the state of society around him—and let us contrast the ryot in these respects, with the occupant of land in countries where annual money rents, as in Europe, have been for a long period the settled usage.

The ryot, or farmer, in the Peninsula of India is placed, we may first observe, from physical causes, in essentially different circumstances from the occupant cultivator in Europe. The intensity of unpropitious seasons in the temperate zone, especially in the case of drought, never being such as in tropical or Indian climates; whilst the variety of soil further secures the European farmer against *a total failure* of his crops. An unusually wet season in Europe causes the light soils to yield abundantly; and the dry year produces heavy crops on the deep land. It never occurs therefore, that the European holder, does not obtain some considerable return of produce from his land in each year; and though this return may frequently be below an average crop, yet the enhancement of price at these periods, consequent upon the great extent of the purchasing population,* at all times compensates him, for deficiency in the quantity of his produce, and his yearly money rent can invariably be paid therefore with little difficulty from the annual out-turn from his land.

But in Southern India, in seasons of drought, instead of any considerable return, there is frequently not a single field in the entire range

* Agricultural, or producing population in England 35 per C.—non agricultural or purchasing 65 per C.—Agricultural or producing population in India 90 per C.—non-agricultural or purchasing 10 per C.—See Babbage and other authors on the statistics of England.

of a ryot's farm, which is not either wholly barren, or very greatly deficient in produce. Often on the larger portion of his land, not an ear of grain is left, and the seed has not been returned to him: and even if some few showers should have fallen, and his well land has yielded a crop, he has still not a fifth or often a tenth of his ordinary crops to reap. No increase of price, it is plain therefore, can avail a ryot ought at these seasons; for he has no produce to bring to market, or but such a fraction beyond the wants of his family, that his entire crop will not give him any thing like the amount of his annual rental. The extreme pressure upon him consequently at these periods, arising out of the *physical* circumstances under which he carries on his occupation, places him in a wholly different position from the landholder in Europe; and in one, I believe, for which no providence, nor industry, can fully prepare him, if his full annual tax, or rent, be required from him, as prescribed by the present system, at a period, when he has lost nearly the whole of the year's outlay upon his land, and has not reaped grain enough either for seed, or to maintain his family through the year.

It is this peculiar feature of South Indian agriculture, resulting from physical causes, an almost entire failure periodically of nearly all return from the land, which constitutes a marked distinction between the circumstances of the Indian, and the European farmer or occupant of land, and which renders *fixed annual* money rents at their present rates, however advantageous in Europe, of doubtful policy in this country. When strictly acted upon for a series of years, it will, I believe, be found, that the heavy demand which this system makes upon the Indian landholder at seasons of extreme difficulty, and of peculiar loss, sweeping away at such times the whole of his little capital, or involving him inextricably in debt, is one of the chief causes of the present general impoverishment of the ryots. It is also to his knowledge of the certain recurrence of the periodical droughts, and their consequences; so fully appreciated by the ryot, but not yet, I am disposed to think, sufficiently considered by his European superior, that we must ascribe it, that he has been generally led to prefer a heavy; and vexatious tax in kind, of even 50 per cent of the *actual* annual produce, varying therefore with the season, to any permanent rent in money, at a lower rate. For he knows, that he is, under that tenure, protected in the season of drought, from a heavy Government demand,

which he has no produce to meet and which must entail upon him ruin.*

It is deserving of remark, that these seasons of very severe drought where the seed is not returned, and which are known by a peculiar term, recur on an average in the southern provinces of the Madras presidency once in seven years. From accounts before me from Coimbatore, and Trichinopoly, five years of this kind are named within the last 33 years.

But it is not only in the want of adaptation to the peculiar physical circumstances of the agriculture of the country, that fixed and invariable annual money rents are open to objection; they appear also unsuited to the present circumstances of the great body of ryots. The mass of the land is held in very small parcels, by proprietors of petty tenements under 30 or 40 rupees. Proprietors of this class can possess little or no capital, and very limited credit, and that only upon ruinous, and usurious terms. How is it possible then, that they should be able to meet all the contingencies, both of price and season, affecting so large a proportion, as the Government share of 33 or 45 per cent of the average annual produce of their land.

* "Their objections (the ryots of Trichinopoly) are stated to have been, that if the land be once assessed at a specific sum in money per cawney, a fall in the price of grain, or an unfavourable crop, will make the payment of the Government dues extremely difficult. Whereas, at present, we suit our consumption to our actual produce; and in the event of a deficient produce, although we cannot consume so much as we should in a favourable year, we have still sufficient to maintain our families unburthened with any payment, unfettered by any penalties. *We preserve our lands*, and if we do not grow rich, at least *we are not utterly ruined*.

"They alone must be the judges, whether it is more beneficial for them to pay a proportion of the produce in kind, or, a fixed sum an equivalent in money."—*Madras, Rev. Sel. vol.* III. p. 519.

"In many cases, too, the objections (of the ryot) to fixed money-payments appear to be well founded. The precariousness of the produce and the poverty of the cultivator, rendering it necessary that the rent should either be paid in a proportion of the crop, or that the ryot should adopt the less advantageous mode, of trusting to an undefined understanding that a part of the stipulated rent will eventually be relinquished".—*Madras, Rev. Sel. vol.* III. p. 158.

"During my late tour through this territory (Dehli, &c.), the dissatisfaction of the zemindars at nukdee or money-settlements was almost universal, the inconvenience to which they have been, in consequence, subjected from bad seasons, being of a species unknown to them formerly".—*Rev. Sel. vol.* III. p. 415.

"The disadvantage immediately resulting from this system, and which constituted the chief difficulty in effecting village rents, was the balance left out-standing at the end of the year, the account of the Circar grain remaining unsold; and the difficulty of converting it into money, so as to realize the revenue within the year. The inhabitants aware of this difficulty, were averse to the responsibility of a money rent, and the actual experience of many years justified their apprehension".—*Rev. Sel. vol.* I. p. 562.

The ryots of Southern India are also, like all individuals of limited means and education, improvident. They are in eight cases out of ten in debt.* It must surely be idle to look to them, for the forethought which shall store up every small gain of a favourable year, to meet an adverse season. This providence can and does exist, only in educated and highly civilized communities, and is the very reverse of the national characteristic of the Indian agriculturists; not one of whom from high to low, scruples to involve himself irretrievably in debt for marriage or funeral ceremonies. A system therefore, which throws upon the Indian cultivator, the whole onus of providing for every emergency, and requires from him the forecast, to meet all the variations in the market, as well as those of the seasons, is manifestly ill adapted to his present character, and condition, and little calculated to enable him to realize property in the soil.

The system is likewise, I conceive, unsuited to the existing state of society in Southern India, of which the preponderance of the agricultural class is a peculiar feature. This feature of Indian society renders the demand of a permanent *annual* money rent, not only highly disadvantageous to the ryot, but, it may even be said, unjust. For the large excess of the agricultural population over all the other classes, of not less than eight to one, necessarily brings an immense surplus of grain into the market in favourable seasons. Prices in consequence fall exceedingly low, there being no foreign vent for grain in Southern India; and the ryot, in lieu of gaining largely, not infrequently receives less money for the whole of his crop brought to market, in productive years, than in an average season, or in one a little below it. He therefore finds more difficulty in paying his money tax at such periods; and he may be now occasionally even a loser, and his gains must at all times be very inconsiderable in abundant and favourable seasons. Whence then in the present state of society is his profit to come from, to meet the loss and deficiences of unproductive years, and of seasons of excessive drought? The rule now in force, of an invariable annual demand in money on an average crop, and at average prices, makes no provision for this peculiar condition of society. It is assumed, in the teeth, I think, of facts, that the profits of favourable seasons, always are, and will be adequate to meet the demand of unfavourable years; and the whole burden of failure in the season, or fall of price,

* "The difficulty lies in the character of the ryots whose improvidence renders them to so great a degree incapable of realising property when the means are put in their power."—*Court of Directors, Rev. Sel.*

"The debts and embarrassments in which the whole of the agricultural population is plunged." Mr. Elphinstone.—*Ind. Sel.* iv. p. 14. 3.

is, under the existing system thrown on the poor occupant of a 30 rupee tenement to his utter ruin. There is also, a further disadvantage to the ryot in money rents, which does not exist under the native practice of a division of crop. Under that system, bad as it is in all other respects, there is this advantage, that the Government dues are only taken, when the ryot is best able to pay them, at the precise moment at which he has gathered in his produce, when it is easy for him to assign to Government its portion, and he has then no subsequent demand to meet. But under ryotwar money rents, the entire crop is left upon the ryot's hands, and all the risk of subsequent fluctuations, falls upon him. The rents in money are also usually exacted with such unsparing and rigorous punctuality, that the great body of the ryots from their want of capital, are practically compelled, in order to pay the Government dues, to bring the whole of their grain to market at a loss within the year. Whereas, had the rents been taken in kind, the Government would have stored a large portion of the year's crop for future consumption, and much would have been kept out of the markets: the share left to the ryots would have been brought consequently to sale gradually, and against it is probable less competition, and to a better market, even allowing for the diminished demand which must result, when the revenues being received in kind, Government payments are also made in grain.

In the foregoing remarks on the circumstances of the south Indian ryot, arising out of the peculiar nature of the agriculture of the country—his own habits and present condition, and the state of society; we have only considered the effect of permanent annual money rents in cases, in which the landholder (the ryot) or the party answerable for the Government tax, and the actual cultivator of the soil, is one and the same. Let us now view the subject where the tenure of land is different, as in provinces like Tanjore, where the land is in the hands of proprietors who do not themselves till it, but enjoy a landlord's rent. Where therefore, property in the soil has not to be created but actually exists. It will then I believe be seen, that the rule, which prescribes an *invariable* annual demand in money, is not merely unsuited to the circumstances of the landholder, but if not modified, absolutely destructive of his well-being and to the existence of all saleable property in the soil.

The gross produce of the wet land in Tanjore irrigated by Government works, is divided upon an average nearly as follows; 50 per cent. the Government tax or assessment, 25 per cent. charges of cultivation or an allowance to the actual cultivator (the occupant *cudi*), 12 per

cent. village cesses; total 87 per cent. leaving about 13 per cent. as the merasidar's, or proprietor's rent. From this, the merasidar supports his family, keeps the minor water-courses in repair, provides advances of seed and stock for the occupant cultivator, and under the new ryotwar system of fixed annual money rents, he takes upon himself the risk of the fluctuations of season, and of price on the Government share. The Government relinquishing to him upon this ground 5, or 8 per cent. of its share, and he is expected for this consideration, to bind himself for an *invariable* annual payment to Government, of 45 or 42 per cent. of an *average* crop, at a fixed price.

The cultivators, or occupant *paracudis*, unable to take any part of this responsibility, continue the ancient usage of a division of the crop. They at all times receive their share of the produce in kind, and at all seasons also, the merasidar has an outlay of 2 or 3 per cent. from his own share, on the water-courses, and in advances of seed, besides his payments in village cesses. His annual liabilities are therefore not less than from 80 to 85 per cent. of an average crop, of which, under ryotwar, 40 to 45 per cent., is further commuted into a certain and invariable annual money payment. If crops are deficient in any season 15 or 20 per cent., he receives little, or nothing. The whole produce is barely sufficient to cover the Government, the *paracudis*, and the village demand. If the returns should be still less, i. e., if there should be even so slight a variation, as 10 per cent. of decrease in price below the standard, combined with 15 per cent. in produce, he is most seriously affected. These minor fluctuations he can stand for a short time, for his land is saleable, and his future returns, as they depend upon the south-west monsoon, sure he can therefore command credit at a moderate rate. But if prices, and produce should in one or two seasons both fall 20 or 25 per cent., a total of 40 or 50 per cent., his final bankruptcy is almost certain, and as seasons of this kind always occur in the course of every eight or ten years, the eventual destruction of property in the soil, under this system at the present rates of assessment, appears inevitable.

The merasidars of Tanjore have seen this, they have in consequence strongly opposed the ryotwar invariable money rents, and have proposed these terms. That when produce is deficient 20 per cent., or upwards, they shall revert in effect to the old usage of an equal division with the Government of the actual crop.

The justice, not to say necessity of this provision under merasi, a tenure, which allows a proprietor's rent, as well as a Government tax, will I should think be admitted, if we consider—that the gross re-

ceipts of the merasidars, cannot in the best years exceed 25 or 30 per cent. of the produce, that independently of the share apportioned to the *parcaudies*, the merasidar pays from his own share of the produce, a further part of the charges of cultivation, in finding the seed, and repairing the minor water channels, and that his family is to be maintained, and clothed from the produce left to him after all outgoings have been provided for. His largest net surplus profits therefore can scarcely, at any time exceed 8 or 10 per cent. per annum be he ever so prudent. And it must be impossible for him, with an annual surplus of this extent, to undertake the liability for a permanent 42 or 45 per cent.; in a country, where crops often fluctuate, 30 per cent., and where price in abundant years sinks 50 or 60 per cent. and even more.

The following memorandum of the produce, and prices, in one of the richest of the talooks in Tanjore (Sheally) in the four years immediately preceding the introduction of the ryotwar money rents, affords a striking instance of the fluctuations to which both prices and produce are subject in this country, even where the lands are watered by the south-west monsoon.

Years.	Produce of the Talook.	Prices.
Fusly 1233 ..... A. D. 1823-4.....	5,37,000 cullums....	1 R. per cullum.
Fusly 1234..... A. D. 1824-5.....	7,14,000 do.....	1 R. 2 Annas do.
Fusly 1235..... A. D. 1825-6.....	5,91,000 do.....	—— 8 Annas do.
Fusly 1236..... A. D. 1826-7.....	8,24,000 do.....	—— 7½ Annas do.

We see here, in the short term of four years, produce fluctuating 30 to 40 per cent., or from 5 to 8 lakhs, and prices 130 per cent., with the remarkable feature, that in the third year fusly 1235, produce *decreased* nearly 20 per cent. on the previous year, not the best of the four, and prices fell at the same time more than 120 per cent., making a total fall on the preceding year of 140 per cent. These are the fluctuations in the short period of four years, and there is no reason to doubt that like variations in produce, though it is probable, not to the same

extent in price are common. Where such great fluctuations exist, it must, I think, be evident, that a proviso, for casting upon Government in seasons of great decrease of price, or produce, its full share, if not the whole of the deficiency, is absolutely necessary, or the proprietor will be in a few years ruined, by the large and varying demands which he is unable to meet from the annual produce, and all trace of property in the land must eventually be swept away.

So little attention would seem to have been hitherto paid to this effect of an invariable annual money demand, especially *under the different species of tenure*, that this very proviso in the permanent field assessment of the Tanjore province, which is essential to the existence of merasi tenure, in other words, of property in the soil, has been pronounced by high authority (Proceedings of Government 1833) wholly indefensible, as at variance with Colonel Munro's ryotwar of the Ceded Districts. That it is a departure from that system is palpable. But the question is, is it not absolutely necessary to the existence of proprietary right, not only in Tanjore, but elsewhere; and is it not a further evidence that the ryotwar system of permanent money rents is ill adapted to the circumstances of the agriculture, to the state of the landholder, and to the condition of society in this country.

In support of this opinion we may adduce the fact, that although the ryotwar system of a fixed *annual* money demand for each field occupied by the ryot, without reference to the annual out-turn from it, has been professedly in force in this Presidency for many years, it has rarely, if ever, been carried out. In the Ceded Districts, and other ryotwar provinces, a departure in practice from one of its fundamental rules has been admitted for years, by the grant of remissions; but more especially by the practice of not making the annual settlement (*dittam*) for the ryots holding, till towards the close of the year, and then determining his rent, not by the actual extent of his occupancy, and his cultivation during the year, but by his productive fields.—Thus throwing the risk of season on the Government, and annually regulating in fact the demand of revenue in a province in each year, by the character of the season, by the crop reaped, and the number and extent of the productive fields of the ryot, and not, as ryotwar prescribes, by his occupancy.

The 7th rule of ryotwar stands thus (see plan of ryotwar Colonel Munro's letter 15th August 1807, appendix to 5th report p. 944). "No "remission shall be made on ordinary occasions of bad crops, or other "accidents should failure occur which cannot be made good from the "property, or land of the defaulter, the village shall be liable to 10 per "cent." And the practical application of this rule is explained by

Colonel Munro to his sub-collectors as follows—" Whatever may have " been the crop should it have been even less than the seed, the ryots " should always be made to pay the full rent, if they can, because good " and bad seasons being supposed to be equal in the long run, the loss " is merely temporary and the making of it good, is only applying to " the deficiency of a year of scarcity the funds which have arisen from " one of abundance." (Letter of Principal Collector—Ceded Districts to his assistants on remissions, appendix to 5th report page 769, para 5).

If this rule be not enforced, and the full rent for every field occupied during the year be not duly collected, it is manifest, that each field is *permanently* taxed only in name, and that the amount of the ryots' payment or the annual tax on the land, is regulated by the crops or returns to the ryot, and by his means at the time of demand. It is the same thing of course to the ryot whether the Government practically reduces his rental by striking off so much of the fixed tax on each field he has held, or by striking from the account, a portion of the field themselves, which he has occupied at a fixed assessment, the only point he can be anxious about, is that the demand upon him, should be limited annually to an amount which his annual produce will enable him to meet. The great, if not the only end then now answered by ryotwar, is to determine once for all a maximum payable by the ryot for the land he may have been induced to occupy, which shall save the necessity of an annual contract with him; and leave the revenue officer, the sole duty of extracting from him at the close of each year, the utmost he can pay even though the seed has not been returned.

That a demand and collection regulated by the out-turn of the year, has been, and I may add, must be the system in force, under a fixed money assessment on an average produce, might also, I think be demonstrated by an appeal to experience, as well as by the consideration of the peculiar circumstances already adverted to in the nature of the agriculture, and in the condition of the ryot. I would refer to the practice in ryotwar districts of granting remissions under various forms, and this, not as an extraordinary boon, but as a part of the system in practice whatever may be the theory, as one proof, that permanent ryotwar rents have never yet been realized. Again, the amount of balances of rents in ryotwar districts struck off as dead loss in the account general books. These enormous sums, further proving the absolute failure of the attempt to collect a fixed *invariable* annual rent in money from each field occupied. Finally, let the total revenue, or the full tax on all the land held for five years by the ryots at the beginning of each fusly, in ryotwar districts, and the amount

actually realized in the five years be calculated and compared, and it will be evident, I believe, that the system has been in districts assessed at the full rate of 33 and 45 per cent., not so much to consider the amount, for which the ryot may have engaged by his occupancy, as the rent to be collected from him, but, what he could actually afford to pay, with reference to the returns from his land in each year.

If the permanent money tax should, as in Coimbatore, have been fixed at, not more than 25 per cent. of the gross produce, with this peculiarly low assessment in its favour, the people will bear up under it for a long period, especially, when it has been also accompanied by remissions, and every species of indulgence to the ryot. So also, if one province, like Cuddapah has a comparatively rich soil, and an extraordinary proportion of rent-free lands, or, like Bellary, has been especially favoured by a general, and permanent deduction of 25 per cent. of the Government dues, whilst other provinces have not received a fraction; these provinces will of course comparatively flourish. But is it the ryotwar money rents, which produce this result? Or is it not solely in such districts the light assessment—and that, happily for the people and the permanent interests of Government, made lighter, by a departure from ryotwar, both in the remissions granted; and by the substitution for a settlement at the *commencement* of the year on the land held, and a fixed demand accordingly, a settlement towards its *close*, regulated by the season, and by the actual produce of the year.

The failure hitherto to do this fully, and the impolitic attempt to collect, as prescribed by theory, the full assessment annually, even in years when the seed has not been returned, combined with the forced cultivation of the soil, have been, I conceive the chief causes of the present depressed condition of the landholders. The demand which has been made upon them for years past in seasons of difficulty, has even, I fear, sapped the sources of future improvement and prosperity, by draining from them, their little capital, and preventing those accumulations, which can alone enable the ryot to profit by the peace, and security afforded by British rule. It is also to this severe pressure of late upon his resources in periods of difficulty, to which we must look, as the great proximate cause of the present decrease of the land revenue.

The evil of a fixed annual money rent, when persevered in for years, is not confined to district assessed at the full ryotwar rates, for when it does not, as in provinces lightly assessed, bankrupt the ryot, it manifests

itself in the diminution of substantial and wealthy ryots. The following table drawn from the accounts of thirty three villages in the Kangyam talook in the Coimbatore province will shew the effect of the system when combined with the practice of forced cultivation:—

Years.	Total numb of Ryots.	Ryots paying from 50 to 500 Rupees.	Ryots paying from 30 to 50 Rupees.	Ryots paying from 1 to 35 Rupees.
In 1801	1778	78 or 1 in 23	709 or nearly one half	971
In 1816	3449	34 or 1 in 100	1231 or about one third	2234
In 1831	5031	28 or 1 in 180	1396 or about one fourth	3607

The whole of the increase it is of importance to notice in the years from 1816 to 1831 is in the smaller holdings, and chiefly in the pauper tenements from 1 to 35 rupees—whilst the wealthy ryots, in lieu of increasing under our rule, have diminished in number from 78 to 28. A similar result after making the necessary allowance for the practice of wealthy ryots subdividing their lands nominally, by entering them in the names of their dependents, is exhibited in a statement from the Caroor talook. And personal enquiry, tended to establish the fact, that formerly a larger proportion of the occupants of the soil, were substantial ryots; whilst it is apparent that at present the great mass or more than three-fifths are in this favoured ryotwar district little better than pauper labourers, occupying for the most part tenements at a rent of trifling amount, which they pay with difficulty in seasons at all unfavourable.

Ryotwar authorities, are in the habit of ascribing this increase of small, or, pauper proprietors, to the usages of the people alone, especially to their law of inheritance. They do not appear sufficiently to advert to the fact, that the same law and usages have existed for ages, and that this sudden, and rapid augmentation of small proprietors within the last twenty years, cannot well therefore be the result of a long prevalent usage, but must have its origin in some more immediate cause. The augmentation is no doubt, in part, the effect of the greater security of property and person under British dominion; but there is little reason also to doubt, that it must chiefly be ascribed to the revenue system in force.

The extreme subdivision of property, and the rise of this large class of pauper landholders, have also been advocated as beneficial to the

country by some ryotwar authorities who have kept out of sight the momentous consideration, that the return from land held by this class, is full one third less, than if cultivated by a proprietor of substance, who could afford to dress it properly; and that the permanent effects of a system which brings the mass of the land into the hands of the poorer classes, is, to place the country under a sentence of comparative sterility, covered like Ireland with pauper occupants, without capital to meet any reverse, or surplus to undertake any improvement; and unable to command those comforts and conveniences of life, which would gradually raise them in the scale of society, and advance the country in civilization and wealth.

Before closing these remarks, I would notice briefly two other evils inherent in fixed money rents. All fields permanently classed and assessed as wet or garden land (*Nunjah* or *Bhajayet*) must continue always such, in order to give the higher permanent tax. The conversion therefore of wet or garden into dry grain land according to the varying demand of the market, is prohibited by the system itself. And though the demand for garden or wet produce in a district, may fall off 50 per cent. or more, and prices may sink, to an extent to make such produce an unprofitable crop at the wet, or garden rate of tax, compared with dry grain, yet the ryot has no option, he must still sow this land with rice, &c., for that alone will yield in money the higher rate of assessment.

Again no adequate provision is made, except in the putcut ryotwar of Coimbatore, for fallows, and for the exhaustion of the soil, the certain consequence of the continual cropping rendered necessary to enable the ryot to meet the invariable annual Government demand. Of the evil effects of this omission, the following instance was brought to my notice. The *Bhagayet* of a ryot, then a flourishing and productive property, had been classed and permanently assessed in 1802. But in the long period intervening, the soil had become exhausted, and did not return any thing like an average crop. Still the proprietor was called upon to pay for it, the same full *Bhagayet* tax, as when first assessed. At the date it was examined (1832), the land was so exhausted by continual heavy cropping, as scarcely to repay the charges of cultivation, and for some years previously it had of course been deteriorating, whilst throughout the whole period of this deterioration from natural causes, the full rent had been demanded, and paid. The means of the holder were necessarily therefore annually impaired, till he became unable to bear the tax; and nothing but ample remissions, not

for one or two years; but for a term could save him from ruin. Yet revenue authorities strictly following out the principles of ryotwar, and not sufficiently bearing in mind the peculiar physical circumstances of the agriculture of the country, and the present condition of the people, denounce all remissions, as incompatible with sound revenue management. Whilst it would appear almost self-evident, that so long as produce, and prices annually fluctuate very largely, and droughts are constantly recurring; so long an unvarying annual money tax on each field, cannot be imposed upon a small proprietor without his *utter ruin*. And further, that so long as the bulk of the landholders remain, what they now are, proprietors of petty tenements, and without capital, the principle of a fixed *annual* money rent, which leads inevitably to an extreme pressure on the ryot in adverse seasons, is not a sound and practically wise system.

Assuming such to be the case; and both experience, and theory would seem to confirm it, I would suggest for consideration some modifications of the existing revenue system, which would I believe greatly relieve the agriculture of the country from its present depression—and gradually convert the ryots into a body of wealthy landholders—without trenching largely on the Government revenue. To avoid misapprehension, I would here remark, that it is not ryotwar, *as a mode of collection*, of which it is the chief feature, that there shall be no middle man, between the Government and the occupant of the soil, of which I should propose a modification. For under the present circumstances of South India, and in the general ignorance of all classes of the people, I do not think there is any class, whether zemindar, mootadar, or the heads of the village community, to which the well-being of the ryot can be so safely entrusted, as to the European officers of Government; and I should regret to see this important feature of the Madras revenue administration touched. But looking to ryotwar as a mode of *assessment* on the land, containing as its leading principle, the imposition of an unalterable money-rent on each field, payable annually, under all circumstances of season and of price,—it is to this, I object, and would raise the question whether it is not highly injurious to the ryot in the long run, whatever may be its temporary advantages.

In considering the modifications required to adapt the revenue system fully to the country, I take it for granted, that it is not in the power of the Madras Government to relinquish any large portion of the revenue at present raised directly from the land; and consequently that the Government is not prepared for that great practical measure of relief,

which might render every other measure unnecessary, of reducing the rate of tax on all land occupied, and not irrigated by Government works, to the ordinary poonjah or dry grain rate, and thus yielding to the ryot for ever the entire benefit of all improvements on his land. The plan proposed, proceeds therefore upon the supposition of giving up as little as practicable of the present amount of land revenue; and of leaving waste, and other sources of future income from the land open.

I would suggest first, as better suited to the circumstances of the country a permanent assessment on each field in grain, commutable into *variable* money payments, in lieu of the permanent tax in money now assessed. The commutation to be made periodically with ample allowance for unfavourable years.

The basis of the system, would therefore be a fixed corn or produce rent, as a maximum rent, commutable into a money payment, regulated by, and varying periodically with the actual state of prices.

An assessment varying from time to time with prices, in lieu of the permanent money tax of ryotwar, appears to be required; not only because prices are found by experience to be subject to very great alternations, but because money itself alters in value, and the land-tax of a fixed amount of money, which may at one time be light and equitable, may become by changes in the value of the currency oppressive, and intolerable. But it is chiefly necessary, because the amount of the tax on the land is so large, and the capital of the ryot so limited, that a very trifling alteration in price, is of vast moment to him; and because, the excess in this country both of agricultural population and capital, over non-agricultural (which from the influence of caste must continue) is such, as of itself to induce a constant tendency to an overstocked grain-market, and consequently to depreciation of price. Any *permanent* money tax, founded on an average of prices drawn from the state of the markets during previous years, will therefore, in the long run, prove injurious to the landholders. And it will be found, I believe, essential to the prosperity of the ryot of South India, when his rent is received in specie, that the money tax on each field unless extraordinarily low, should not be permanently fixed, but that a review of the state of prices should take place at short intervals, and the Government demand be adjusted accordingly.

A fixed moderate average corn or produce assessment, which shall be the maximum of the Government demand, would also hold out to the proprietor, or occupant, the strongest inducement to improve his land, as it will effectually secure to him, the *whole* increase arising from better cultivation, or from capital sunk in improvements. This can never

be attained by *a fixed money* rent on each field, at *the present rates*, for every considerable fall in price, an event of frequent occurrence, must disturb the calculations of the ryot, and destroy all certainty of profit from such outlays under that system. But, if he has to take into his consideration, only the fluctuations of produce, he can estimate his prospect of success with more accuracy, and he is secured against one source of failure. This, it is obvious, must lead to a more frequent, and successful investment of capital in improvements, so important both to the individual and general welfare.

These two points—a fixed maximum assessment of grain or produce on each field, and a fair commutation price varying periodically with the market, being established, I would further engage on the part of Government, that in years of drought, when the produce might fall short 20 or 25 per cent., or upwards of the average, taken as the basis of the assessment, that the deficiency beyond that, should be borne in part if not wholly by Government. For instance, if the ordinary *average* produce of the cawney be rated at 100 measures, and the rent be fixed accordingly, and the actual crop in any year, shall be reported by the collector to have fallen to 75 measures, or less, a general, and well defined remission of tax, according to the extent of the decrease in produce, should be authorized.

And further, in years of excessive drought and total failure, when the land has made no return, not even the seed, that there should be a postponement of demand, or an entire relinquishment of the Government dues on such land. This I am satisfied will prove the only wise course at such periods. For it is certain, that the suffering inhabitants will find sufficient employment for any surplus funds which they may possess, in meeting the high prices of famine. And it will be the better policy, as well as a moral duty to leave to them the full extent of their resources, to bear up against the visitation, and to provide some small surplus, to commence anew, when the pressure shall be past.

As a compensation to Government, and to enable its treasury to meet the defalcations of calamitous seasons, I would adopt the rule, that in all years of high price, combined with an average produce, or one above it, when the profits of the cultivator must be certain and large, that after a limit say 10 or 15 per cent. advance in price, the Government should participate, and receive a proportionate increase of revenue, an addition of 5, 10 or more per cent., according to the extent of the rise in price. This would of course prevent, as all taxation on the land must, the rapid augmentation of the national wealth. It must make its progress more slow; but it would not be found greatly to retard improvement.

It should be considered as an extra demand, to be regulated at the lowest scale compatible with the exigencies of the state, and it would be found when tried by the test of general principles, the best *present* available source of revenue. For the extra tax would be imposed, only, when the surplus wealth of the people is largest, and not like the permanent tax of ryotwar, often when their means are lowest: and one of its chief effects would probably be, to divert into the coffers of the state a portion of the sums now wasted on marriage festivals, and in similar occasions of large personal expenditure; for it is in that mode, that the extra gains of profitable years in lieu of being husbanded, are at present expended by the ryot.

The system here proposed is in force in its leading features, in several of the best managed properties in Scotland and England, and a reference to the evidence annexed to the last Report of the Committee on Agriculture of the House of Commons (1836) will shew its beneficial effects. Its first principles, a corn rent with a fluctuating commutation price within a defined limit, are contained also in the *Oo'oongoo* system of Tanjore, introduced nearly 15 years' back, which has been, and still is in operation throughout a large portion of that province. It could not meet therefore with any serious difficulties in practice, indeed the ryotwar, as it is termed, of Tanjore, recently introduced, also contains some of its essential elements: and it is in favour of the plan, that the merasidars of that province, who are without doubt competent judges of what is necessary for their permanent interest, have rejected a fixed annual money rent, and required a modification of the ryotwar tax of the nature here suggested, in order to meet the necessities of unfavourable years.

The chief objection which would attach to the plan, is the obvious evil of the occasional changes of settlement required, in order to adjust the commutation price. To obviate this objection, we might take as our guide, an average of only the low, or medium prices of the previous seven or ten years, and fix the standard price at this rate. Owing to the circumstances repeatedly adverted to, particularly the large excess of the agricultural population over all other classes, which make low prices the general rule, and high price the exception in this country, the Government would lose but little, in excluding from the commutation average, years of high price, and two most important advantages would be gained.

The ryot, or merasidar would be secured against over demand; and it would not be necessary to interfere with him frequently, for it would probably be found, that the rent fixed on a commutation taken at this

low average, might safely go on for seven or ten years together, and new engagements would not be called for oftener under this system, than once in ten years.

The advantages which the proposed plan would possess, over the present system, are.—First, that it unites the benefits which result to Government from an assessment in money, with those which the ryot enjoys from an assessment in kind. That it does not like the ryotwar require from a people wholly unprepared for it, the duty of a forethought foreign to their habits, nor throw upon them the burthen, to which they are unequal, of all fluctuations of prices, as well as of periodical drought, and of alterations in the value of money.

Secondly, it provides more effectually for the profitable outlay of capital in the improvement of the land, by establishing a better defined and more certain Government demand, a maximum rent not liable to fluctuation.

Thirdly, it secures the landholder, equally with the immemorial division of the crop, from the ruin, and total bankruptcy, which seasons of excessive drought must bring with them, when he is, as at present, required to yield at such times to Government, the 33 or 45 per cent. of a produce, of which he has never reaped ten, nor possibly one per cent.

The Government revenues would also suffer, but little in the course of years, as the treasury would be filled by the extra levy, in years of average crops and high prices, and by the more regular payments in ordinary years, the consequence of a more equable demand. The cases of failure also would necessarily be few, when the Government itself shall provide against the larger fluctuations, and when the system in force, shall not call for the exercise of a providence which will not be found amongst the ryots for generations to come: and which were it now the national characteristic, would not avail the ryot under the existing high rate of tax on the land, joined with the extreme subdivision of property growing out of present usages. Both these causes precluding the accumulation of capital in the hands of the landholders, which might enable them to meet the heavy Government demand in unfavourable seasons.

It may be observed finally, that, if this substitution of a commutable corn or produce rent, for a fixed money rent, has been found of late years, from the great fluctuations in price alone, expedient even in England, where the farmers and holders of land compared with the South Indian ryots, are persons of large capital and extensive credit; and where also, produce and prices never fluctuate to such wide extremes. It would appear to be still more required in South India,

and it can scarcely be doubted, that it would be found better adapted the wants and character of the agriculturist, and to the peculiar circumstances of society around him, than a system, like ryotwar, which demands the same annual money tax invariably, admitting in theory of remissions, and having in practice none adequate to the heavy losses unfavourable years either of produce or price.

On a Redemption of the Land Tax.—In concluding these Notes would throw out for consideration, as a measure practicable, under existing, or any system of revenue administration—the expediency of conceding to the landholder the privilege of redeeming the land tax for lives, or for a term of years.

A provision of this nature, would, it is probable give an important impulse to agriculture; and without it, it is I fear hopeless to expect any decided improvement at an early date. For if the land is to bear an annual heavy assessment, it follows, almost as a necessary consequence, that every proprietor will continue from year to year, the old routine of cultivation, in order to ensure the amount of his tax. But were his land wholly free from tax, for a term, he might, and would be disposed to speculate in raising new and more valuable products, the returns from which must in the first instance be uncertain. And when we consider that it is not often, in consequence of the great subdivision of property by law, that agricultural capital accumulates in one hand, in this country, it is of the more importance, to open such a field as the redemption of the land-tax would do, to induce its employment on the land.

It is almost certain, that the late efforts of Government to engage the ryot in the cultivation of tobacco, senna, sugar, &c., must fail of any practical utility, unless a measure of this character is at the same time adopted; which shall enable him to undertake the cultivation of such products without the risk, which now attends the attempt, of not having wherewith to meet his annual tax: and with no adequate security also, that if successful, a heavier assessment will not be the early if not the immediate consequence.

The redemption of his land tax would, at the same time free the ryots or meerasidars, from the constant interference of the revenue officer, and would lead to improvements from which they are now deterred by the knowledge, that the public officer can, and will interpose whenever any change is made. It is also by this means that they will be enabled gradually to rise above the tutelage and influence of the talsildar, from whose interference they now often suffer. Whilst under a re-

demption of the tax, the ryots would partially escape the evil of the successive revenue experiments which must continue to be made, till the land is in the hands of proprietors, equal in intelligence with their rulers.

There can be little doubt also, that the measure would give much greater stability to the revenues of the country. For the redemption, in other terms a payment in advance on an equitable adjustment of the Government demand, excludes the possibility of remission; and the possession by the ryot of a portion of his land in all seasons rent-free (the tax being already paid) must give facilities to the punctual realization of the annual revenue.

It would at the same time, it is probable, be found to operate beneficially on native habits. As the prospect of freeing his land for a term from its burdens, would hold out a great inducement to the ryot to expend his accumulated savings on his land and he would inevitably be tempted to turn off a part of his present wasteful expenditure on marriage occasions, &c. into this more profitable channel.

I am not aware that any evil could result from according this privilege to the land-owners, if it were confined, as it should be in the first instance to a term of 15 or 20 years, renewable at the option of the owner, for 10 or 15 more, on the payment of a limited fine or premium. It would then, I think, work well for the country without diminishing the Government revenue. It has been adopted on a much more extensive scale than here proposed in Ceylon, and if applicable to the state of society, and the tenures of land there, it can scarcely be found inapplicable to the neighbouring provinces on the continent, in a great measure similarly circumstanced.

On the Interference of Government in periods of Famine.

The entire failure periodically of all return from the land, and the improvidence and poverty of the great mass of the ryots, which have been adverted to as incidents in the agriculture, and in the state of society, peculiarly affecting the question of permanent money rents in this country, apply, I conceive, equally to another question, scarcely less important—the duty, and policy of the Government in seasons of severe dearth or famine.

The doctrine now promulgated on this subject, is professedly based upon the principles of political economy, and drawn from Adam Smith's

work (Book iv. ch. 5. Digression on the Corn Trade and Corn Laws), but rather I must think from the letter, than from the spirit of that enlightened work. The circular orders of Government* which embody Dr Smith's arguments, overlook apparently the important consideration, that his views are mainly; if not wholly grounded upon the circumstances of agriculture, and society in Europe alone, and even in Great Britain; and that in the very few remarks he makes in reference to famine in India, his premises are incorrect, and his conclusions necessarily therefore of little weight.

Dr. Smith first states as an historical fact, that, in Europe, owing to the variety of soil, and the nature of the climate, "*the grain lost in* "*one part of the country is in some measure compensated by what is* "*gained in another, and that a famine has never arisen from the fault* "*of the season, nor from any other cause than the violence of the* "*Government attempting by improper means to remedy the inconvenience* "*of dearth.*" In this statement, so far as Europe is concerned, we may fully concur. But when he goes on to assume, that "even in rice "countries, the drought is perhaps never so universal as necessarily to "occasion (of itself) a famine," and *that famine has always been induced in India, by the acts of the Government* we must, with our more enlarged experience of the nature of tropical droughts, withhold our assent. For we well know from bitter experience, that although the Government of India for years past, has most rigidly abstained in seasons of scarcity from all interference,—the most intense and deso-

* *Circular Orders, 30th January* 1833. "The Right Honorable the Governor in Council requests, that you will take every suitable opportunity of explaining to the Judicial Officers, with the desire that they will inculcate the same upon the native servants, that in a time of scarcity, high prices must obviously constitute the best security against the calamities of famine. When there is a deficiency of the necessaries of life in any country, the only method of counteracting the evils resulting from it, is to diminish, as much as possible, their consumption. This is effected by high prices better than any other measure, for as every poor man is compelled to contract his wants to the smallest quantity of food that can support him, it is plain that a larger number of families are thus enabled to subsist upon a diminished supply whereas the interference of Government in such emergencies either by fixing a maximum of price, *or by throwing a quantity of grain into places which would not receive it in ordinary course of mercantile speculation*, disturbs the natural current, by which, where trade is free, the demand of any commodity is sure to meet, as far as circumstances will allow, with a corresponding supply, and has a tendency (which it is to be feared has too often been realized amongst the native states) to convert a season of scarcity into one of absolute famine.

The Right Honorable the Governor in Council considers it highly desirable that the natives in the provinces should be made acquainted with the sentiments of Government on this important subject, and be apprized of the calamitous results which would inevitably follow any other line of policy."

lating famines have nevertheless prevailed. And it is open to every day's observation, that the drought in whole provinces, contrary to Dr. Smith's assertion, is ordinarily universal: the failure which affects one field, affecting all. And further, that in South India, and we might add in tropical countries generally—there is not that variety of soil or climate, which can compensate the failure of the periodical rains.

If we cannot premise then of India, as we can of Europe, that famine "never arises from the fault of the season alone," Dr. Smith's principles, and his whole reasoning fail of application to this country, and the orders of Government based upon them, rest consequently on no solid foundation.

The Government orders appear also erroneous, in applying without limitation to the grain trade of South India, the great general principle established by Smith, that, "where trade is free the demand for any "commodity, is sure to meet as far as circumstances will allow, with a "corresponding supply." In applying this principle to trade in the food of a country, we shall err, if we omit to take into our consideration the striking peculiarity of the corn trade, *that it admits of no delay in its supplies.* The supplies of grain must arrive at the precise moment they are required, or they are useless, the evil has been done, the consumers themselves have been cut off. The truth of Dr. Smith's general principle no one will be disposed to question, as respects trade in general, and even the grain trade in seasons of scarcity in Europe, for the reason he repeatedly assigns, that the energy and enterprize of the British or European merchant in pursuance of his own interest, will always supply the market *more readily*, as well as more cheaply than Government agency: and it follows as a necessary consequence, that if the Government interfere in the corn trade in Europe in a period of dearth, and the private trader withdraw, the requisite supplies will be provided more *tardily*, and at a greater cost, and a dearth or a temporary famine will ensue.

We know well that in periods of scarcity in England, when large profits are to be realized by the importation of grain, the British merchant, be his ordinary traffic what it may, immediately turns aside from it, and invests his capital in grain—and such is the extent of his credit, that he can augment his capital almost at will, and before his bills at 60 or 70 days' sight are due, he has brought his cargoes from the Baltic, and other continental corn markets, and disposed of them to the inland dealer.

How differently circumstanced is the grain trade in South India. The whole trade is shackled by the trammels of caste, and of usage, which

confine it in a great measure to a limited number; and the native merchants of the Madras Presidency have little of the energy and enterprize, which characterize the European trader, and which could fit them for the task of meeting the emergency of a famine demand. To such a degree is this inertness carried, that rice may be selling at Madras at double its ordinary value, and be comparatively a drug in Tanjore, yet neither the merchant, nor the native craft-owner would think of attempting to bring up a single bag by sea, till the monsoon was favourable. And the whole coasting traffic of the presidency, so far as the native merchant is concerned, is at this hour regulated, not by the varying demands of the market, as by the monsoon—I might ask, what application has the reasoning of Smith to a trade so circumstanced ?

As an instance of the manner in which native maritime traffic is carried on at this hour, I may mention the fact, that the master of a vessel leaving the port of Nagore with a cargo for the Eastward, on meeting with an adverse wind even within 24 or 48 hours sail of Penang, now immediately tacks, returns leisurely to Nagore, puts his vessel into dock, lands all the cargo, and patiently abides the favourable season of the following year, before he again attempts to take his cargo to its market.—This, and similar facts, furnished to me not as special cases, but as samples of the ordinary routine, afford sufficient proof of the present infant state of native commeree, and they are of great importance in their bearing upon the grain trade. For they go far, I conceive, to prove, that in this trade at least, where supplies cannot be waited for many days, it is not correct to assume as an established principle, as the government orders do, that the demand in the trade in South India always meets at the hands of the native trader with as full a supply as circumstances admit.

But the grain trade in this country, has not only to struggle against the want of energy, and enterprize of the small body of dealers to whom it is by usage confined: but even if they had the necessary enterprize, I would enquire, where, in the emergency of famine, are they to find the extra capital which shall enable them to purchase, and bring to market the requisite supplies at the high prices of dearth ? Let us suppose that the average supply of rice for Madras is 10,000 garces in the year, and the capital required, when grain sells at its ordinary rate, 20 lakhs of rupees.—Owing to the scarcity, price rises 100 per cent, and the demand, in consequence of the more frugal consumption caused by high price, falls off 20 to 30 per cent—still large extra funds are required in the trade in order to bring the reduced supply to market *in due time*.—Where can the grain merchants now procure this additional capital. Their credit is not of that character, that private capitalists would advance largely.

even if capital was forthcoming, and as abundant in India as it is in England, which it is not. Unless then the Government afford its aid, by opening its treasury, and making large advances, how is the necessary supply of grain to be brought into the market *in time* to remove the scarcity, by the instrumentality of the native dealer alone?

Every successive dearth has demonstrated to us hitherto his inability; for in no district, has there hitherto been a timely importation, sufficient to avert famine. This, which I believe to be a well established fact, furnishes in itself a strong a priori argument against the correctness of the view of Government. As does also the fact, that although the trade is under British rule perfectly free, rice sells in seasons of scarcity in one district at eight or ten measures the rupee, and in another almost adjoining, at half that cost. Another proof, that supply, and demand do not now in practice, readily adjust themselves.—And there is I apprehend but one explanation to be given of this circumstance—that there is neither enterprize, nor capital in the corn trade at present, adequate to meet the large, and extraordinary demands of the market in districts where famine prevails.

The peculiar circumstances of dearth in this country, afford also additional arguments, against the views contained in the Government orders, and point to the necessity of the interference of the State. *The magnitude of the evil*—entire districts being involved in suffering at the same moment—*its extreme pressure* on the population—destroying even thousands in a few weeks—with the well known *limited means of* the native merchants, and their general inability, to undertake extensive speculations in distant markets,—all preclude the hope, that private exertion will be found sufficient to meet so great an emergency. We have strong confirmation of this, in the circumstances of the recent famine in this presidency in 1832-3. Rice was at that period abundant and comparatively cheap in Canara, Malabar, and elsewhere in our own provinces, when the famine was at its height in Guntoor; and yet, no supplies reached that province, in time to prevent its almost entire desolation.

Facts of this nature appear to me to demonstrate the duty of interference. And that it is not enough for the Government to offer the people work, and pay them for their labour, when the crisis of famine has arrived—trusting to the native traders' unassisted energies to provide the requisite supplies to meet the urgent demand for food—but they must, by a prudent foresight, and by their own energy, bring the abundance, and the stores of distant and foreign markets within the timely reach of the retail trade, or the pressure of famine will remain in full force, till the population is brought down to the level of the numbers, which the native trader can supply.

If these views are borne out by experience, they lead us to an inference wholly opposed to that assumed in the Government Orders; and in lieu of concurring in the opinion,—that "if the Government were "to throw a quantity of grain into places, which would not receive "it in the ordinary course of mercantile speculation, the only effect "of this measure, would be to convert a scarcity into a famine," I should almost be disposed to assert the reverse, and to maintain,—that at present in South India, whilst its corn trade, and trade in general are at so low an ebb, the timely and judicious interference of Government, instead of aggravating, is the only mode in general, by which scarcity can now be greatly mitigated and famine prevented. And that an importation of grain, through the means of Government capital, and possibly of Government agency, *from foreign or distant markets*, where there is abundance, into districts suffering from dearth, may be under the existing circumstances of the country a measure of sound policy; and the best, if not the only practical method by which the distress caused by the peculiar character of tropical droughts can be greatly alleviated.

It is no argument against an interference of this nature, to cite to us, as the orders of Government do, the fact, that native rulers in former times, participating in the ignorance, and in the prejudices of the people, have converted scarcities into famines, by the barbarous policy of compulsory sales, or other arbitrary interference with the capital, or with individuals in the trade. There can be no question now, as to the proper course to be pursued on this head: for Dr. Smith has placed beyond dispute the important principle, that the interest of the inland dealer and the public is the same, and the more free he remains, the better.

No interference with this branch of the trade is for a moment advocated: for if adequately supplied, the home-dealers it is certain, are fully equal to the due distribution of all the grain brought into a district in a year of famine, in as much as they distribute the larger supplies of abundant years. But it is in the importation—the foreign or whole-sale trade, that we would propose the interposition of Government. Not by any restriction on the wholesale merchant, or the importer, but by offering to him the assistance of Government; and by endeavouring to infuse into the import and wholesale trade a spirit of adventure and activity, adequate to meet the urgent and large demand of famine. And should this, after full trial, fail to place the necessary supplies in due season, at the doors of the retail dealers—then only by leaving the wholesale merchant to himself, and making use of a Govern-

ment agency for introducing for sale into famine districts only, timely supplies from distant and foreign markets, at the risk of Government; whilst the home, or the local trade should be left altogether to take its own course, and purchase large or small supplies as it might see fit.

The mode in which the interference of Government could best be effected, experience can alone determine. But on general principles, it would appear right to interpose in the first instance, by throwing Government capital into the existing grain trade, in the form of advances to native merchants, and others, who might be willing to import grain at their own risk, into districts threatened with, or suffering from dearth. This assistance has an advantage over the principle of a bounty as it furnishes the capital by which the supplies are to be obtained, and might readily be afforded, by authorizing Collectors to grant pro tempore, bills at favourable rates on the treasuries in those provinces, in which grain was abundant and cheap. To this should be added bounties on importation; and it might be also highly desirable for the Government to offer to the native trader peculiar facilities, either Government vessels or land carriage, for the safe transport of his grain to the districts where famine existed—that no impediment might arise to the introduction of his supplies, from the want of carriage, or from the fear of violence from a suffering population.

If these means failed, and it shall be found, that the native trader is not equal to the task of providing the extra supplies needed in seasons of famine, and that neither his credit, nor any securities he could offer, are such, as could warrant large Government advances to him,—then it would be no departure from sound principles, to employ a Government agency—for procuring grain from distant markets. The present course sanctioned by Government, by which its treasury is open to its Commissariat, to purchase up in one hour from the wholesale dealer, the entire stocks actually in the home market; whilst the retail trader is left, either without any supply, or to seek it from a distance, is now a practical interference of the worst kind, one which must greatly aggravate the distress. At Nagpore in 1833, it is reported to have instantly converted scarcity into an absolute famine—and it is not easy to conceive it to be a wise course even in a financial point of view. For the same supply, procured in the distant market, where grain had not reached famine prices, would it is probable cost less even with the carriage, than when purchased at scarcity prices. Instead of the present practice, I should be inclined to suggest, even though it might occasion loss to Government, that in seasons of great dearth, the Commissariat should be prohibited from

purchasing grain in the markets of those districts, in which famine prevailed; and that it should be required to import its supplies from places, where grain was comparatively abundant By this means, the stocks of the district would be left available to the retail trader; and it is more than probable, that as the scarcity increased in severity, the Commissariat might be made instrumental in supplying from its stores the local market with *foreign* grain, at a cost, which should cover all expense of carriage, and yet greatly mitigate, if not prevent famine. I will not however pursue this subject—the object of these remarks is not so much to advocate particular measures of relief. But rather to induce a full examination of the doctrine laid down in the Government orders; and to endeavour to ascertain, whether it be an indisputable truth to be taught to all our native servants, that injury must invariably result from any interference of Government in seasons of dearth in this country. And to lead to the important enquiry, whether there are not, as Dr. Smith seems from his guarded language to admit, means open to the Government, which may not be improper for it to adopt in periods of drought, by which that most dreadful scourge, the absolute famines which now periodically desolate our provinces may be wholly prevented, and scarcity at all times greatly mitigated, without a departure from sound general principles, and at no great charge on the finances of the State.

III.—*On Improving Internal Communication in the Carnatic.*—*By* J. KELLIE, Esq., *Assistant Surgeon.*

The expence of transport of goods from Madras to Trichinopoly, 220 miles, is about 35 rupees, or £1 10s. per ton, which is nearly as much as the present price of freight from Madras to London.—CAPTAIN COTTON'S *Report.*

With the view of facilitating intercourse and giving a spur to commercial enterprize, it was some time ago in contemplation to construct an iron railroad betwixt Madras, and the large towns of Conjevaram and Wallajanuggur.

That the project was a most enlightened one, and would fully have sustained many of the expectations of its original projectors, all, who have regarded with attention the amazing benefits derived from similar undertakings in other parts of the world, must confidently have expected, and every one who takes an interest in the progress of civilization in

this our adopted country must regret, that any obstacle should have interfered with the execution of a measure pregnant with such numerous advantages to society. For, putting aside the more obvious and immediate benefits which would have been derived from such an establishment; no measure, with the exception of the diffusion of the English language, would conduce so much to diminish the immense space which exists between the inhabitants of India, and the European, and to inspire a general national feeling throughout the country, as facilitating intercourse betwixt cities and the towns in the provinces; the novelty and cheapness of regular and rapid communication, would induce numbers of inhabitants, who under other circumstances would have remained stationary, to leave their homes, and flock to the capital, "where the competition that takes place, the excitement that is constantly kept up, the collision of so many minds brought into immediate contact, endeavouring to outstrip each other in their respective departments, developes all the resources of the human mind, and renders a great city a perpetual radiating focus of invention and intelligence."*

The belief that principles of economy alone, and the little prospect of a direct remuneration commensurate with the great outlay of capital requisite for such an undertaking, influenced the members of Government in not giving their support, convinced although they must have been of the advantages which would flow from it—has induced me to address you, and to advocate a plan, by which all the great objects of such an establishment may be secured at a comparatively trifling expence, and at the same time is free from the numerous objections which in my opinion are necessarily attendant on iron railroads in India.

Iron railroads are constructed and maintained at an enormous expence, and are only suited to a country abounding in wealth, and which has arrived at so high a state of civilization as to render time a most valuable consideration and cause celerity of intercourse to be estimated beyond all price, and even then will only be attended by success if supported by a large influx of passengers, able and willing to pay for these advantages. For, it must ever be borne in mind that it is still a matter of opinion how far heavy goods can be conveyed along railroads with advantages to the proprietors, and that the great success of those established in England has arisen *entirely* from the conveyance of passengers.

In my opinion, which however I offer with great diffidence, iron railroads are not adapted to India, either as regards the present condition

* M'Culloch.

of the country—the genius of its inhabitants, or the stage of civilization at which they have arrived. India is essentially an agricultural country —but carrying on a considerable traffic between the coast and the interior, and which is in a state of great depression from the impediments to free intercourse; nothing therefore will conduce so effectually to raise it from its low estate as a cheaper mode of conveyance for its merchandise and raw produce. That expensive iron railroads would effect that change is more than problematical.

The saving of time is in the estimation of the natives of India a matter of very little importance, and strong indeed must be the prospect of gain, and small the fare to induce them to leave their present dilatory proceedings and various occupations to avail themselves of this new means of intercourse. Thus the main source of revenue in England, the conveyance of passengers, will, from the indolence and poverty of the great body of the inhabitants, form an unimportant item in the returns of an Indian railroad. There are other objections to their general introduction of no small magnitude.

1st. They would require to be laid down upon an entirely new line of road.

2ndly. An engineer who has directed his attention especially to this department could alone superintend the construction of iron railroads, and he would require to have a large body of iron workers to assist him in making, and repairing the rails, carriages, &c.

3rdly. No carriages but those of a peculiar construction could be used upon iron railways.

4thly. An efficient police establishment would be requisite along the whole line of road to protect such valuable property, and to prevent the rails being injured or the road obstructed.

5thly. By such a means of conveyance, there is immediate collision with the interests and prejudices of a large body of the natives, now employed as carriers, by entirely removing the means of transport from their hands. to

6thly. The expence of maintenance. This item alone in the accounts of the Liverpool and Manchester railroad for blocks, "sleepers," "chairs" &c. amounts to more than £400 per mile!

Instead therefore of using bars of iron in the formation of the "way," it is proposed to substitute slabs of granite, each slab about 5 feet long and 1¼ in breadth and thickness. These, if laid down perfectly level and having their upper surface even with the road, in parallel rows, and at such a distance apart that the wheels of the common cart will run in the centre of each row, will form a road possessing nearly

all the advantages of an iron railway, and constitute the one now recommended.

Ways of the above description, or tram-ways, as they are usually called, have been constructed in Italy of blocks of lava, and at Marseilles of granite, and the waggon road laid down by the East India Company, betwixt their docks and warehouses, is constructed of the same materials and upon the same principle.

It is unnecessary to remark, that the superiority of iron railways over turnpike roads arises solely from their being perfectly level, and smooth, and from their admitting of carriages being so adjusted, as to allow of their being propelled forward with great velocity by means of steam or horse* power, without the chance of escape: now it will at once be obvious, that a granite way gives all that is required in the first instance, and, as the *very rapid* conveyance of either goods or passengers ought not to be so much the object in this country, as the formation of a smooth, level way, composed of a solid material, and requiring little repair, admitting of the easy passage of carriages, and the consequent great saving of animal labour, the fixing of the carriage on the rail becomes a matter of very secondary importance; indeed, without that arrangement, it secures all the advantages of an iron railroad, *on which the carriages are dragged by horse power*, as no difficulty could be experienced in guiding a horse betwixt, or two bullocks along the two broad level strips of granite forming the road; and I presume the most sanguine in improvements can hardly anticipate the time when steam power will be used in India for that purpose!†

On the other hand, tram-ways would not originally cost so much as iron railways, *even when constructed under the most favourable circumstances;* they would require but little superintendence, and could be repaired when necessary by the common workmen of every village. They could with facility be constructed over the Carnatic on the roads at present in use, and, would offer no obstruction to the general traffic of the country, as they might be crossed and recrossed by native bandies without inconvenience or injury. Being adapted for carriages of every description, they would not abruptly interfere with the customs of the natives, and would, if they were so inclined, leave the transport of goods in their own hands—but, with this manifest advantage, that their oxen

* On the Edinburgh and Dalkeith railroad the carriages are dragged by horse power at the rate of 10 miles an hour.

† The original cost of a locomotive engine is about £800, and the repairs calculated at £1500 per annum!—Lardner on the Steam Engine.

would be able to drag a much heavier load. The accompanying figures and extract from Gordon on Loco-motion will shew at a glance the advantages which this description of way possesses over iron railroads:—

	Iron rail-road.	Granite tram-way.	Broken stone-road.
Tractive power required to move one ton on a level ...	10-lb.	$12\frac{5}{10}$ lb.	43-lbs.
Annual maintenance per mile.....	£400	£5	£133

"Upon this road (the Commercial-Road tram-way to the E. I. Docks) Mr. Walker found, that one powerful horse was able to draw 30¼ tons, upon a level, at the speed of four miles per hour: but the exertion of the horse was too great to be continued for any considerable time; and hence this must not form a basis for calculation. Mr. Walker has however shown, that upon a level, ten tons gross may be considered a proper load for a draught horse."—"The facility of turning off and on such a road, and of crossing it, the advantage being unconfined to any one species of carriage, or branch of trade,—being open to all,—being $\frac{8}{10}$ths cheaper in construction than any railway,—and costing for annual maintenance less than 1¼ per cent of the acknowledged sum required to maintain the Liverpool and Manchester railway, compensate amply for the mere difference of tractive power."

I have thus endeavoured, however imperfectly, to point out the comparative value—the advantages and disadvantages of these two descriptions of "roads." The one in my opinion combining in its formation cheapness, simplicity, and efficiency, proportioned to the present state of society in India, the other, complicated in its construction, enormously expensive, and immediately interfering with the prejudices and interests of a large portion of the inhabitants. Iron railroads are undoubtedly the most scientific means of transport yet known or probably that can be devised, but their great cost &c. is a bar to their introduction in India. Tram-ways stand next in importance, and may be used with advantage when the poverty of a country or small traffic will not justify the construction of an iron railroad.

However, the superiority, and the advantages which would flow from such a means of communication could only be fully developed, and

demonstrated to the inhabitants, by the establishment of a regular and a speedy system of conveyance upon them. If we rest satisfied by placing at the command of the natives such an improved means of intercourse, and content ourselves, by simply levying a toll on all carriages which take advantage of it, no one will doubt but that the grand objects of such an undertaking would not be obtained, that few of the evils which press so heavily on the internal transport of the country would be removed, and the civilizing influence of the measure would be entirely defeated.

The advantages of such an establishment can only be worked out by European energy and European talent, by men who are convinced of its expediency, and who are well acquainted with the incalculable benefits to society which can be extracted from it. Under their direction, light vans would be established for passengers, and cars for the transport of heavy goods. The natives would by degrees discover the superiority of such a mode of conveyance over that at present in operation, in cheapness, rapidity, and regularity, it would gradually be taken advantage of, and might ultimately become the sole channel of internal communication. By this means an impulse would be given to internal commerce hitherto unknown, and thus would be consummated a measure of vital importance to this portion of India, and one considered essentially necessary for the proper development of the resources of every country.

It were superfluous to point out in detail the various advantages which India would derive from the formation of roads admitting of such easy intercourse, as there is not an individual who would not be directly or indirectly benefited by their establishment, and above all that portion of the population would derive the greatest advantage, who stand most in need of assistance, the cultivators of the soil. In this as in other countries, they form the most numerous and important class of the inhabitants. But in India, in place of the intelligence and industry observed in other countries, the ryot through long oppression, is sunk in poverty, ignorance and apathy, and hardly an effort has been made to raise him from his degraded condition. The formation of such excellent roads would operate immediately in his behalf, by enabling him to bring the produce of his land with facility, to the best market, at the least possible expence. By such means he would be rendered independent of the travelling merchant, the hope of gain would stimulate him to exertion, and that apathy and languor, which are the invariable concomitants of poverty and want of hope, would give place to energy and enterprize. In his journies he would become familiar with new objects, and would be inspired with the desire to obtain them, which

would again act as an additional incitement to renewed exertion. being brought into collision with the inhabitants of the towns- mental deficiences could not fail to be made apparent even to him and to prevent his children being over-reached by the superior act of the citizen, education would necessarily be resorted to. Thus in train of knowledge all the blessings of civilization would be diff over the country.

Should the above plan be considered worthy of examination, a mittee of gentlemen might without much difficulty collect inform on the subject, sufficient to enable them to form an estimate of expence per mile, on a line of road in the vicinity of the presid For example, from Madras to Arcot via Conjevaram and Wallajanu The following rough estimate, for raising a road and constructing it a tram-way, may serve as a guide to future enquiries ; but I hardly remark that it is only by an accurate survey of the line of ro which the way is to be formed, that any thing like an approxim to truth can be arrived at:—

Cost per mile.

2,112 prepared granite slabs 5 feet long..... Rs.	2112
Levelling, laying down slabs, &c.....	583
Bridges.....	300
Carriage.....	675
Sleepers.....	62
Incidental expences.....	100
Rs.	3832

As the road betwixt Madras and Wallajanuggur has already been ally raised, and levelled, we may expect that the formation of a way upon it would cost considerably less than the estimate I formed, but taking Rs. 3832 as the average cost per mile—

60 miles the distance betwixt Madras and Wallajanuggur will amount to.....	22
Cost of oxen, carriages, &c. estimated at.....	5
Total cost Rs.	28

To justify the above outlay of capital the following is the a amount of traffic, and its value, on the line of road above allude taken from Captain Cotton's valuable report:—

Traffic.

Fuel	40,000
Straw, &c	5,000
Grain	5,000
Goods	20,000
Passengers, &c. equal to	5,000
	75,000

Present expence of this traffic at 6 Rupees per ton Rupees 450,000

It may be fairly conceded that at least one half of the above traffic, valued at Rs. 225,000 per annum, would pass along the way. Estimating therefore, the current expences of the establishment at Rs. 58,200, there will remain a balance of 166,800. A sum more than sufficient to remunerate liberally the proprietors, and provide for all contingent expences.

However encouraging the above estimate may be of the probable results of such an undertaking, I feel convinced that from its novelty, few private individuals, whether european or native, would be induced to embark in it, without in the first instance obtaining a promise of support from Government. In other countries the state grants patents and monopolies as a recompence for undertaking expensive experiments, of which the public is to reap the benefit. I therefore cannot but confidently expect that Government will approve of, and afford the most efficient assistance to put to the fair test of experiment, a measure supposed to carry in its train the amelioration of the natives over whom they rule. Of its rapid and complete success there can scarcely be entertained a doubt; and a probable consequence of success would be that other companies would spring into existence, and be incited to embark in similar undertakings, " a superior description of roads would thus be introduced over the country, and one rupee would not in future be required from Government either for their execution or support."

It is unnecessary to remark that the roads at present in use in the Madras presidency, are, with a few exceptions, of a very indifferent description, and it appears to me that with reference to the climate, their construction is essentially defective. Every shower loosens the soft materials of which they are composed deep ruts are speedily formed, water collects which sinks down and softens the whole mass to its foundation, and if the road is not immediately repaired, it is by the next fall of rain, utterly destroyed. Tram-ways by preventing the

road being cut up by carriages would in a great degree obviate these defects.

It therefore becomes a subject worthy of consideration, whether it would not be preferable to encourage by every means in our power private individuals to construct granite ways from which a direct revenue would be yielded, than to continue forming common roads at a very great expence from which no pecuniary return is received, and from which very partial benefits to the country are derived. Government have already expended immense sums of money in the construction of roads,* but the necessity of granting a small annual sum for their occasional repair has unfortunately in many instances been overlooked; by such a course of policy and economy, works of the greatest utility, the labours of years, have not infrequently been rendered entirely useless in a few months. The time of the civil establishments is too much occupied to admit of their bestowing that attention to the subject which its great importance demands, and I presume Government are not prepared to establish superintendents of roads, with all the necessary appliances, throughout the presidency. It has therefore evidently become necessary in working out the regeneration of India, for Government to avail themselves of other agency than that over which they possess immediate control, and to delegate their authority and interest in the execution of measures of improvement to the inhabitants themselves, to stimulate them to exertion by holding out honourable rewards—affording them every information requisite for such undertakings, and withholding no aid that will tend to combine them together and induce them to identify themselves with every measure having the prosperity of their own country for its object.

The formation of Joint Stock Companies will at once effect every thing that is desired. It is to them that England is indebted for her railroads, canals, and indeed for almost every establishment of great public utility, carried on as they are by the combined capital and energies of large bodies of individuals. In India, roads constructed by such agency would create a description of international property, in which influential natives, both at Madras and in the provinces, would become partners; such a coalition would not be unattended by its own peculiar advantages, in softening down the distinctions of cast and colour, and of presenting opportunities of introducing with effect other measures of usefulness amongst the native population.

* The high road from Masulipatam to Hydrabad, a distance of 230 miles, has already cost 8¼ lacs of rupees!—and the road from Madras to Poonamallee a distance of 9 miles cost Rs. 450,000.

It may be urged in opposition to the above measure, that the line of road will require to be as carefully levelled for the formation of tram-ways, as for the construction of an edge railroad, and thus one of the most important items of expence in their formation will be found equally necessary. There can be no question, that, as we approach a perfect level in the construction of the "way," the more will it approximate to the perfection of an iron railroad, but, from the nature of the Carnatic, a perfect level in most instances will be very easily attained—and embankments for that purpose will be no further necessary than would be requisite in the construction of a good common road; but, when elevations of any magnitude did occur, the removal of which would entail much expence, an inclined plane might be formed and relays of cattle kept for the purpose of affording assistance. By such an arrangement that objection will in a great measure be removed, while we secure at a moderate expence a most excellent description of road—formed on so firm a basis, of such weighty and solid materials, as to defy the effects of the monsoon, and in other respects to be peculiarly well adapted to this country.

Such are the views which have occurred to me on the subject of internal communication, and the Carnatic presents peculiar facilities for carrying my suggestions into execution, being nearly a perfect level, and abounding in the requisite material. In submitting them, my sole object has been to draw attention to a subject of acknowledged importance, and if roads of the above description were made to intersect the Carnatic, few will be so bold as to doubt that in a few years they would effect an entire change in the statistics of that portion of India.

MADURA, *20th November*, 1838.

To the Editor of the Madras Journal of Science.

MY DEAR SIR,—I have the pleasure to send you herewith a brief but masterly review of the relative cost and advantages of iron rail-ways and tram-ways as compared to common roads. The author has here shown, beyond all question, the vast preponderance in favour of tram-ways as regards first cost, facility of construction, and durability over iron rails: while, as a means of facilitating transit, they nearly equal them, and excel roads of the common construction by 250 per cent. with the almost incalculable advantage, for this country, over edge-rails, of permitting the free use of all kinds of wheel-carriages the same as on the common road.

When the paper first reached me, I took the liberty of showing it to an influential person, and requested the favour of his opinion as to the propriety of bringing it forward, in such a way, as might perhaps lead to the plan proposed being tried on a few miles of some much frequented road.

This gentleman, though fully coinciding in my opinion as to the beneficial results likely to flow from the adoption of such roads, yet seemed to think, as I understood him, that the expense would prove a bar to their adoption. I was not then, nor indeed am I now, prepared to show by comparative statements that the first expense of laying such a road would not greatly exceed, if indeed it did not actually fall short, supposing Mr. Kellie's estimate nearly correct, of the cost of forming a good road of the common construction. This could be easily ascertained in Madras where the tear and wear of roads is great, and road making and repairing in constant practice. According to Mr. Gordon's table, quoted in the paper, the tear and wear of an iron rail-road is 80—and of a broken-stone road 26 times greater than that of a tram-way, hence, were the cost of making a tram-way 20 times greater than that of a common road, it would still prove the cheaper of the two, leaving altogether out of the question, its superiority as a means of transit. Can more conclusive evidence be adduced in favour of the plan than this table affords?

The destructive tendency of our monsoon is alleged as an objection to this kind of road, this is at best a speculative objection, common roads are well known to suffer most severely from this cause, tram ones have never been tried, and there seems every reason to believe that the massive materials of which they are composed, will effectually counteract causes of destruction, to which loose materials offer no resistance.

I have already remarked that I do not know the average expense of laying a good broken-stone road, but according to Mr. Kellie's estimate, which was submitted to a very able engineer, and who thought it a "roomy estimate," the cost of a tram-way of two lines of stone is about 16 inches for the rupee; and supposing we add 168 rupees to the estimate to give us in round numbers 4000 per mile; we should still have 15 inches for the rupee, at which rate, I question if we could thoroughly break the stones required to make so much really substantial road, 8 feet wide, exclusive of the charges for carting and laying them in their place: and when placed, they require constant attendance to keep them there, if it happens to be a much frequented road. When to these drawbacks we add the difference (250 per cent.) of tractive power required on such roads, I think a very strong case has been made out for giving the plan the benefit of a trial on a considerable scale, and if the result, is

at all commensurate with the calculations, we may reasonably hope, soon to see the plan extending itself in all directions. In this part of India where we have no water carriage, by which to bring the commercial produce of the interior to the coast, good roads are indispensable to its prosperity, and would prove not less advantageous to the native population, than profitable to the European community by the extended mart they would open for the introduction of British manufactures, but which is now nearly closed, through the imperfection of the means of intercourse.

If you can find a place in the Madras Journal for these remarks their insertion, will much oblige.

Dear Sir, Yours truly

ROBERT WIGHT.

—Geology of Bangalore, and of some other portions of Mysore.— By JOHN CLARK, ESQ., M. D. *Assistant Surgeon, 13th Light Dragoons.*

It is the remark of the eminent philosopher and physician Sir Thomas Browne, that the world was made to be inhabited by beasts, but studied and contemplated by man. The world is here referred to in a general sense, including the whole world of nature—not in that local and limited sense in which the geologist would view it, who may literally be said to study and contemplate the world—the earth—the matter of which it is formed, and the arrangement of all its parts. It is only over that portion comprehended in the command of its great Creator "and let the dry land appear," which employs the study and contemplation of the geologist. That which the ocean covers, is, like many mysteries in the science, hidden from our eyes, although still open to conjecture. How a world has been formed, is not so much the study of the geologist, as how it has been altered—and two modes have been followed in investigating this subject—that by conjecture, and that by observation. The first was much employed in the infancy of the science, and the last has happily replaced it. It is only by observing the changes constantly taking place, and the forces or causes which may lead to these changes, that correct and philosophical data can be established. Too much must still be left to conjecture, and it is extremely easy by a well developed organ of constructiveness, to form a

world within our little minds, and alter it by our puny imaginings—a world built indeed upon a sandy foundation. Of the conjectural manner of explaining things, such *has* been, although such is not now, the tendency of the science, and it is our inability to enter into the mysteries of time and eternity—the impossibility of throwing the mind back to that beginning when light shined out of darkness, and of understanding the forces which then operated, that has attached to geology the character of not being one of the exact sciences. The "light which shined in darkness" we only darken by our comments, and it is with us as with the darkness which Scripture tells us "comprehended it not."

In the history of the earth there are but two grand geological facts recorded—its formation and its submergence for a time under water. The universal flood, taken so much into consideration in accounting for the present appearance of the earth, has, perhaps, in its influence, with reference to this portion of the globe, been over estimated—may it be supposed that there was a sudden subsidence of the waters from this the Old Continent, leaving it as it came from the hands of its mighty architect, *ready to be again peopled*, and that there was a gradual retirement of the waters or of the ocean from the new world, with new depositions, and as it were fresh creative bursts—forming and reforming. But leaving what *has* occurred, to what is daily taking place, something may be here said of the agents now in operation which may have altered the surface of that part of the country, the mineralogical features of which are about to be described. And first of decomposition, and its chief agent heat—as the human constitution is susceptible of the effects of heat, so are the rocky masses which cover the country and are hourly crumbling into earth. The rays of a tropical sun act so powerfully that a rock when touched communicates to the hand a burning sensation, and the consequence of this heat, is a state of expansion. As soon as by the setting of this powerful luminary, the great agent in expansion, the cold evening breezes begin to affect the heated rock, condensation follows; and this daily process of expansion and condensation carried on for ages establishes a crack which increases till whole masses are separated. This process of the elements is the one pursued by the natives in quarrying, as they invariably burn logs of wood over the rock to produce a state of expansion, and then sometimes but not always throw cold water upon it—an excellent example of man in total ignorance of the laws of chemistry, observing and imitating the simple laws of nature. These cracks are frequently both perpendicular and horizontal, separating immense cubic masses from each other, the fantastic and irregular appearance of these arising afterwards from unequal decomposition—

some portions undergoing rapid decomposition or resisting it altogether. Many small granite rocks, much exposed to the influence of the weather, exhibit on their surfaces fissures both perpendicular and horizontal, dividing them into small cubic masses, showing distinctly on a small scale the mode of decomposition and separation. It may be remarked, that even the earth from the decomposed rock, when again in some measure by the influence of the sun consolidated into a sort of hardened baked earth, exhibits similar fissures.

Oxydation or oxygenation is another process by which the earth's surface in India is undergoing a great change. In my paper on the lateritic formation this was entered into at some length. To hyper-oxydation and decomposition are owing the lateritic, lithomargic and *intermediate* formations. The lateritic formation is of two kinds—one arising from the hyper-oxydation and decomposition of a rock in *situ*, and the other, from the decomposed materials being afterwards carried by water to a distance, forming a species of detrital laterite. Over the country in every direction, but chiefly in the neighbourhood of the cantonment, deep water-courses or nullahs exist, formed apparently in the following manner, and prevail where the soil is of a red demi-lithomargic character. During the very hot season, the sun acts so powerfully as to produce fissures and cracks all over the ground, and during the rains the water rushing along passes down into these fissures, and large massses of earth give way, forming in time these nullahs or water-courses, which generally terminate in tanks. Tanks abound all over Mysore and are extremely dirty and muddy, and contain a great deal of fine soil, carried thither from the neighbouring fields. The decomposition of rocky eminences into soil, and the delivery of this into the valleys by the rush of water, must tend to establish a more level state of the country.

Near many of these tanks, or where tanks have once existed, the kunkar deposit is often found. Between Mundium and Madoor, on the high road to Seringapatam, there is a very extensive valley, where kunkar is seen accompanied by the black cotton soil; and close to the Mundium tank, in the dry season when the water is low, an impure carbonate of soda and muriate of soda cover the ground like hoarfrost, and small calcareous nodules the size of marbles are intermixed with it. A very interesting question now intrudes itself, viz. how is this kunkar formed? and next to the laterite formation, is the most important with respect to Indian geology.

Kunkar, so universally distributed over India, is considered to be a species of calcareous tufa, divided into that of old formation, and that

which is daily forming. Professor Jamieson says "The first, (the old), "appears to have been deposited from the waters of lakes that formerly "existed in limestone districts, but which have long since disappeared." Of the last he says "The waters which flow along the surface of the "globe and which are charged with calcareous earth, deposit it on the "districts they traverse, and thus form tufas which are either porous "or compact, and are of the newest formation." The best example of the old formation I found in the neighbourhood of Goondlepett, about 30 miles from the bottom of the Neilgherries, and extending towards Mysore. The country there is flat, with few undulations, and with the appearance of having perhaps once been much covered with water. The calcareous tuff in that locality, is either compact, or loose and earthy in texture. The compact I found on the road between Goondlepett and Sindhally, jutting out about 2 or 3 feet from the ground in rounded masses, and sometimes with a most irregular and almost pisiform surface. On being broken into, it showed in the most compact specimens a sparry semi-crystaline appearance, with round darker coloured brown spots—in many of the specimens crystals of quartz were imbedded or attached, and some had a cavernous appearance. It might almost be called a calcareous conglomerate, and answers exactly to that described by Colonel Cullen as existing at Cuddapah, forming many of the inclosures, which indeed it did here. The softer and more earthy kind of kunkar I found in the ditch at Goondlepett, immediately under the soil and covering hornblende and actynolite slate; and an excavation inside the fort showed the same—a bed of kunkar, of a water-worn, irregular and almost coralline appearance. Some of the specimens in the ditch were of a brown approaching to red colour, with pieces of hornblende and actynolite imbedded, described by Dr. Benza, and forming as he says a real breccia. In the rocks, of which the fort is constructed, are some of calcareous spar, and it is more than probable deep sections in the surrounding country would show a limestone rock.

In districts such as this, where the old calcareous or rather kunkareous formation exists, and in many places in India where limestone abounds, the modern kunkar formation can be satisfactorily accounted for. But there are many tracts in India and in Mysore where no trace of ancient kunkar is to be found, and where there are no limestone rocks. How then it may be asked can we account for the formation of this kunkar? Long did I endeavour to do so, but in vain, until a deep section near the road between Mundium and the French Rocks opened up to me some views on the subject. In the section there was decomposing gneiss with beds of hornblende slate, and thick veins of a calcareous substance

somewhat resembling kunkar. In a valley immediately below, there was much kunkar, and a calcareous and clayey soil prevailed for some miles before reaching this place. Near Periapatam, which is not far distant from Coorg, other veins of the same kind were observed, which first directed my attention to the mode in which the far famed black soil of India may be formed. Are these veins from the decomposition of calcareous spar, which we know occurs frequently in hornblende slate? Wherever I have found much kunkar I have remarked that very few rocks elevated themselves above the surface, most likely all of them having undergone decomposition, and the ground has generally looked as if it had once been much under water. I think also that the formation has existed generally in a hornblende neighbourhood—an analysis of hornblende shows that much lime enters into its composition, and perhaps an analysis of hornblende rocks in India might show a larger proportion than even what is met with in Europe. In districts, then, where this ancient kunkar exists, or where limestone abounds, we are able to account for the modern formation, as the calcareous material is afforded, which water takes up and again deposits: but in these localities, where neither ancient kunkar nor limestone is to be found, the only mode of accounting for it, is by taking into consideration the calcareous veins in the decomposing rocks, as seen in the section above mentioned, or allowing for the decomposition of hornblende and granite rocks, containing carbonate of lime. The celebrated Voysey, in his second Report on the Geology of Hyderabad, says of the granite "in several places I have found carbonate of lime a constituent, the quantity very small and only to be detected by effervescence in acids, and a tufaceous limestone is found through the granite in nests and beds."—He again alludes to it as "veins of an earthy carbonate of lime."

Kunkar of an ancient formation has just been described, and one of its localities in Mysore mentioned; but there is another kind found in nodules a few feet below the soil, not in large masses or forming a conglomerate or a breccia. I have found it connected with a black soil, and much hornblende on the surface in small decomposed pieces. These nodules are carried away in baskets to the kilns, and when burnt afford chunam or lime for architectural purposes. I believe it is not considered a very fine kind. The modern formation of kunkar is common, and is found either in small pieces, the size of marbles, strewed over the ground, and sometimes along with an impure carbonate of soda or muriate of soda, or in larger pieces several feet below ground, accompanied with much clay—one locality of this last, about 8 miles from Bangalore, at Madapullay, on the Madras side of Kistnarajaporum, I may here describe.

The nodules are found about the depth of seven or nine feet from the surface. There is first a whitish brownish earth to about the depth of two feet, then about a foot of white clay, to this succeeds a blueish clay, intermixed with a little reddish earth to the depth of 4 or 5 feet, and a blueish whitish earth or clay with lumps of kunkar imbedded in it. There is apparently always much clay connected with the modern formation, and it is likely an analysis of the rocks in the neighbourhood would show a superabundance of felspar with a considerable proportion of carbonate of lime. It is probable also that some chemical action is constantly at work, not by us well understood, but perhaps in some measure similar to that which leads to the formation of saltpetre. Besides this modern formation of kunkar in nodules, I have seen it as an earthy deposit upon rocks in one of the large branches of the Cauveri.

Before leaving this subject I may allude to the existence of small mounds in many parts of the country, and detached fragments of a substance resembling bone; of a white colour and cancelated structure, and considered by the natives to be the burnt bones of giants, and called asurhar or giant's bones. Mention is made of these by Buchanan—and a note upon the subject will be found in the Journal of the Asiatic Society of Bengal for December 1835. Lieut. Newbold, in the October number of the same Journal for 1836, gives an account of substances of a calcareous and siliceous nature found near Bellary, and in the 18th number of the Madras Journal of Science some observations on the same will be found by Dr. Benza and Mr. Cole. Buchanan, Benza and Cole consider them as specimens of calcareous tufa, which some of them most certainly are, but specimens answering to their description were brought me, picked up about twenty-four miles from Bangalore, which were of the same peculiar cancelated structure like bone, but they did not effervesce with acids—they are siliceous and approach closely to, if they are not a coarse kind of semi-opal in a decomposed state. It is necessary therefore to divide these substances so much resembling burnt bones into the calcareous and the siliceous, the last of which appear perhaps to be a sort of opaline siliceous sinter.

The soils around Bangalore and generally in Mysore, may be divided into the black or cotton soil, not common in this part of the country—2d. A rich red soil from the disintegration of rocks containing much iron-like hornblende.—3d. The common or reddish brown soil, where perhaps the iron is in a state of protoxide.—4th. A white siliceous unproductive soil, and.—5th. A clayey soil found in the valleys and below tanks. Besides these five, there is another seen to the south-west of the fort, near a small range of little hillocks of a chlorite rock contain-

ing much iron, the colour is a light rich red. A soil similar to this is to be found between Mysore and Goondlepett, and seems to arise from the decomposition of chlorite slate with an admixture perhaps of hornblende and oxide of iron.

The black cotton soil occupies, according to Dr. Heyne, four-fifths of the Peninsula of India, and the cause or causes which lead to the formation of this soil form an interesting subject in Indian geology. It was referred by Dr. Voysey to the decomposition of a basaltic trap. A passage from some notes kept during a late geological tour bears upon the present point. " Started for Periapatam-road through jungle for four or five miles—soil black, occasionally red.—After this jungly tract, the road passes through a flat country, containing a good deal of black soil, having small pieces of kunkar on the surface, and much impregnated with saline matter. Just before entering Periapatam there is a deep water-course, with masses of basaltic hornblende lying exposed. This section shows for about three feet, the black soil so prevalent over this part of the country—succeeded by a reddish yellow earth, in which were rounded masses of basalt or basaltic hornblende—below this again was gneiss in a decomposing state, containing veins of a calcareous substance similar to what was before described, and having a vertical position." Here then was basaltic trap decomposing into a reddish or rather yellowish earth. How then could it form the black soil which was above? I can only answer by saying, that further on at the bottom of Coorg, I found the same black soil and some way up, but it changed then to red without any particular change in the rock. Now having observed much kunkar for some time before reaching the bottom of these hills, I asked myself the question, whether this black soil did not originate from a jungly country being covered for some time by water, or whether it was not the result of a calcareous admixture. In many parts of the country where this soil exists I have found kunkar beneath, as at Hoonsoor and Yelwall. Hornblende and basalt, as before observed, are constantly seen decomposing into a reddish or yellowish earth, highly ferruginous; and when they do form into the black earth, is it from the quantity of calcareous matter which we know these rocks often contain? or is it from the admixture of calcareous and ferruginous matter, making this far famed soil to be of a calcareo-ferruginous nature. By analysis it has been found to yield chiefly lime and iron, and its very name of cotton ground, from that plant flourishing in it, is in favour of its calcareous origin, for the soil most favourable to the growth of cotton is that which contains a very large proportion of lime. Does not this view of things reconcile the apparently conflicting opinions of Voysey and Benza. Dr. Benza

says "since neither sort of basalt found at present in Central and South "India, decomposes into a black soil, what kind of trap and under "what circumstances different from the present, could this basalt give "rise to such a different product? Is the general opinion of the black "soil having resulted from the decomposition of the basalt one of those "that are repeated only because once told." It appears to me that the kind of trap decomposing into black soil is that which contains much lime; for on the Neilgherries, where it decomposes into a yellow clay, no lime has been found; but in the Hyderabad district, described by Voysey, he mentions as one of the peculiarities of the part, the abundance of the carbonate of lime with the wacken, the basalt &c. &c. &c. and in another place he says "carbonate of lime is intermixed with the rock whether sienite, greenstone, granite, basalt or wacken."

Bangalore is situated on one of the most elevated ridges of the high table land of Mysore, nearly three thousand feet above the level of the sea. The principal rocks in the neighbourhood are gneiss, granite and trap, the formation being entirely primitive. The grand fundamental rock all over the Mysore may be called a sienitic gneiss, for where deep and extensive sections are opened up to view, the rocky masses are distinctly stratified, and contain more or less of quartz, felspar, mica and hornblende. In these sections sometimes beds of quartz and felspar only meet the eye, forming a pegmatite—then again we may find quartz, felspar and mica, forming a true granite or gneiss, and then beds of hornblende and felspar, or hornblende and quartz, forming a hornblende slate.

All the strata around Bangalore, and also throughout Mysore, run more or less north and south, sometimes north-west and south-east, or north-east and south-west, and the trap dykes and basaltic dykes or veins, which are numerous, and cut through the gneiss, have an east and west direction, but sometimes, as near the Madras road, before entering the cantonment, north-west and south-east. A mass of gneiss, about a mile south of the road, and about two from the village of Ulsoor, runs north-east and south-west, and a basaltic dyke cuts through it, running about north-west and south-east or rather N. N. W. and S. S. E. Some very large nullahs, principally towards the west end of the cantonment, one, two or three miles distant however, show well the constitution of the decomposing gneiss, better than can be seen on the surface, where only the more solid and less perishable portions of the rocks remain. In these nullahs we meet with crumbling masses of felspar—large beds of mica or hornblende, and numerous veins of quartz. The common colour of the mica in the undecomposed rock is black, but exhibiting a variety of shades in decomposition—first, it becomes of a brownish

yellow, then a yellow with a tinge of green, and finally it assumes a sort of sulphur yellow or siskin green, the scales of mica scarcely perceptible. When, however, the mica is in contact with or near a vein of quartz, it becomes of a pinkish hue, most likely from the higher oxydation of the iron in the quartz. Immense masses of mica are often seen lying at the bottom of many of these nullahs, and feeling very greasy when touched—indeed mica in many parts of Mysore is very greasy in decomposition, approaching to talc, a talcose mica, or passing into chlorite.

It is perhaps the decomposition of a species of talc-mica with felspar, which affords the very fine white soft and greasy earth found in some of the nullahs, called by the natives shidi munnu, and used occasionally for white-washing their houses. In looking at the different appearances of decomposing mica in the nullahs, one is led to believe what Dr. Thomson says "that it is pretty evident more than one species is at present confounded together under the name of mica, though we have not yet data sufficiently accurate to separate them with accuracy from each other." Magnesia he mentions as one of the constituents of black mica, and it is very probable that magnesia enters into the composition of the micas generally through Mysore, for potstone, a magnesian mineral, is very common through the whole country, although not so in the immediate neighbourhood of Bangalore. The mica and felspar are both very abundant in the gneiss rocks—the mica, as mentioned above, generally of a black colour, and is dispersed through the rock, or in nests or even beds, and sometimes in very small thread like streaks. I have observed when there are large beds a good deal of golden mica is mixed up with it. The felspar is generally white, but frequently of a reddish tinge. The large crystals are often of a light red or pink colour, and when there is nearly a total absence of mica, and the rock approaches to or becomes pegmatite, the reddish felspar predominates.

What is called red granite by Dr. Buchanan I have found in several places in Mysore. I picked up a few specimens to the west or south-west of a very fine bund near the fort—there were no rocks of it, but merely some pieces lying on the ground—the rocks having undergone decomposition. The second place I have met with it is between Closepett and Chinepatam, and the third place between Mundium and Seringapatam. The specimens vary a good deal, but the quantity of felspar of a red colour is very great, and this felspar is of a clayey aspect and peculiar. The specimens from near the bund are alone of this red clayey looking felspar, with glassy quartz, making it a pegmatite. Those between Closepett and Chinepatam are of looser texture, consisting almost altogether of this clayey looking red felspar, with a few crystals of quartz, and numerous

small cavities of a yellow earthy powder, decomposed hornblende, or perhaps iron? Another kind is porphyritic, large, crystals of felspar imbedded, with the same microscopic cavities, this being the rock which Dr. Benza says he is at a loss what to denominate.

Not far from Seringapatam, are some rocks near the road, about 4 miles before entering the town or rather fort, consisting almost entirely of the red clayey looking felspar, with numerous small cavities of a black shining metallic looking substance, what in decomposition seems to afford the yellow earthy powder. This is a rock which I should think has at one time been rather common through Mysore, but has rapidly undergone decomposition, as it appears to contain a good deal of iron. Whilst on the reddish felspar I may mention that there are some gneiss rocks near the gardens of the Horticultural Society, where I have found occasionally some very beautiful specimens—the felspar and quartz of a pinkish tinge, with green streaks and lines, dark green needle-shaped crystals of, I think, epidote, with occasional crystals of kyanite. The next ingredient in the gneiss rocks is the quartz, which is usually of a white colour or having a very slight blue tinge, generally the first when with felspar, and the last when in veins by itself. The light blue sometimes approaches almost to an amethystine colour—small pieces of rock crystal are sometimes picked up, one fine specimen in my possession, containing iron pyrites, was found in some rocks about two miles from the fort. In a small nullah about a mile and a half to the north of the Belfry, and near the boundary hedge of the cantonment, there are large quantities of quartz crystalized into six sided prisms terminated by six sided pyramids. The hornblende, which is found in beds in this gneiss, is seen in the nullahs decomposing into a greyish or greyish green earth.

Gneiss is the prevailing rock around Bangalore, and is generally of the common grey colour, with nests and streaks of black mica, large veins of foliated felspar and quartz, and the strata often very much contorted. The process of decomposition is proceeding rapidly, and where a deep ravine exists, this decomposition is well shown—an immense rock will be found retaining its shape, but quite soft and crumbling down on being touched, veins of quartz traversing the soft disintegrated mass in all directions. In digging to any depth, as in forming wells, after removing a few feet of a brownish earth, we come upon the gneiss rock in a state of decomposition, forming a white stony earth. In the valleys all around, the felspar decomposes into clay, which is used by the potters and chatty manufacturers. Where a bed or vein of quartz highly ferruginous has existed, a quartz laterite has been formed, as on the left-hand side on going towards the fort near the Canarese school

establishment of the Wesleyan Missionary Society. A small village is built upon this kind of laterite, which differs much from that on the western coast, but is somewhat similar to some specimens obtained at Coorg. In some places, as towards the west end of the cantonment, near the very last building appropriated for the stand of arms of a native corps, a thick bed of pebbles is seen below the soil, forming what Dr. Benza would call a lateritic or quartzy detritus.

The highest hills in the immediate neighbourhood are about 4 or 5 miles from the fort to the south of the Kingaree road—these hills run north and south, and are of gneiss and granite with occasionally hornblende slate in the declivities. Hornblende slate is found in several spots jutting out of the soil, chiefly on the west side, its principal locality is in the direction of Kingaree, and near the high hills just spoken of. Basalt is pretty common either in dykes or veins, and, also chiefly to the west, trap dykes the same. These last I shall now describe, but it may be as well first to observe, that there are four principal roads leading into and out of the cantonment—the east or Madras—the south-west or Seringapatam—the south or Trichinopoly and the north or Nundidroog and Bellary. Besides these, there is one about due west, leading to Severndroog, and another about north-west leading to Sera and Chittledroog.

About 8 miles on the Madras road, close to a village and valley where there is much kunkar, and from whence Bangalore is chiefly supplied with chunam, there are several hornblende rocks near the road, and a range of the same is observed running about north and south. This range of trap rocks runs for many miles. On descending the last hill but one on the same road, before entering the village of Ulsoor, and about a mile and a half from it, a trap dyke is observed on the right-hand side. If we now leave the road and turn off to the left in a southerly direction, on a line with this dyke and about half a mile from it, we come upon some black rocks of basaltic hornblende, the continuation of the dyke seen near the road. This basaltic hornblende almost in some of the specimens passes into basalt, and a large gneiss rock a few yards distant from this trap dyke has a basaltic dyke cutting through it—the strata of the gneiss about north-east and south-west, and the dyke north-west and south-east or more correctly N. N. W. and S. S. E. The basaltic dyke in length is about 78 paces—its greatest breadth about 2 feet, and the least about six inches—towards its smaller end a vein of basalt is seen running parallel with it.

We will now take a jump geological and transport the observer to the west end of the cantonment, placing him in a road which leads from the Infantry review ground to the pettah. This road is lined on each side

with trees, and must not be confounded with the military road, less than a quarter of a mile to the eastward of it, which also leads to the pettah. He will here observe another dyke running about east and west. It is seen first in the road, and protruding in rounded masses in the adjoining field; its dark appearance well contrasted with the grey of the granite through which it has burst—the soil resulting from the decomposition of the two is also well contrasted. The greatest breadth of this trap dyke is about 70 paces. On nearly a line with it and going westward, and across a large field, a confused group of granite rocks is seen with a large one of irregular shape perched on the top—one portion of it having been taken away for purposes of building. I mention this elevated portion as it forms a good guide in searching for a dyke of basalt close to it, in the same mass of rock, and only a few feet from it. By the mutual processes of quarrying and decomposition, only a very small portion of the dyke is here visible, and attached to the granite, but on looking to the west end of this group of rocks, distant about 30 yards, the continuation of the dyke is seen running east and west—in breadth two feet at its east end—about 30 paces in length and at its western extremity about two feet three inches in breadth. The granite rock it traverses has a smooth rounded outline, is compact and difficult to break, when broken into exhibiting numerous pinkish dots, the felspar in some places of a light flesh colour and some garnets distributed through it. I picked up a specimen of magnetic iron ore close along side, lying in the field. This basaltic dyke runs east and west and is on a line with, but distant about 27 miles from, the large and celebrated rock of Severndroog, seen rising majestically from the numerous smaller hills around it. Sivagunga lies more to the north-west, and is about the highest hill in Mysore. But to return to the dyke—about 15 paces to the south of it a smaller one is seen running in the same direction and through the same granite block, it is 5½ inches broad at its west end and three at the other, and about 15 paces in length, and deserves more the name of a vein than a dyke—in one place it has suffered displacement. On retracing our steps back to the elevated mass occupying the west end of this group, a small road is observed passing close to it, and leading to a very large gneiss rock in the direction of the pettah—crossing this small path is another dyke of basalt. It has undergone decomposition, and only a few pieces protrude; it is most likely connected with either of the two last described, from which it is distant about 30 yards. Several hundred yards further on in the same field, going west or a little to the north-west, close to a small valley across which a bund has been thrown, there is a

large gneiss rock much quarried, upon which a rude mud hut has been erected. Near this hut another basaltic dyke or vein is seen running about E. N. E. and W S. W. the strata of the gneiss about N. W. and S. E.; it is 57 paces in length, it seems to have entered from the westward, where its breadth is 8¼ inches, takes rather a zigzag course, and at last becomes small and thread like, and is lost in the gneiss. In two places the basalt of the dyke has decomposed on its surface into a brick coloured looking substance.

Crossing the bund, and entering a spot where there is a good deal of cultivation and many trees, we arrive at a tank not of very great size, and not to be confounded with a very fine one near and close to the north-west gate of the pettah. As there is a peculiar arrangement of rocks close to the bund of this tank I will first describe them, before proceeding to the further account of the trap dykes. A large black mass, close to the end of the bund, is seen running down with a considerable slope, and is lost in the tank. At a distance it looks like a basaltic dyke, which I at first took it for, but it runs with the strata, does not cut across them, and is not basalt but hornblende slate. It is a large mass of hornblende slate, perfectly dyke-like in its appearance. The gneiss near it has a very slaty appearance, and contains very little mica, and next to it there are large masses of a very slaty rock of a grey colour, the strata perpendicular to the horizon—it appears to be a sort of argillaceous chlorite slate. Between this chlorite slate and the dyke-like hornblende slate, the gneiss rock, as just described, has undergone alteration, and assumed a slaty aspect. The observer now finds himself on a road which leads into the pettah; and about a hundred yards from the spot now described, there is a small tope of trees and apparently the continuation of the trap dyke which was seen about half a mile off bursting through granite—this dyke crosses the road, and is seen for miles stretching in a westerly direction, forming little elevations. If instead now of following the road which leads close to a very magnificent tank, and enters the pettah at its north-west angle, we turn off to the right and take the road round the pettah wall, some way on we find a road leading out of the pettah and taking a course about due west—this is the road to Severndroog formerly alluded to. There are some rocks to the south-west of this road, where the geological observer will find another basaltic dyke running about east and west—he also now finds himself in the very region of rocks, in the midst of which there is a very large village and several sawmy houses cut out in the rocks. In a direction further on again, he comes into the high road leading to Kingaree and Seringapatam, which I will now pursue, but

commencing at the gate going out of the pettah and near the fort.

A very short way after leaving this gate, a trap or greenstone dyke is seen close to the road on the left-hand side running for many miles to the westward—it here contains a good deal of felspar, and has numerous needle-shaped crystals of a white colour—this dyke cuts through granite containing very little mica, and is continued on for several miles. About two miles from the pettah gate, it is seen rising into two or three small hills on the left and close to the road. Here the trap assumes a basaltic appearance, and a regular dyke of basalt is observed passing through a granitic mass which lies between the trap rocks and the road, distant from the last about sixty-five paces. I here found a piece of micaceous iron ore. Some rather high granitic rocks are seen on the other side of the trap dyke, forming one end of a large bund which is worth inspecting, and which has been cut through—the masses of granite heaped together in a most confused manner. But resuming the trap dyke, which, as just observed, here forms two hillocks, it now passes to the other side of the Kingaree road, and extends as far as the eye can reach, forming slight elevations. On the other side of the road, and near it, there is a gneiss rock through which a vein of basalt passes, and from this rock a very extensive view is afforded. The trap dyke is seen on the left, near the road, and another is observed to the right, and they both run along for many miles. The one on the right of the gneiss rock is not so broad, but is in large tabular masses, not in rounded blocks, and approaches to regular basalt—a ravine between the two shows beds of pegmatite and of hornblende slate.

The region now under description is quite igneous, the specimens of trap varying in appearance, but more or less either regular basalt or basaltic trap. From this gneiss rock, the trap dyke, before described previous to coming upon the Severndroog road, is also seen. On returning to the main road, and passing through a small tope, the road continues along, leaving the first described trap dyke which stretches out to the west, the direction of the road being now about south-west. A quarter of a mile on, a basaltic dyke traverses the road east and west, the stratification of the rock through which it cuts being north and south—the breadth of this dyke about one foot, two inches. Continuing along this road for some way, a small stream is crossed, granite and gneiss rocks on each side—further on another small stream is passed, and now we find hornblende slate very common. Turning to the left, and following this stream on our way back, large masses of hornblende slate are exposed in the bed of the stream, and near this we come upon a rather high range of granite hills running north and south—the highest in the immediate neighbourhood of

the cantonment. To the south of the small stream, and near the granite hills, two conical and darker coloured hillocks are seen, consisting of chlorite, hornblende and actynolite—the specimens internally of a greyish green or blueish green hue. It is more compact than the generality of the chlorite rocks, and seems to be an intimate admixture of chlorite, hornblende and actynolite. Two miles nearer the cantonment, there is a conical hill, of the same appearance, but not so high, with several small hillocks running from it and taking a south-west course. The largest has a few shrubs growing from between the blocks, which lie in an irregular manner together, glistening in the sun—colour externally of a greyish or greyish blue, with very small holes or cavities, giving the specimens a somewhat variolated appearance. Some particularly in decomposition have a red, iron rust aspect; these contain much iron, internally of a greyish green with small cavities, containing oxide of iron, and when these are abundant it assumes in decomposition a reddish colour. It consists chiefly of chlorite and oxide of iron, and perhaps there is a little hornblende or actynolite. Following up the little hillocks which run from it, a good deal of quartz pebble is found covering the ground, and much magnetic iron ore distributed about, with large pebbly looking bodies, and pieces of what might be called iron stone, of a brown colour externally, black within from numerous crystals of iron ore, which, with some few small crystals of quartz, decompose into a species of iron clay of a brick red colour and quite indurated.

Chlorite rock is not uncommon in various parts of Mysore, and the hand specimens differ greatly even in the same locality, as in the immediate neighbourhood of the Mooty Tallao or Lake of Pearls, near the hill of Mailcottah, famous for its sanctity and its jewels. I have now before me a great variety of specimens many of them from between Madoor and Mundium where it abounds. One conical hill, upon which a pagoda is erected, on the right of the road, some few miles before reaching Mundium, is in appearance similar to the chlorite hills just described. I did not visit this hill, but the rocks on the road side, and on a level with it, are of chlorite with actynolite, a chlorite rock or slate either alone or with an admixture of hornblende and actynolite, as observed above, is not uncommon, and prevails between Mundium and Madoor, and in the neighbourhood of the Lake of Pearls. Besides the oxide of iron which it contains in nests, iron shot quartz is found and cubic crystals of brown iron stone. The specimens in my possession seem to answer to Dr. Maccullock's second subdivision, varieties. E. F. and G. Chlorite, talc, and potstone pass much into each other, and are arranged by Mr. Allan under the same head—talc comprehending the lighter varieties, and the last, when very coarse and indistinctly granular, forming potstone.

The geological enquirer labours under many disadvantages in India—the climate is constantly opposing him, and the condition of the inhabitants and state of civilization such, that few deep sections ever meet the view as in happier and less barbarous climes. The enquirer in other lands, has only to observe the stones used in building the houses of the inhabitants, from whence he may form some idea of the principal rocks in the neighbourhood; but in India, where mud takes the place of stone, this cannot be done, and we must be satisfied with the sections or nullahs naturally made, in the absence of artificial ones, and betake ourselves to these and to the large wells and tanks, the bunds and sides of which are constructed of stone. In his scientific investigations, the geologist is one, who daily realises the old classic adage, of truth being at the bottom of a well, that is, deep in the bowels of the earth. Of these nullahs three very large ones exist near the cantonment—one about 2 miles from Ulsoor on the north side of the Madras road—another close to the Infantry butts, and another about a quarter of a mile to the south of the Belfry. In many of these the decomposed masses of earth are of a beautiful pink colour, and have assumed a conical shape—I may describe a smaller one, which is distant about a mile and a half west from the Infantry butts, running about east and west, and terminating near a small village—it is somewhat different from the others, and I select it in consequence. At the upper or west end, beds of hornblende slate are exposed, then beds of mica or rather chlorite, sometimes the two running into each other, and decomposing into a yellowish green earth—a little way down the decomposing rock is almost a pegmatite, much red felspar with quartz, with a very slight coating or tinge of chlorite of a yellow green colour—the mica and hornblende are found again predominating, then further on the felspar and quartz—some masses close grained and passing into eurite. At the bottom of the nullah there is a village, as before mentioned, and much hornblende slate with veins of quartz running through it, giving the rocks much the appearance of flinty slate—pieces are lying about of a ferruginous dark appearance from the hyper-oxydation of the iron in the hornblende and quartz. Lying at the bottom of the nullah towards the top, there is also a species of soft chlorite slate. What is called the Belfry, is a small spot of elevated ground, upon which a pagoda, or rather tower, is erected, to the north of this nullah—it consists of lithomarge, and is said to be the highest spot of the table-land of Mysore. The elevation is one mass of lithomarge of a mottled red and white colour, which adheres strongly to the tongue and feels fine and greasy. This

hill of lithomarge confirms me in my views respecting the lithomargic formation, as entered into in other places. It has resulted from the decomposition of a rock or rocks containing hornblende and felspar—the white showing the felspar—the red the hornblende. Basalt has also most likely been contained in the rock originally, for besides pieces of felspar, of hornblende and of quartz, found lying on the surface of the hill, there were some of basalt. I also picked up one piece of magnetic iron ore. Upon the surface of this hill, or rather mound, are small nodules, of a brown colour and quite hard. On breaking into them they are of the colour of brick, with white specks diffused over them and irridescent blue iron spots and streaks; they resemble the pebbly looking bodies found in the chlorite rock along with iron stone. Now these indurated specimens seem to be those pieces of the rock before decomposition which contained much iron. By the kindness of my amiable and excellently informed friend Mr. McGrigor of the 39th regiment with whom, in geological brotherhood, I have visited all the places hitherto described, I am indebted for some specimens of a similar kind to the last, forming small elevations in the neighbourhood of and beyond Nundidroog. Surface irregular and of a reddish brown colour, internally brick red and resembling burnt brick, with lines, streaks and nests of decomposed felspar, as in the lithomarge just described, and spots and lines of a blue ferruginous colour. The soil in the neighbourhood of these hills is red and favourable to the growth of tobacco. These hills then seem to consist of a species of iron clay, intermediate between lithomarge and the laterite of the coast. From minute inspection of the rock, and in agreement with former views on the subject, I consider it entitled to the name of laterite, although it is scarcely cavernous. A study of these specimens, shows the passage of indurated lithomarge into clay stone or laterite. If the original trap rock from which it was produced, contained more felspar than hornblende, and not much iron, lithomarge is formed; but if the rock originally contained more hornblende than felspar and much iron, then the clay stone or laterite is formed. It is this last rock, I should imagine, which is described by Voysey, under the name of iron clay, forming elevated table-land at Beder.

Nundidroog, distant 35 miles north from Bangalore, rises in three majestic hills from the surrounding plain—at the distance it has the appearance of being only one hill, but there are three—one being thrown back some miles does not deserve to be included. It is said to be 1700 feet high. A peculiar kind of granite was brought me from here, but whether from the hill or not the person who brought it could not say—he thinks it was—he forgot to make a memorandum at

the time, and it was in the same bag with others. It looks an aggregate rock—large crystals of grey quartz in a confused mass of felspar of white colour, with only a very few of the very smallest scales of mica, scarcely perceptible. To the west of Bangalore, some most picturesque and beautiful hills are seen running in a direction about north and south. They are of various sizes and show a variety of shape—some of the smaller, peaked, but the greater number having a somewhat cupola or dome shape, mentioned as peculiar to porphyritic granite, which they are. In the midst of this range a large rounded mountain is conspicuous above them all, Severndroog, once famed for its strength as a hill fort, and now still famous for its unhealthiness. The country in the neighbourhood is of a wild and wooded character, which first commences about 3 or 4 miles beyond Tauverkairy, 13 miles from Bangalore. This range of hills is between 20 and 30 miles from the cantonment. About 4 miles beyond Tauverkairy passes the Arkawutty river, the largest in this part of Mysore. In its bed are some beautiful specimens of granite, with red and green felspar, and the mica in decomposition, giving a greenish tinge to the rock. The road after crossing the river ascends, and there is a pass through the hills and rocks which are elevated above the surrounding jungle. The rocks are of granite, showing more or less the porphyritic character—the felspar both red and white. I possess some beautiful specimens which I found lying about, consisting of green felspar with blueish quartz and crystals of red felspar distributed over them, some of the specimens are of red felspar with a chlorite tinge in some places—other specimens again are entirely of green felspar.

Severndroog and the surrounding hills are of porphyritic granite—more marked in some than in others—the felspar red and the mica greenish black. Much trap is seen lying about the road in small pieces, and it is very conspicuous in the rocky hills, giving them a dark appearance in certain places. I have never proceeded further in this direction, but my friend Mr. McGrigor sent me some specimens which he picked up between Coongul and Belloor, apparently a very interesting tract of country: the specimens are trap, of which many of the hills seem to consist—flinty slate, talc slate, actynolite, and chlorite slates, and a species of chlorite porphyry, the felspar red. This is the main road to Semooga, the present capital of Nuggur or Bednore. At Chineroypatam is the famous statue cut out of the solid rock, and near Belloor are the ruins of Hallibede, both of which are well worthy of inspection. Not far from here, are the Baba-Booden hills, giving origin to the Badra river, which uniting with the Tungha near Semooga, forms the Toombuddra. By the kindness of two very zealous and talented botanists,

Lieut. Munro and Mr. Gough, I have been favoured with some specimens of which they say the Baba-Booden hills principally consist. Flinty slate and quartz rock seem common, and are much impregnated with iron. One specimen of flinty slate, or perhaps what Buchanan would call hornstone, affects the magnet, and another is full of particles of iron sand, granular magnetic iron ore. I possess two kinds of the magnetic iron—one an amorphous mass, of a reddish blue colour, highly magnetic, and possessing polarity in a very great degree—in fact the natural magnet or loadstone, apparently the same as found in Siberia and the Hartz. The other specimen or specimens are slaty, tabular slaty masses, externally of a brownish yellow tinge and internally of a dark purple colour. This slaty kind is also highly magnetic, and exhibits polarity in a very high degree. Besides these, there is hæmatitic iron ore, and its passage into a rock which somewhat resembles laterite. An argillaceous potstone seems also to be common; it is of a yellowish brown colour, very soft and greasy, and is I imagine the talcose argellite of Buchanan, some specimens more argillaceous than talcose, and others more talcose than argillaceous.

Another kind of stone I possess of a dark colour externally, but internally of an olive green black, very soft and rather greasy—it is used for manufacturing gods out of. I have not seen it in any other part of Mysore, it may be called a talcose hornblende, being a mixture of either talc or perhaps potstone with hornblende. In the specimen described, the talc predominates over the hornblende, but in some, found between Mysore and Nungengode, the hornblende predominates over the talc and is of a green colour. I am not aware that this rock enters into the formation of the Baba-Boodens, but it is found in the neighbourhood.

The rocks then forming these hills are flinty slate, quartz rock, both much impregnated with iron, the granular magnetic iron ore. Hæmatitic iron ore, slaty magnetic iron ore, and the same in amorphous masses, and argillaceous potstone.

The whole of the Nuggur or Bednore district of Mysore abounds with iron, which I am told fetches a very high price in the Bombay market. At Hurryhur, distant from Bangalore 185 miles, and according to Heyne 1831 feet above the level of Madras, and probably the lowest point in the whole of Mysore, Buchanan tells us the basis of the country is somewhat between an argellite and schistose hornblende, and between the strata of this argillaceous hornblende slate are masses of an earthy quartz or hornstone impregnated with hornblende.

I will now describe some portion of the south-west part of Mysore,

proceeding to the bottom of the Neilgherries, and then turn off at Mysore in the direction of Coorg. The Kingaree road has in some measure been before described, granite and gneiss rocks, with several trap dykes, and much basalt and basaltic trap. About half way hornblende slate in large beds is very abundant, and the country very bleak, and only very slightly cultivated—soil stony and unproductive. Between Biddidy and Closepett the country is wooded, very little cultivation and much pasture land; as we approach the last mentioned place the masses of rock near the roadside are of porphyritic granite, the felspar of a light flesh colour. Closepett, or Ramgiri in the native dialect, has a most picturesque locality in a valley close to the Arkawutty river, enclosed on two sides by hills of considerable height. There is much dense jungle around, and the rocky hills, shaped like Martello towers or bastions, rise up from amidst the jungle. The porphyritic character of the rock is here better marked than in the Severndroog direction, for these belong to the same range. The country immediately on the other side of Closepett is still wooded, but the hills are of much less elevation, and have lost the porphyritic character. To the north of the road there is gneiss, full of garnets of various sizes, strata of the rock running about north and south: and on the road, and bordering it, are detached specimens of a heavy ferruginous looking stone, consisting seemingly of quartz and hornblende.

About half way towards Chinepatam, there is a temple dedicated to Hanuman, the very wonderful monkey god, who with chivalry for distressed damsels perfectly quixotic, led an army over to Ceylon, and delivered from thraldom a beautiful princess. Near this temple are some red rocks, looking at the distance like ant hills. This is the red granite of Buchanan, and has before been described—it chiefly consists of red felspar of a very clayey aspect. A little way beyond this the hills recede, the country opens, and a flat cultivated plain extends on the right, some jungly hills still on the left. The principal rock around Chinepatam is gneiss, but different from the rock round Bangalore, here it is red instead of grey. Around Bangalore the quantity of black mica, with the white felspar and quartz, gives the rock a grey appearance, but here the specimens are beautiful from the quantity of red felspar in patches, veins and streaks. The country continues open, much wet cultivated ground for some miles, succeeded by open plains covered with small bushes, chiefly the *cassia auriculata*, which is very common and used for tanning—very few stones or rocks on or near the road, and those containing red felspar with small garnets. Further on the road becomes very sandy, the soil showing a saline impregnation, and topes of toddy trees cover the country. In the river Madoor, which, as usual with most

of its class in India, contains more sand than water, gneiss is exposed, and many of the pebbles of quartz picked up are of a green colour from chlorite—water-worn pieces of kunkar, like finger coral, are also mixed up with the sand.

Madoor is close to this river, and is a small and as usual dirty village, with much cultivation in the neighbourhood. On leaving Madoor there are some hornblende rocks on the right and close to the road—hills now at considerable distance—ground in long swells, and covered with stones and long grass—pieces of quartz and hornblende on the road, very few rocks. Hornblende slate in various places is seen passing across the road, with much iron sand in the nullahs. About four miles before reaching Mundium, and previous to descending into a very extensive valley, containing much black soil, a small conical shaped hill, with a pagoda on it, is seen on the right-hand side of the road, but distant. It has the same form as the chlorite hills near Bangalore; on the road chlorite slate is picked up in several places, and just on entering the valley there are several rocks of chlorite and actynolite—brown exterior, internal surface decomposing and ferruginous. These specimens vary much, some are altogether of chlorite, others of chlorite and actynolite, the needle-shaped crystals of the last very distinct, and some are very hard and close grained—an argillaceous chlorite. In one place the rock was porphyritic, the basis chlorite with crystals of white felspar imbedded. This valley contains much black soil, with kunkar, and on the Mundium side a stream runs along which has exposed the rock viz. gneiss with large beds of hornblende slate—the felspar in this gneiss of a snow white colour, with silver mica. Near the bungalow at Mundium, outside the wall, are several rocks of hornblende, and on the other side of the large tank salt is manufactured, but of a very impure kind. It is obtained from the soil which in several places betwixt Mundium and Madoor is full of it, and in which the palm flourishes.

Two or three miles from Mundium on the Seringapatam side, the soil is calcareous and clayey. Small pieces of kunkar, like marbles lying about—the ground low and as if once much under water—some hills of slight elevation, running parallel with the road on the left-hand side, and most likely consisting of chlorite slate and actynolite slate, as some specimens were found forming a water-course which passed over the road, along with a porphyritic rock, met with, and to be described, in the bed of the Cauveri near the Wellesly bridge at Seringapatam. In a deep nullah near the road a little way beyond this spot, gneiss rock exposed; felspar red, with beds of hornblende slate, and veins of a calcareous substance resembling kunkar—kunkar in a valley below. Towards Seringa-

patam the country becomes more elevated and barren, much quartz covering the road. Sometimes quartz rock jutting out of the ground, but principally hornblende slate—the road then passes through a range of low hills terminating in the Corighaut hill.

This range of low hills, better seen coming from than going to Seringapatam, is of smooth outline—no deep valleys between—one hill running into another, peaked slightly at top, and sloping down, meeting another of the same formation, and well contrasted with the porphyritic granite of the French Rocks at the distance. These hills of low and smooth outline, and through which the high road passes, are of chlorite slate—the chlorite of a beautiful light green colour and glistening—much quartz in small pieces lying about, and the gneiss rock showing the passage into mica slate. In one spot on the road, the union existing between hornblende, actynolite, tremolite, and asbestos, was well shown, as mentioned by mineralogists, and it would have been difficult to define well and clearly which they decidedly belonged to. Here also there are some rocks of the red stone before mentioned, containing principally a red clayey felspar, with small microscopic cavities of a black shining metallic substance. This region is altogether a very marked and slaty one—the country rather elevated, and very bleak, and with not the least cultivation. As we approach Seringapatam, trap dykes are observed on both sides of the road.

Seringapatam, a place of such classic military celebrity, lies low, and in a valley, high ground on three sides of it. It is built upon an island, formed by the branching of the river Cauveri, 2,412 feet above the level of the sea, and therefore between five and six hundred feet lower than Bangalore. It is a place possessing much interest both to the military and medical man. The eye of the last wanders over it, questioning the reason of its unhealthy celebrity. Many writers, and the very best, Mr. Geddes, are inclined to refer its unhealthiness to its proximity to a jungly tract of country, not entirely overlooking its site, but perhaps not allowing sufficiently for it. If proximity to jungle had any thing to do with it, the French Rocks, distant only six miles, would be similarly unhealthy, which they never have been. It is as healthy a station as Bangalore or any other in the Mysore country. In 1835, the 19th regiment N. I. lost only 5 men—in 1836, 11 men, and in 1837, 18 men—average for the 3 years 11. In all investigations into the sources in general of disease, we are too prone perhaps to attach importance to one particular cause, neglecting the combined influence of minor circumstances—and where one does not stand out prominent, we throw the others aside as perfectly insufficient. No jungles being close at hand, no extensive marshes in the neighbourhood,

the bed of the river being rocky and not muddy, none of the very marked features of miasma present, we dismiss the subject as incapable of explanation.

But allow me to describe Seringapatam particularly as it must have been some years ago, and the description is one that all must confess to be unhealthy—a small island, lying very low, containing a dense and dirty population, enclosed by the high walls of a fort. On looking down from one of the minarets near the gate opposite the Durria Adaulet Baug, we observe, that the fort must have been at one time crowded with houses to the very fort walls, affording a density of population seldom I should imagine equalled. Even now we observe the streets or lanes are extremely narrow, and the collection of filth very great. But density of population and filth cannot alone account for the disease, for many have contracted the fever and died in the Durria Adaulet Baug and Laul Baug. The first still exists, and is considered the public bungalow, a native palace in the centre of a fine park, one of the branches of the river passing near it. Is it here, then, lowness of position alone which is prejudicial? I believe not, and suspect miasma is combined with it. If asked what miasma is, I must borrow a word from an excellent writer, Dr. Fergusson, and say, *nescio.*

I do however believe that we may expect some light to be thrown on the subject by geology. This science has already explained some points connected with disease; the existence, for instance, of goitre in those districts in mountain tracts where limestone is the principal rock; and its not attacking even neighbouring villages, if built on granite, the water of course being calcareous in one, and not in the other. The island and immediate neighbourhood of Seringapatam show, that igneous action has been much in operation. I mentioned above that trap dykes were seen just before entering, and over the northern branch of the river a bridge is thrown, close to which there is an arrangement of rocks worthy of notice—a red looking mass, dyke-like, runs across the river, and is observed to be porphyritic—the basis a red felspar with imbedded crystals of white and reddish felspar, and innumerable needle-shaped crystals of schorl, or perhaps what might be called schorlaceous actynolite—some parts of the rock having a coating of a green substance, chlorite or actynolite. It is a beautiful looking rock, and well contrasted with gneiss, which is along side of it. This gneiss distinctly stratified, and containing much black mica. Along side of this and nearer the bridge, there is a large mass of hornstone running, dyke-like, in the same direction. Hornstone, which is common over the island, is of two shades or colours, one grey and the other blue; the grey kind is

full of elegant moss-like impressions, most likely oxide of manganese; the blue kind does not seem to possess them, but both contain imbedded small crystals of glassy quartz. On the other side of the bridge, the bed of the river is very rocky, and the rock exposed is a gneiss with much red felspar, black or blueish black mica, white quartz, and veins and patches of a light green substance, actynolite. Near this last and forming the bank of the river is a large quantity of kunkar, having a decomposed water-worn and almost osseous appearance. The surface rock on the island is hornblende, and in one place, opposite the Bangalore gate, leading to the public bungalow, it is hornstone, in large tabular masses. From observing the quantity of hornstone in the walls of the fort, I am led to imagine that it must have once prevailed much. The ditch shows gneiss rock decomposing, with beds or dyke-like masses of hornstone traversing it—some of these having a vertical, others an horizontal, position. There are also numerous trap dykes. From trap being the common surface rock, with hornstone and the red porphyry above described, we may I think call the locality an igneous one. It is perhaps needless here to mention, that igneous, or rather volcanic, countries like Italy, &c. &c. &c. are highly miasmatous. There is one point it is necessary to touch on, connected with the subject of the geology of the neighbourhood, I mean the soil. To the east and south-east of the fort there is much cultivation. I observed the sugar-cane in particular, and I may in passing just remark the general unhealthiness of those West India Islands where the sugar-cane is cultivated to a great extent. The soil in this direction is of a black colour, which I have no doubt arises from the constant state of cultivation it is kept in, and from the quantity of water obtained so easily from the neighbouring river. Where there is much cultivation, and where much water is mixed up with a soil, that soil is generally of a black colour. This water it must be borne in mind passes through an immense tract of jungly country, and must contain a very large proportion of vegetable matter. There is another point also. The bed of the Cauveri is full of large rocks which have a clean and healthy look, at least what would not be imagined miasmatous; but may not these large rocky masses with pools of water about them generate miasma? May they not absorb the water and extricate a gaseous and miasmatous principle from the rents and cracks produced by the sun's rays upon them? The granite statue of Memnon is well known to have emitted sounds when the morning beams darted upon it, and M. Humboldt, the greatest authority as a scientific traveller, mentions that from some of the granite rocks of the Orinoco subterranean sounds have been heard, resembling those of an organ, and

supposes them to be produced by the passage of rarified air through the fissures; and he seems to think that the impulse against the elastic scales of mica which intercept the crevices may contribute to modify their expression. The epidemic fevers which prevail on the Orinoco, the natives refer to the noxious exhalations that arise from the *bare rocks* of the rapids. This Humboldt remarks is worthy of attention, on account of its being connected with a fact that has been observed in several parts of the world, although not sufficiently explained. Among the cataracts and falls of the Orinoco, the granite rocks, whenever they are periodically submerged, become smooth and seem as if covered with black-lead. The same appearance is presented at the cataracts of Syene, as well as those of the Congo. This black deposit, according to Mr. Children's analysis, consists of oxide of iron and manganese (so says Mr. Macgillivray, the translator of Humboldt), to which some experiments of Humboldt induced him to add carbon and super-carburetted iron. Mr. Macgillivray goes on to say that this phenomenon has only been observed in the torrid zone in rivers that overflow periodically, and are bounded by primitive rocks. M. Humboldt supposes it to arise from the precipitation of substances chemically dissolved in the water, and not from an efflorescence of matters contained in the rocks themselves. The Cauveri overflows periodically, and its waters pass through a most jungly tract of country.

There is another circumstance connected with the river, which is this—that although there is often but little water, thus leaving bare the rocky masses, water will most likely be near the surface of the ground all over the island, and lead to dampness and exhalation. In the mornings and early part of the forenoon, a dense vapour covers the fort and island, when the neighbouring country is perfectly clear. All valleys and low positions in Mysore, are more or less unhealthy, and are much hotter in the day and colder at nights. The mean annual temperature of Seringapatam is two degrees higher than Bangalore—the average mean lowest of Seringapatam about 63—that of Bangalore 69—the average highest of Seringapatam 90—that of Bangalore 81—a difference of 27 degrees in the one, and only 12 in the other. This alone might account for the prevalence of the fever, and the other circumstances, previously mentioned, explain its malignity.

The rocks between Seringapatam and Mysore are chiefly igneous, trap and porphyry—hornblende seems the most common, and has often on the surface a most variolated aspect. There are few rocks besides the hornblende, not including the usual granite and gneiss, to be met with, but many of the buildings on the road side consist of a rock of a porphyritic character, purple brown compact felspar, with white or reddish

crystals of felspar imbedded, and numerous small pieces of schorl, not so much in needle-shaped crystals, as in dots. Hornstone porphyry appears also to be common and some of the specimens very beautiful. One in particular with crystals of red felspar in a basis of dark coloured hornstone—another kind which formed a dyke running east and west, contained very minute round or oval crystals of felspar, like the eggs of some insects, with needle-shaped crystals of schorl. I found another kind to the left of the road, the hornstone of a dark colour, the felspar crystals chiefly white, with schorl and iron pyrites. Just before entering Mysore there is much hornblende rock, giving a ringing sound under the hammer.

Between Mysore and Seringapatam there are few or no tanks, the country watered by a fine canal, which twists and turns in all directions, and is crossed six or seven times between the two places. Mysore itself lies low, under a very high hill of the same name, a thousand feet above the plain. The country around is slightly elevated; a fine red soil prevails, in some places highly cultivated. A deep section called Purneah's cut, close to the town, enables us to see the formation—the rock is gneiss, in a decomposing state, with veins of quartz and beds of hornblende slate, the mica is of a dark green colour. The gneiss rock here differs from that of Bangalore and Chinepatam, by containing much green mica, and the felspar is both red and white. This cut, according to Hamilton, is thirty miles in length, between thirty and forty feet in breadth, and sunk in some places to the depth of eighty feet through strata of solid rock. Purneah appears to have been a truly clever and public spirited man. The Government ought to erect a monument to his memory, and place it in the very centre of the town, to show how much it appreciates native talent, energy and public zeal, and as an incitement to others of his countrymen.

The stones in the fort of Mysore, within which is the palace of the raja, and those used in constructing the neighbouring fort of Mungerabad, which was commenced by Tippoo, show specimens of the rocks around. The most common is the gneiss just described, white and red felspar, very little quartz, and much green mica in stripes—then there is a rock of red felspar and glassy quartz, felspar predominating, and in large crystals, with only a few scales of mica—red compact felspar with veins of actynolite, and then a sort of porphyritic or augitic hornblende rock. Mysore hill consists of common and porphyritic granite—the felspar is abundant and is either white or with a very slight tinge of red, very light flesh colour—mica blueish and black. The porphyritic character of the rock is best seen from the road leading to Nungengode; the stones on the road used for building show it. The rock at the bottom

of the hill, near what is called the zigzag, is of chlorite and actynolite slate. The rock on the Nungengode side as shown in a large nullah near the road side, opposite the Delwahairy tank, is chlorite, or perhaps more correctly a talcose chlorite slate, with actynolite, and perhaps tremolite. Chlorite, talc, actynolite and hornblende are constantly running into each other, and the specimens are often difficult to define. In nature there are not always those decided specimens which are arranged and described in cabinets—order exists more in the mineralogist's head, than in nature—nature indeed is often very disorderly, but by systems and classifications we endeavour to tie her down.

On the road to Nungengode a chlorite slate, combined perhaps with horn blende, is seen near the above large tank, and is decomposing into a red soil It is of a red colour externally—further on, I picked up specimens where the hornblende predominated over the chlorite, or talcose chlorite—on the road side specimens of magnetic iron ore, with also some of micaceous iron ore. The private bungalow and park of Nungengode, the prettiest spot I have seen in India—the house, in the cottage style, placed on the borders of a fine river, and in a large compound deserving the name of a park, in which are the finest tamarind trees I have ever beheld. Proceeding towards the bridge, by the little path near the water side, we find a ledge of quartz rock impregnated with chlorite, and further on, granite or gneiss, close grained, with very minute specks of black mica —near the bridge much hornblende slate—in one ledge of it, a few garnets—hornblende slate continues on towards Mysore, with much chlorite or talcose chlorite on the road. In the sandy bed of the river, are pieces of kunkar, of a water-worn appearance, of a very light consistence, and like pumice.

Nungengode is a large town, *famous* or rather *infamous* for its pagoda, on which are carved figures of the most indecent character. It was here, where two hundred Jungum priests were murdered. They were called upon to attend the raja, quite unaware of their impending fate, and, on admittance to his presence, whilst bending their heads in token of submission and respect, had them severed from their bodies. Sindhully, a public bungalow about five miles further on, is built on elevated ground—few rocks around—the country covered with long coarse grass—the soil of a very light red—pieces of hornblende and quartz on the ground. One or two decomposing granite and gneiss rocks, and a section near the bungalow, from which water is obtained, shows hornblende slate, the decomposition of which I should imagine gives the colour to the neighbouring fields. On the Goondlepett side of Nungengode are

many topes of toddy trees—much kunkarious soil, with saline impregnation.

The road to Goondlepett is extremely wide, with magnificent trees, of apparently great antiquity, on each side. The country is flat, but not very much cultivated, has the appearance of having been once much under cultivation. On the road ancient kunkar, in rounded masses jutting out of the ground, and blocks of the same kind forming the bunds of some of the tanks. It is almost a calcareous conglomerate, pieces of quartz, actynolite and hornblende mixed with it, and answers to that described by Colonel Cullen as found at Cuddapah. Goondlepett, a place which some years since was almost depopulated by a visitation of cholera, is situated on an extensive plain: large nodules of kunkar jutting out of the ground, with small pieces lying about—around the fort and in the ditch much actynolite slate, and much kunkar attached to and connected with it. The stones in the walls of the fort consist chiefly of hornblende slate. There is a very pretty rock of red felspar with actynolite, and another a sort of chloritic porphyry. I found a specimen or two of calcareous spar, or perhaps slate spar. The country towards the Neilgherries, which are only distant about 35 miles, is very flat—the calcareous conglomerate showing itself on the road side, gneiss in a decomposing state, with beds of hornblende slate and pegmatite—much quartz hornblende slate and kunkar lying on the road. About 4 miles from Goondlepett, the jungly tract is entered, which surrounds the bottom of the Neilgherries and renders their approach so dangerous.

Before reaching the Tippicado river, there is mica slate in one spot on the road, and the granite, or rather gneiss, assumes a tabular shape and slaty appearance, containing much blueish black mica, a tinge of red in the rock. In the Tippicado river, and around, there is much hornblende slate in large tabular masses, like tombstones, fixed in the earth, and inclining a good deal. The road then winds round these immense mountains, the trees larger, but the jungle not apparently very dense. The Segoor Pass, leading up to the Neilgherries, is the shortest, and, under the scientific superintendence of the engineer officers, the best constructed, of all the ghauts.

The deep sections in this ghaut show hornblende rock and sienitic granite. Towards the top, a little way above what was the Sapper encampment, basalt of a black colour is seen passing into the sienitic granite, and the passage from hornblende rock to basalt distinctly seen. In the sections made in forming the road, the sienitic granite and hornblende rock are found in nodules, decomposing in concentric laminæ, like the layers of an onion. There appears to be more felspar

in the rocks in this ghaut, than any of the others, and masses of it decomposing give a chalky appearance to some parts of the road. Some way down there are beds of compact felspar, through which a green basalt has burst, and mixed itself up with, and the hornblende in the rock then becomes of a green colour, being generally black all over the hills. About Adams Peak, 4½ miles down the ghaut, garnets appear in the rock in nests, and afterwards abound in it. The bottom of the pass is about 400 feet higher than Bangalore. As the Neilgherries are not a part of Mysore, it would be out of place my describing them here, a task so ably and minutely executed by Dr. Benza.

In describing another part of Mysore, I will take a fresh departure from its capital, and proceed in the direction of Coorg. At Yelwall, distant about 9 or 10 miles, the country is elevated and rather bleak, much high coarse grass covering the ground; cultivation in the valleys. In the compound attached to the Residency, there is a good deal of chromate of iron, which was found I believe by Captain Haldane, the officer commanding the Resident's escort; it is lying in pieces on the ground, and near it a rock of hornblende slate of a green colour, which as it has a tinge of yellow externally on its decomposing surface, most likely contains a little of the chromate. At the bottom of the Residency, but outside the wall, there is a nullah, where mica or chlorite slate is exposed. The sand in the nullah abounds with garnets, some of considerable size. Kunkar is also found at Yelwall, some feet below ground, in lumps or nodules of a brownish colour, and irregular, almost pisiform, surface; the soil is inclined to black where it is found, and pieces of hornblende slate cover the ground. There is magnesite also I am informed in the neighbourhood. The road between Yelwall and Hoonsoor is through low jungle, or what in some places would with more propriety be called brushwood; quite a trap region, some specimens of the trap porphyritic, forming a greenstone or hornblende porphyry, crystals of felspar imbedded.

Towards Hoonsoor, much magnetic iron ore on the road. Near this place the country is more jungly, and Hoonsoor itself lies rather low, rising ground on all sides, hilly to the south and west, some of the hills covered with low jungle, the soil both black and red. The locality is a very interesting one, and the mineralogical features were pointed out to me by Mr. Gilchrist. Besides granite, gneiss and trap, of which there are several dykes; the granite and trap decomposing in concentric laminæ, like the basalt *en bouille* of the French, or nodular basalt of Voysey; there is in some places a good deal of a brown and rather compact but not crystaline limestone, or rather ancient kunkar, which instead of being united, as at Goondlepett, with hornblende,

actynolite, quartz and other minerals, forming either a conglomerate or breccia, is found connected with semi-opal, ferruginous opal, or jasper opal. The soil where it is found is black, well contrasted with some high ground near it, which is red, and most likely ferruginous and not calcareous. Much magnetic iron ore on the surface in some places, and sometimes attached to the semi-opal. In a most interesting spot, pointed out to me by Mr. Gilchrist, a low, ragged, and peculiar looking rock, juts out only a foot or so from the ground: it is of a brown shining aspect externally, and I think deserves the name of jasper opal or ferruginous opal, and passes into semi-opal, chalcedony and a coarse kind of jasper. Near this there is found a chloritic talc slate, which graduates into a sort of potstone. The jungly hills to the westward are of granite towards the top, with trap at the bottom; magnesite is found in the neighbourhood.

The road towards Periapatam is for some miles jungly, and then is very flat—much kunkar in small nodules on the surface, trap dykes passing across the road, chiefly of hornblende with crystals of olivine. In several places, found jasper opal, as at Hoonsoor. In a ditch near Periapatam decomposing gneiss, with vertical veins of a tufaceous limestone, and above the gneiss, large masses of nodular basalt, decomposing into a yellow earth with black soil on the surface. In the ditch or nullah, were large masses of basaltic hornblende, ringing on being struck, with a peculiar squeezed appearance, like half wrought images. I have observed this frequently in the basaltic hornblende—is it the result of igneous action under great pressure? A very flat country around Periapatam, with much water and much kunkar in the soil. The country, all the way to Fraserpett or Cushelnugger, is jungly and hilly, with small villages and patches of cultivation here and there. Soil generally black—all the hills appear to be of trap—in one place where a section was afforded, the soil on the surface was black, but reddish below. Near a village about half way, found specimens of a very coarse jasper opal, approaching upon and running into quartz; and a white calcareous like substance, with hornblende slate, decomposing in horizontal strata.

The Coorg mountains are part of the Western Ghauts, and consist of horn blende rock and sienitic granite. The geological formation resembles much that on the Neilgherries—only the hills are smaller, more generally rounded, and show a more perfect state of decomposition into lithomargic earth. Quartz veins and iron ores are not abundant, indeed of the last I saw none: and nothing answering to Benza's hæmatitic iron ore; but it is

very extraordinary how few rocks elevate themselves above the ground. We may wander over one hill and then another for miles, and not meet with a single rock. Decomposition has taken place to a great extent as shown where sections have been made in forming the roads. In some of the deep sections near Mercara much porcelain earth is found in beds in the lithomargic earth, and some of a decomposed earth answering to the shidi munnu in the neighbourhood of Bangalore. In a deep pit about two and a half miles from Mercara, a thick bed of laterite was pointed out to me by my most intelligent friend Dr. Baikie. On the top of some of the hills I found granite or rather pegmatite, and the valleys below of a whiter colour than usual. The hills at Coorg are smaller and more irregularly grouped together, with numerous narrow valleys intervening, many of them so narrow, that the inhabitants cut away a little of the lower portion of some of the hills, in order to cultivate: being able in this way to irrigate. All the valleys I saw contained a light yellow soil, and from this and an inspection of some few of the rocks which occasionally have resisted decomposition, I imagine felspar is the most abundant mineral, which with hornblende has formed the lithomargic earth. On the Neilgherries, the surface of the soil in the valleys is black, with a yellow clay beneath—here the soil in the valleys and generally on the hills is light yellow. There is another great difference in the vegetation. On the Neilgherries many of the hills are bare, or have only trees at their bottom or running up a portion of their sides; whereas at Coorg, most of the hills are covered to their very summits with a variety of trees of the most beautiful kind. The immense quantity of rain which falls (the quantity from June 1835 to May 1836 being 119.14 and from June 1836 to May 1837 87.04—for this information I am indebted to Dr. Baikie), must encourage vegetation, and the decomposition of rock.

According to Dr. Baikie the temperature is most equable, the daily range inside never exceeding 6° or 8°, often not beyond 2°. Thermometer seldom above 74, or below 60. The maximum of barometer occurs during the dry season, the highest noted being 26.220—and the lowest in July during the monsoon 25.912—the greatest daily range observed was .076 the mean .050. Mercara is 4506 feet above the level of the sea, and its mean temperature is perhaps about 68. Ootacamund is 7361 feet, its mean temperature 58.68. Bangalore nearly 3,000 feet, mean temperature about 75. The Western Ghauts consist of hornblende rock, with garnets and sienitic granite—mica is not absent—a micaceous rock with much foliated mica I found at the very top of the Heggula ghaut. Mysore is surrounded on three sides, south, east and west, by the wes-

tern and Eastern ghauts, the Neilgherries uniting the two—the passes leading down into Malabar and Canara being very grand.

Iron is generally obtained in Mysore from the iron sand, very abundant in some parts of the country, and washed down into the nullahs. On the Baba Boolen hills it is obtained from the magnetic and hæmatitic iron ores. Buchanan mentions its being obtained from two ores at Ghettipura, a village about 7 miles from Maurgree. From his description of the *Adra Calla*, it appears to be a quartz much impregnated with iron, the hard specimens called the male stones, and those in a decomposing state, the female. The other ore, mentioned by him under the name of *pyrites*, I imagine to be the magnetic iron ore, pure without any admixture of quartz; for this is found occasionally in the fields and on the roads all over Mysore. In most of the rocks around Bangalore and on the roads, pieces of a very ferruginous looking character are seen. They have the appearance of iron, but are quite light, and do not affect the magnetic needle, but when ground into dust, are attracted strongly by the magnet. I was long unable to define them, but I now think they are specimens of what Dr. Heyne calls ferrilite, a species of hornblende, and from this ferrilite much iron must be derived.

Antimony—one or two specimens of this were brought me by a native from or near the Bala-Ghauts. He says it is abundant there, and if so, it is an important discovery, for Dr. Ainslie mentions that this mineral has not hitherto been found in our Indian dominions.

Gold and *Silver* have both been found in Mysore. From what I observed at Maroondy and in the Wynaad (purgleem a direction towards the Neilgherries, I have no doubt gold exists in considerable quantity in this most unhealthy district. At Maroondy, not far from the bottom of the Neilgherries, species, or rather sub-species, of rajahs from Government the golden region. Maroondy is not in Mysore, but on the borders of it. The golden region is about a mile and a half from the village, and opposite it. A very high mountain is seen rising above the others, shaped somewhat at the top like the head of a violincello. In front of it are a smaller range of hills, and it is on the sides of these where pits are dug, and the yellow or red soil removed and washed for gold. Near these pits, and carried round the small hills, are artificial watercourses, and the soil is taken from the pits in baskets and washed there. In the watercourses, along with a very rich yellow soil, are stones of quartz. The surface of the ground is covered with long coarse grass, below which there is about 2 or 3 feet of a red earth, full of pieces of quartz, and below a rich clayey reddish yellow earth. A quartz rock is the prevailing one in the Wynaad, as far as I could observe, and in many

s at Mellialum is auriferous—it is from the decomposition of soil that the gold is procured. Gold was discovered in the rovinces of Mysore by Lieutenant Warren of H. M. 33d regi- 802—he found it in the small nullahs, or ruts, or breaks, in the it Warrigum, a small village 4½ miles S. W. of Battamungalum i the banks of the Palar river, and the Ponian, near Caargory— ad of this earth near the last, he obtained three sparkles of e found gold also at Marcoopium 3 miles south of Warrigum— ere were mes worked by the natives. Tippoo had worked , but desisted on finding that the produce just balanced the . The strata described by Lieutenant Warren as existing in ent mines do not agree, but the ore was found in large stones, eous or quartzy nature, of a black changing to deep rust colour, generally adhered a deep orange soft substance. Within the act the proportion generally obtained by him was *one* grain of ld out of 12 baskets of earth taken at random.

lum is found at Mundium near Seringapatam, and in other parts e, as at Tippity Beygoor, three days march from Bangalore, and tah, about 12 miles from Beygoor, 9 miles from Bangalore— different colours grey, blue and reddish. Rubies of a ind have been brought me; and also *beryl*, or what Dr. Heyne schorlous beryl.

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arks on Cambogia Gutta Linn.—Stalagmitis Gambogioides y; and on Laurus Cassia Linn.—By ROBERT WIGHT, M. D.

bjects of botanical inquiry, both of considerable interest, have engaged my attention; and as the conclusions at which I have re somewhat different from what I anticipated at the out-set, I ummary of the results may not be uninteresting to your botani- s. The first of these, taking them up in chronological order, examination, for my Illustrations of Indian Botany, of the natu- Guttiferæ for the purpose of marking out its limits and eluci- Indian genera and species. The second was an endeavour to the *Laurus Cassia* of Linnæus, and the tree which furnishes the , or *Cassia lignea*, of commerce; undertaken by order of ent, with a view to the solution of a question submitted for its

consideration by the Ceylon Government. Adopting the same course on this occasion, I shall commence my present remarks with the Guttiferæ.

In the 13th number of the Madras Journal of Science I published some observations on the genera of this order, elicited by a communication of Dr. Graham respecting the Gamboge plant of Ceylon. In that paper I showed that the genera *Garcinia* and *Cambogia* of Linnæus were the same, and that *Stalagmitis* of Murray was, so far as could be ascertained from characters only, identical with Roxburgh's *Xanthochymus*. Conceiving the genus *Garcinia* too complex I there proposed subdividing it. The following extract will explain the views I then entertained.

"In my opinion the genus *Garcinia*, as now constituted, ought not to be retained: a glance at the accompanying figures will explain my reasons for thinking so, by exhibiting in one view several of the incongruities which it presents. For example, the *Garcinia mangostana*, *speciosa*, and *cornea*, have the filaments of the male flower united, forming four large fleshy bodies covered with anthers, and two of the three are known to have a globose, not sulcated fruit. These might form the type of a genus under Rumphius' original name *Mangostana*. *G. Cambogia*, has the stamens of the male flower ranged in a single row,* round a disk-like receptacle, with a sulcated fruit. This might form the type of a second genus, for which, as nearly corresponding with the character assigned by Linnæus to his *Garcinia*, that name might be retained. In *G. Kydia*, *Zeylanica*, *pedunculata*, *paniculata* and *affinis*, the filaments are united into a staminal column, terminating in a head covered with anthers, fruit usually furrowed. These might form a third genus, retaining for them the now vacant name of *Cambogia*: and lastly, *G. pictoria*, Roxb. (*Mangost. morella* Gært?): *elliptica* Wall. (*fid.* Graham) and Dr. Graham's Ceylon plant, would form a fourth, distinguished by their united filaments, and cup-shaped, one-celled, circumscissile, anthers; for which the now vacant name, *Stalagmitis*, might be retained, in preference to disturbing Roxburgh's *Xanthochymus*, now well established, by rigidly enforcing the rule of priority, and restoring that of Murray, thereby causing considerable confusion in the synonymy, that might thus be easily avoided."

Since the publication of that article much additional light has been thrown on the subject through the publication by Dr. Graham of Edinburgh, in the 2d volume of the Companion to the Botanical Magazine, of a paper entitled "Remarks on the Gamboge tree of Ceylon and char-

* This I now find is an error: Roxburgh, when he prepared the figure of his *Garcinia Cambogia*, was unacquainted with the male flower, and only represents the bi-sexual one.

of Hebradendron, a new genus of Guttiferæ, and that to which the elongs."

s is an excellent paper, and embodying as it does much very in- ng information, well repays the trouble of a careful perusal. I t however adopt Dr. Graham's conclusions as to the propriety of ing this plant to the rank of a distinct genus, nor, supposing that botanists than either Dr. G. or myself consider ourselves, admit it h into the system of plants, do I think his name can be adopted. uestion, whether or not this is the Gamboge plant of Ceylon, I ipon as set at rest by the evidence adduced in the "Remarks." All are that I have now to consider are simply the following botanical ons—1st, whether this plant ought to form the type of a genus dis- from *Garcinia*?—and 2d, if so, whether it ought to receive a new ' The first of these questions I answer in the negative, because I think it sufficiently distinguished from *Garcinia* by the solitary ter assigned—the peculiar structure of the anther. The second lly answer in the negative, because this plant is undoubtedly the f the genus *Cambogia* of Linnæus, whose name therefore ought to een retained. My reasons for the first of these conclusions, being tated page 122 and 123 of my Illustrations, I subjoin the passage. the precedent established by Dr. Graham in the formation of his *Hebradendron* be followed, we may, I fear, soon expect to see the from *Garcinia* about as numerous as its species now are, since enus is separated on account of a variation in a single point of re, and without reference to analogous forms met with in other . The only point in which it differs from *Garcinia*, as defined in odromus is—in having 1-celled circumscissile anthers—while the sual form in that genus is to have them two-celled, with introrse, dinal dehiscence. Should this be considered a satisfactory reason removal, then *G. Kydiana* Roxb., which has a four-sided connec- with a polleniferous cell in each face, must equally be separated ie genus, as well as another species of which I possess specimens lergui, the anthers of which are 1-celled, dehiscing transversely the apex. Another variation of structure, which has been long d in a few species of the genus, will equally demand separation, g of at least equal generic value; I allude to those in which the s of the male flower are united into four thick fleshy androphores, highly developed sterile pistil in the centre. Here then, assum- t we are justified in assigning generic value to such variations of re, limited as they are to the male organization, are four distinct and all, so far as such artificial characters can make them, equal- e.

I confess that I have an objection to this kind of excessive division, inasmuch as, whatever rule holds good with respec genera, must equally apply to orders, and must inevitably lead to elevation of half our present species to the rank of genera, and an proportion of genera to natural orders; both of which might be av by a slight extension of our characters, and still better by a carefu comprehensive investigation of groups of allied species and genera, fore attempting their disunion in the formation of new genera and or In support of these views, I think I may safely cite the recorded op of the first living authority, Mr. Robert Brown. He says, in a let Dr. Graham, referring to the plant which has called forth these rem "In your plant the structure of the anther is indeed very remark and might well induce you to consider it a new genus; but it is to add, that approaches to this structure, and which serve to explai analogy with the ordinary structure of the family, exist in *Garcinia,* which I suppose your plant would agree in its female flower as we in fruit." From this concluding caution I imagine that, before e lishing a genus on such grounds, he (Brown) would have ascert the structure of the anther in the whole order, marked its variat and then, and not till then, have determined on the propriety or ot wise of assigning a generic value to its variations: and I can scar avoid thinking, that, had such a course been followed in that instanc sectional value only would have been awarded.

I confess that a less perfect examination of the order, than t which improved materials has now enabled me to effect, led into a similar error; on which occasion, I proposed to subdi the genus *Garcinia* into four distinct genera—*Garcinia, Man tana, Cambogia,* and *Stalagmitis* (see *Madras Journal of Scie* vol. 4, page 304). This suggestion has not, so far as I am aw been yet adopted by any one; and I trust it will not, as I now sider it wrong in principle, the variations in structure, there pointed not meriting a higher than sectional value in a genus so strictly natu Influenced by this reduced estimate of the relative value of the sev structural variations mentioned above, it is my intention, on the pre occasion, to keep the old genus together, but divided into section accordance with them. I am induced to do so from observing that variations are limited to the male flowers, and do not on any occa extend to the female. For example *G. Mangostana* and *G. cornea,* referred to the same section: the former has 4-8 celled ovaries, and latter usually 4; in *G. Kydiana,* Roxburgh describes the berry as b from 4 to 8 seeded, *G. Cowa* from 6 to 8, and most of the others are cribed as having as far as 4, or 8 seeds, showing a general want of

formity in this respect: variations, therefore, of the number of the cells of the ovary, cannot be admitted as of generic, or even specific value in this genus. Should further acquaintance with the tribe show that, in uniting *Hebradendron* or rather *Cambogia*, Linn. (for they are the same genus, and the latter the more appropriate name) to *Garcinia*, I have erred, the error can be easily corrected, and, in the mean time, my sections will afford the means of more easily determining the known species, and of referring to convenient places such new ones as may be discovered. For the present, nothing is more difficult than to make out from description the species of *Garcinia*. This is mainly owing to the male flowers, which afford by far the best specific characters, being too little attended to in characterizing them. Generally speaking, they are dicicous, and, in collecting specimens, care should be taken to procure them of both sexes. The foliage, except in a very few instances, does not afford good discriminating characters, and when it does, is usually accompanied by others which are more to be relied upon."

My reasons for objecting to Dr. Graham's new name, to the prejudice of Linnæus' old one, is thus briefly explained at page 125 under *Garcinia Cambogia* and *Roxburghii*.

"I have not quoted Linnæus' *Cambogia Gutta* for either of these, though it seems the general opinion of botanists that it belongs to the former. This opinion, however, his brief description of the plant before him in the Flora Zeylanica, shows to be erroneous, and proves almost to demonstration that it is Dr. Graham's *Hebradendron*. The following are his words—*Rami oppositi. Folia lanceolato-ovata, integerrima, petiolata, opposita. Flores verticillati sessiles.* It is in truth the only plant of the genus in Ceylon, having sessile verticelled flowers. In his generic character he describes the anthers, *antheræ subrotundæ*, the pistil *germen subrotundum-striatum, stylus, nullus. Stigma quadrifidum, persistens*, and finally, the pericarp—*Pomum subrotundum, octies sulcatum, octoloculare*—showing clearly that the character of the flower and ovary is taken from one species, and of the fruit from a different, (or perhaps from Rheede's figure) owing to the imperfection of his specimens, and his not being aware that the lobes of the stigma afford a sure indication of the number of cells of the fruit. His *Cambogia*, however, barring this error, is certainly the Gamboge plant of Ceylon, which is further established, as Dr. Graham informs us, by the examination of the specimen in Herman's herbarium, "which may be considered the type of Linnæus' *Cambogia gutta*."—If, therefore, that plant is to be elevated to the rank of a genus, I should say his name ought unquestionably to be retained with an amended character, and botany relieved from the un-

seemly allusion conveyed under the new one. If Murray's *Stalagmitis* is on account of priority to supplant Roxburgh's *Xanthochymus*, much more must Linnæus' *Cambogia* supplant Graham's *Hebradendron*, partly for the same reason, priority, but principally, because Dr. Graham knew when he gave the name, that his plant was identical with that of Linnæus, while it was almost impossible that Roxburgh could ever recognize his *Xanthochymus* in Murray's character of *Stalagmitis*, made up as it is from two genera (*Garcinia* and *Xanthochymus*) so distinct as not to be referable even to the same natural order. In my opinion *Stalagmitis* ought to be suppressed, and *Xanthochymus* retained."

The allusion to *Stalagmitis* in this passage refers to the following sentence, which I quote from Dr. Graham's paper—"It appears then that the generic name of *Xanthochymus* must be dropped and that the species which belonged to this genus must (for the future) receive the appellation of *Stalagmitis*." This reasoning seems to have carried conviction to Dr. Lindley's mind, as he has acted upon it, so far as to append in his Flora Medica the name *Stalagmitis* to our (Wight and Arnott's) character of *Xanthochymus*, as being the original and legitimate name of the genus: but, apparently without due consideration, as, forgetting the rights of priority in the case of *Cambogia gutta* of Linnæus, he has followed Graham in quoting that name, without any doubt as to the identity of the plants, as a synonym for the very modern *Hebradendron Cambogioides* of Graham. Upon what grounds this degree of favour is to be shown to *Hebradendron* and withheld from *Xanthochymus* I am quite unable to discover or even to conjecture: that Dr. Graham should have inadvertently committed such an oversight is not so much to be wondered at, writing as he was under the excitement of having discovered the long sought Gamboge plant, and the novelty of inventing new generic names; but that Dr. Lindley should, in the retirement of his closet, and totally uninfluenced by the stimulus under which Graham wrote, have followed him without questioning the propriety of what he did, is to me surprising.

In my own and in the name of all working botanists, who are daily called upon to unravel the mazes of involved and perplexed generic names, I enter my protest against such unnecessary changing of names in a science already overburthened with them, and one too which must in its very nature become more and more so every day. To have assigned the name of *Hebradendron Cambogioides* to the very plant which Linnæus called *Cambogia gutta*, and then quote the original name as a synonym of the new one without doubt or question as to the identity of the plants, I hold to be such, and therefore consider it a duty to express—in terms less measured than my

own inclinations, not less than my esteem for the author, dictates—my sentiments regarding it; the more so, as I do not consider the genus itself a tenable one. To its goodness, or otherwise, however, I should not have thought it necessary thus to advert, if the old name had been retained; what I object to is, the inconsistency of, in the same breath, setting up a decidedly bad genus without a single genuine species to support it, for such I hold *Stalagmitis* to be, and putting down a supposed good one, resting on the very same foundation on which its successor is raised, the same species being the basis of both. In the case of Stalagmitis I object to the course pursued, on the ground of its being *ab origine* a spurious genus, constituted partly from notes taken from one species, the flowers of which the author of the genus (Murray) never saw, and partly from flowers of another which he examined, and then, with what ingenuity he was master of, invented from these heterogeneous materials a generic character not referable to either. That every thing might be in just keeping in this curious medley, it now appears, that he had for his only species a specimen made up of the fragments of two plants, no more fit to represent either correctly than his character could amalgamate the peculiarities of both, they being referable to two distinct natural orders. With all this information before him, and hunted out with much labour by Dr. Brown and himself, Dr. Graham, inconsiderately I should hope, tells us that the generic name of *Xanthochymus* must be dropped, and that of *Stalagmitis* put in its place, or, in other words, declares that we must put down a good genus and set up a nonentity, a genus without a species. That one of the two must be dropped is certain; but I hope botanists will show more consideration for the meritorious and diligent labours of Roxburgh, than to displace his really well defined generic name, in favour of one which nobody could understand, or apply from its own terms, and which, now that its inconsistencies have been brought to light, no one could adopt. As I have examined this question somewhat in detail, in a postscript to my article on the Guttiferæ, I shall subjoin it also, for the benefit of those who may not have the opportunity of consulting the original work, in the hope that, by thus calling attention to the subject, my remarks may have the effect of causing botanical authors to pause before they sanction, by adopting them, such uncalled for, and, I fear, if not opposed in time, likely to become mischievous, innovations—I now take leave of the subject, and sincerely hope I may not again have to revert to it.

P. S.—After this article was completed and the greater part of it printed, I received Lindley's "Flora Medica," a new work just issued from the press, and, like all the other works of the accomplished author, form-

ing a most valuable contribution to botanical science; on this occasion in connection with medicine. In this work I find Dr. Lindley has added the weight of his authority, to that of those who adopt Murray's *Stalagmitis* in preference to Roxburgh's *Xanthochymus*. This he does for the reasons adduced by Dr. Graham; namely, that Mr. Brown had examined Murray's specimen and ascertained that it consists of two plants, probably of two genera, one of which, in flower, is a *Xanthochymus*, the other, not in flower, supposed to be Graham's *Hebradendron*. Having expressed my belief that *Xanthochymus* does not belong to this natural order, and having no new species to add, nor other information to communicate respecting it, I did intend to have noticed that genus in this place. But as I have said above that, in my opinion, *Stalagmitis* ought to be suppressed and *Xanthochymus* established in its room, I feel now called upon to state more fully my reasons for thinking so—I shall commence by extracting from the "Companion to the Botanical Magazine" the passage of Mr. Brown's letter, quoted by Dr. Graham as his authority for saying that the generic name *Xanthochymus* must be dropped in favour of *Stalagmitis*. "The plant sent pasted by Konig to Sir Joseph Banks, as one specimen, I have ascertained to be made up of two plants, and very probably of two genera. The union was concealed by sealing wax. The portion in flower, and which agrees in structure with Murray's account, is, I have no doubt, the *Xanthochymus ovalifolius* of Roxburgh. *Stalagmitis* and *Xanthochymus* are therefore one genus, as Cambessides has already observed, giving the preference to the earlier name of Murray. This, however, forms but a small part of the whole specimen, the larger portion being, I am inclined to think, the same with your plant, of which I have seen, and I believe still possess, the specimen you sent to Don.* The structure, however, of this greater portion cannot be ascertained from the few very young flower-buds belonging to it. It approaches also very closely, in its leaves especially, to that specimen in Hermann's herbarium, which may be considered as the type of Linnæus' *Cambogia gutta*. A loose fruit, pasted on the sheet with Konig's plant, probably belongs to the larger portion, and resembles Gærtner's Morella.

So far all appears clearly in favour of *Stalagmitis* and had Murray in drawing up his character rigidly confined himself to the description of the flowers before him, I should at once have adopted his name in preference to Roxburgh's. But on turning to his character, as given in Schreber's Genera Plantarum, we find a 4-leaved calyx, a 4-petaled corolla, and a 4-lobed stigma, combined with pentadelphous stamens, 3-

* One of those received from Mrs. Walker.

seeded berries, the stigmas sometimes trifid: stamina not always polyadelphous? &c. From this very unusual combination of quinary and quaternary, forms I am led to infer that the character is only partly derived from the specimen, and partly, if not principally, from notes communicated by König, who, it appears, from the fact of his having combined, on the supposition that they were the same plant, two distinct species, was not aware of the difference, and misled Murray by communicating written characters of a *Garcinia*, and flowers of another plant, and between the two, there has resulted a set of characters not likely to be often found combined in the same species, and still less frequently in one small specimen. Roxburgh, on the other hand, briefly and clearly defines a genus of plants well known to him, and extensively distributed over India, about which he has scarcely left room for a mistake. If further proof be wanted in support of the opinion I have advanced that this is a hybrid genus, I adduce Cambessides, whose authority is quoted for the identity of *Stalagmitis* and *Xanthochymus*. He has strictly followed Murray, adopted all the contradictions of his character, and constituted a genus embodying, first, Roxburgh's genus *Xanthochymus*, next, Petit Thouars' *Brindonia*, evidently identical with *Garcinia*; then Loureiro's *Oxycarpus*, also *Garcinia*; and lastly, (if I am not misled by Mr. George Don, whom I am obliged for want of Cambessides own memoir to follow) nearly the whole of Roxburgh's species of *Garcinia*; as if Roxburgh was so bad a botanist as not to be able, with growing plants before him, to distinguish between two genera so very distinct as *Garcinia* and his own *Xanthochymus*. In a paper which I published in the *Madras Journal of Science* for October 1836, I showed, from the internal evidence afforded by the two sets of characters, that Murray's *Stalagmitis* and Roxburgh's *Xanthochymus* were partly identical, and attributed the discrepancies to defects of Murray's solitary specimen; a view, which Mr. Brown has shown to be only partly right, by proving that they in some measure originated in the imperfect observation of König, who supplied Murray with the materials for his genus.

Having now adduced what I esteem conclusive evidence in support of the opinion I advanced above, that Murray's genus is spurious, and that of Cambessides, founded on it, is most unnatural, as associating species that never can combine generically; while Roxburgh's is a strictly natural genus, including several nearly allied species, and, moreover, probably referable to a natural order different from more than half of the species referred to it under the name of *Stalagmitis* by Cambessides: I consider myself fully justified in continuing to adopt the generic name *Xanthochymus* (even though opposed by the highest botanical authorities) until careful examination of the original specimen, with reference to the elucidation of the discrepancies I have indicated, shall have proved that

such actually exist in *that* specimen. If they do exist, then the fault is not Murray's, and his name must of right be adopted with an amended character, excluding the numerous species of *Garcinia* brought under it by Cambessides: if they do not, Roxburgh's genus, which as it now stands is strictly natural, claims the preference.

On the Laurus Cassia of Linnæus, and the plants producing the Cassia Bark of Commerce.

The next subject on which I have some remarks to offer is the *Laurus Cassia* of Linnæus, and the plants producing the *Cassia Lign ea* or Cassia bark of commerce. My attention was first directed to this subject by a communication from Government, in which I am requested to endeavour to ascertain "whether the common Cassia bark of the markets of the world is a thicker and coarser portion of the bark of the genuine cinnamon plant or tree, or whether it is the bark of a plant not analogous to the cinnamon plant or tree."

Before it was possible to return a satisfactory answer to this question, it seemed incumbent on me to ascertain what plant Linnæus meant to designate under the name of *Laurus Cassia*, and whether it was probable the plant so called could supply all the bark passing under that name in the markets of the world. This primary, but most difficult inquiry was rendered indispensable by the, generally supposed, ridiculous assertion of Mr. Marshall, that the leaves, and the bark of the trunk and branches of the *Laurus Cassia* of Linnæus, so far from being aromatic and spicy like cinnamon, are bitter and have in a slight degree the taste and odour of myrrh. This assertion, wide as it may appear of the truth, is yet founded in fact, and what may appear still more extraordinary, has led to a discovery, which, without such aid as he has given, would not probably have soon been made by a professed botanist, a title to which I believe Mr. Marshall does not aspire. He appears to have been led to the discovery, that the *Laurus Cassia* of Linnæus did not produce aromatic bark, simply through the native name, and wonders how it could have received from him the name of *Cassia*, and had qualities attributed to its bark which it does not in the slightest degree possess. I think I can now answer the question, and explain the mystery which has so long hung over this species, and been hitherto rendered only more obscure by each attempt to bring it to light.

It is well known to modern botanists, that many of their earlier predecessors were but indifferent describers of plants, and often very loose in their quotations of figures as synonyms, a sin of which Linnæus was often about as guilty as any of his cotemporaries. He seemed to have had an idea, that their figures were generally at best but approximations to

the truth, and that if a figure exhibited even a remote similarity to a plant before him, especially if from the same country, he might with safety quote it as a synonym. Bearing this in mind, we can easily account for a number of errors to which his incorrect synonyms have given rise. The present instance affords an excellent example of what I have here stated, and one which, but for the discovery of Mr. Marshall, might have long remained undetected.

In Hermans herbarium of Ceylon plants, he (Linnæus) found one bearing the native names of "Dawalkurundu, Nikadawala" under which, it is referred to, or described in Hermans Musæum Zeylanicum. This he considered a species of *Laurus*, apparently from habit alone, and in his usual brief precise style, calls it, Laurus foliis lanceolatis trinerviis, nervis supra basin unitis; having previously called the true cinnamon, "Laurus foliis ovato-oblongis trinerviis basi nervos unientibus." The difference between the two, as indicated by the names, seems very slight, merely depending on the one having lanceolate leaves with the nerves united above the base; while in the other the leaves are said to be ovate oblong with the nerves distinct to the base—differences small indeed, and such as could never be found of much avail in distinguishing the one plant from the other, since they are both constantly met with in different leaves on the same tree. Such being the case, it is not much to be wondered at that botanists should have been surprised by the boldness of Mr. Marshall's announcement, that two trees, believed to be of the same genus, and so nearly alike in their external forms, should yet differ so very widely in their properties. But so it is, and nothing can be more certain than that the fact is as he states it.

In proceeding to trace the history of the two species, aided by the light Mr. Marshall has thrown on them, our difficulties vanish like mist before the noon-day sun, though Mr. M. himself, has found it "difficult to conceive how the Dawalkurundu obtained the appellation of *Laurus Cassia* from Linnæus." It was because Linnæus's specimen of Dawalkurundu was neither in flower nor in fruit. Had it been so, he was too acute an observer ever to have confounded it with the plants with which he has associated it in his synonyms. This explanation, it may be answered, is mere assumption on my part—it certainly is so, but supported by so strong circumstantial evidence, as not to leave a doubt of its correctness. Linnæus has in his Flora Zeylanica given a short description of each of these species: his description of the cinnamon is principally confined to the flower, and is most precise. In his description of the other, the flower is not once alluded to. Here he declares, that he knows not by what mark to distinguish it from the *Camphorifera japonensium*, which

in its foliage it greatly resembles, but nothing can be more distinct than its inflorescence: that of the camphor tree being a panicle, having a stalk as long as the leaves; while in Dawalkurundu it may be described as a subsessile capitulum, that is, 5 or 6 sessile flowers congested on the apex of a very short peduncle, and surrounded by an involucrum of 4 or 5 leaves; several of which capitula usually form verticels round the naked parts of the branches where the leaves have fallen. He begins his description of *Laurus Cassia** by stating that he at first considered it a variety of the antecedent (cinnamon), but now that he knows not by what mark to distinguish it from *Camphorifera japonensium*, for the leaves are thinner than those of cinnamon, the nerves uniting above the base as in *Camphorifera*, and are sprinkled beneath with a greyish dew *(subtus rore cæsio illinita)* as in the camphor tree, and are at the same time lanceolate and of a thinner texture than the preceding (cinnamon). The whole of his description in short agrees most exactly with Mr. Marshall's description of the Cingalese Dawalkurundu, and leaves not a doubt that both had the same plant in view, and consequently that Mr. Marshall is so far correct in saying that the bark of the *Laurus Cassia* of Linnæus possessed none of the qualities attributed to it. So far all is clear but now the chapter of errors begins.

Had Linnæus been permitted to exercise his own unbiassed judgment in this case, it is not improbable he would have avoided the error of assigning to a plant which, with all his acuteness, he knew not how to distinguish from the camphor tree, the credit of producing Cassia, or at all events would not have done so without some expression of doubt, so as still to leave the question an open one. But, upon consulting other authorities, he found in Burman's Thesaurus Zeylanicus the figure of a species of *Cinnamomum* or *Laurus* as he called the genus, to which Burman had given the name of *Cinnamomum perpetuo florens*, &c. and assigned the native name of Dawalkurundu, not as it appears from the specimen itself having been so named, but because being different from the true cinnamon of which he had seen specimens and figures, he thought it an inferior, wild or jungle sort, and must of necessity be the plant which Herman had described in his Musæum Zeylanicum, though the inflorescence differed much from the description, (a very essential point, which Burman remarked and endeavours to explain away,) and therefore gave it the same Cingalese name. Linnæus's specimen not being in flower, and the resemblance between the specimen and figure being in

* "Hanc speciem olim pro antecedentis varietate habui, nunc vero, qua nota hanc a *Camphorifera japonensium* distinguam, non novi: Folia enim Cinnamomo tenuiora, nervis ante basin coeuntibus ut in Camphorifera; subtus rore cæsio illinita, ut Camphora, et simul lanceolata ac tenuiori substantia quam præcedentis." *Linn. Flor. Zeylanica p.* 62.

other respects considerable, he had not the means of detecting the discrepancy, and unsuspectingly adopted Burman's figure and name as a synonym to his plant. In Rheedes Hortus Malabaricus (1 tab. 57) he found the figure of another cinnamon, even more closely resembling his plant in its general aspect than Burman's figure, this he also associated as a synonym; and Rheedes' plant being lauded on account of the aromatic properties of its bark and leaves, which resemble the true cinnamon, though it is not the genuine cinnamon tree, he seems to have considered himself quite safe in associating this also, and called the three species, this tria juncta in uno plant, *Laurus Cassia*, and assigned it as the source of the officinal "*Cassia Lignea cortex.*"

After this exposition of the origin of the species *Laurus Cassia*, it can scarcely be a matter of surprise that no two botanists have ever agreed as to the plant which ought to bear the name: nor, that not one of them should ever have surmised what plant Linnæus had constituted the type of his species. It is not my intention on the present occasion to extend these remarks, by tracing the various conjectures that have been promulgated on the subject; suffice it to say that no one, so far as I am aware, has taken a similar view as that now explained. It only further remains for me to give some account of the three species thus erroneously associated.

The first mentioned, Dawalkurundu, Linnæus' own plant and the type of the species is, I believe, the *Laurus involucrata* of Vahl, and of Lamark in the Encyclopédie Méthodique, and has in Professor Nees' monograph of the Indian Laurinæ (Wall. Plant. As. rariores), received the name of *Tetradenia Zeylanica*, but is the *Litsea Zeylanica* of a former work of his, a name, which I presume must be restored, owing to the other being preoccupied. The slight difference of structure does not seem to render a new genus necessary.

The second and third have both been referred, by the same eminent botanist, to his variety of the true cinnamon, the *Cinnamomum Zeylanicum*, a decision to which I cannot subscribe, as I cannot perceive that either of these figures are referable to any form of that species, and they besides differ specifically from each other.

The *Cinnamomum perpetuo florens* appears to me a perfectly distinct species, very nearly allied to, if not actually identical with, Nees' own species *C. Sulphuratum*, of which I have now got specimens from Ceylon. This I infer from the appearance of the plant as represented in the figure, for if any dependence is to be placed on the description, it is impossible to admit it into the genus. On this however, I do not feel disposed to place much reliance, as it was not the practice a century ago,

when the description was written, to examine the structure of flowers with the same care that is now bestowed. Should it be objected, that the species I quote as the *C. perpetuo florens* is clothed with yellowish pubescence, which is not mentioned by Burman, then I have another from the same country (Ceylon) perfectly glabrous, agreeing in the form of its leaves, but differing in having more numerous and smaller flowers, which may be substituted, and that I do not think, more than the other, a variety of the genuine cinnamon tree.

The Malabar plant Carua (Hort. Mal. 1. tab 57), on the other hand, I consider a very passable figure of a plant, in my herbarium named, by Nees himself, *Cinnamomum iners*; but, whether or not I am right in the species to which I have referred it, I can have no hesitation in giving it as my opinion that it is not referable to any form of the *C. Zeylanicum*; neither can I agree with him in thinking the plant figured under the name of *Laurus Cassia* in the Botanical Magazine No. 1636 is referable to the Ceylon species, but is I think very like the Malabar one, the only species of the genus to which the name *Cassia* should be applied, if that name is still to be retained in botanical nomenclature, as being the only one of the three associated species known to produce that drug. Another plate of the Botanical Magazine (*Laurus Cinamomum* No. 2028) I also refer here, and feel greatly at a loss to account for its introduction into that work under a different name from the preceding. The plant which Nees formerly considered the *Laurus Cassia*, but now calls *Cinnamomum aromaticum*, from China, is a very nearly allied species, but is distinct, and furnishes much of the bark sold in the European markets under the name of Cassia, tho' it has nothing whatever to do with the *Laurus Cassia* of Linnæus, which, from the preceding history appears strictly confined to Ceylon and India proper, and that name, not being referable to any one species, ought unquestionably to be expunged from botanical nomenclature, its longer continuance there only tending to create confusion and uncertainty. This brings me to the next question—namely, what plant or plants yield the Cassia bark of commerce?

The foregoing explanation, in the course of which two plants are referred to as yielding Cassia, greatly simplifies the answer to this one. The first of these is the Malabar Carua figured by Rheede, the second Nees' *Cinnamomum aromaticum*. The list, however, of Cassia producing plants is not limited to these two, but I firmly believe extends to nearly every species of the genus. A set of specimens, submitted for my examination, of the trees furnishing Cassia on the Malabar Coast, presented no fewer than four distinct species; including among them the genuine

cinnamon plant, the bark of the older branches of which, it would appear, exported from that coast as Cassia. Three or four more species are natives of Ceylon, exclusive of the cinnamon proper, all of which greatly resemble the cinnamon plant, and in the woods might easily be mistaken for it, and peeled, though the produce might be inferior. Thus we have from Western India and Ceylon alone, probably not less than six plants producing Cassia; add to these nearly twice as many more species of cinnamomum, the produce of the more eastern states of Asia and the Islands of the Eastern Archipelago, all remarkable for their striking family likeness, all I believe endowed with aromatic properties, and probably the greater part if not the whole contributing something towards the general result, and we at once see the impossibility of awarding to any one individual species the credit of being the source whence the *Cassia Lignea* of commerce is derived; and equally the impropriety of applying to any one of them the comprehensive specific appellation of Cassia, since all sorts of cinnamon-like plants, yielding bark of a quality unfit to bear the designation of cinnamon in the market, are passed off as Cassia.

VI.—*Report upon the Run of the Sea, and Set of the Tides at Madras during the North-East Monsoon.*—*By* T. G. Taylor, Esq. *Honorable Company's Astronomer.*

To do justice to an enquiry of this nature, it will no doubt be considered necessary that observations should have been continued throughout several monsoons, whereby a knowledge of maximum and minimum effects would have been attained—instead of the particular ones which have been observed in the monsoon of 1838, upon which this report entirely depends; it hence appears necessary that the particulars of the weather experienced in the monsoon of 1838 should first be stated.

The S. W. wind continued to blow steadily up to the 16th October, on which day the N. E. wind set in in a somewhat abrupt and threatening manner; but, relaxing again on the 17th to the S. and S. W., the weather continued fine until the 24th, when the wind again shifted to the N. E.: from this day (which may be considered the commencement of the monsoon) up to the 10th December, when fine weather again returned, the subjoined meteorological register will exhibit the nature of the weather experienced.

Days.	Barometer at			Thermometer at			Rain.		Direction of wind.		
1838	10 A. M.	4 P. M.	10 P. M.	10 A. M.	4 P. M.	10 P. M.	Sun rise.	Sun set.	10 A. M.	4 P. M.	10 P. M.
	Ins.	Ins.	Ins.				Ins.	Ins.			
Oct. 24	30,010	30,028	30,062	83,3	85,0	82,0			N E	N E	N E
25	074	000	021	84,0	85,0	80,3			N E	E	N
26	022	29,974	000	81,7	84,0	82,5			N E	N E	N
27	018	948	29,994	79,3	81,6	79,5	1,174	0,467	N	——	N
28	008	—	998	78,6	—	79,3	0,367	0,535	N. N E	——	N
29	036	960	30,018	78,6	80,0	78,7	0,147		N	N	N W
30	068	990	056	79,0	79,4	78,2	0,934	0,117	E	N	N
31	040	980	024	78,7	79,6	79,4	0,944		N W	N	N
Nov. 1	016	978	29,990	80,4	82,5	78,5	0,217		N E	N E	Calm
2	008	958	30,000	80,7	83,8	79,9			N W	N E	N E
3	008	951	29,998	81,4	84,0	80,3			N W	N W	N
4	024	—	30,000	78,0	—	78,9	0,667	0,167	N E	——	N W
5	29,990	930	29,976	77,6	76,2	76,4	5,009	0,637	N	N W	N
6	948	910	906	76,5	77,0	76,5	1,382	0,994	N E	N W	N
7	920	876	916	77,7	79,8	78,4	4,700		S W	S E. E	E
8	952	890	940	80,7	81,8	79,1	0,067		E	E	N E
9	966	902	958	80,1	82,0	79,9	3,825	0,037	E	E	N E
10	30,034	914	30,000	78,2	79,0	78,3	1,011	0,067	E	E	N W
11	033	—	003	78,8	—	79,8	1,534	0,107	N N W	——	N
12	063	964	028	78,2	79,4	78,3	0,127	0,147	E. S E	E	N
13	076	990	064	81,8	81,4	79,7	0,247		N E	E	N E
14	090	30,000	090	81,6	79,9	79,7			N E. E.	N E. E	N E. E
15	124	006	068	77,5	79,9	78,3	0,187	0,377	N	N	N E
16	102	002	088	81,1	80,5	79,5			N E	N E	N E
17	110	022	078	80,8	80,8	79,3			N E	N E	N E
18	076	—	076	78,8	—	77,7			——	——	N E
19	067	012	056	79,5	79,4	77,6			E	N E	N
20	030	29,958	003	78,2	80,0	78,0			N	N	Calm
21	29,982	940	29,952	76,3	78,8	74,7			N. N W	N	do
22	30,011	960	30,006	76,9	79,6	76,0			N. N W	N E	do
23	062	974	033	77,2	79,5	73,5			W	N E. E	do
24	088	986	035	76,4	79,5	76,0			N	N E	N E
25	077	—	054	77,2	—	75,7			E	——	N
26	100	30,004	086	77,3	78,0	76,3			N	N E	N E
27	112	016	126	79,1	80,4	77,3	0,147		N E	E	N E
28	156	072	140	76,3	79,0	78,2	0,091		N W	N E	N E
29	126	042	124	79,0	78,8	76,5			N	E. N E	E N E
30	120	042	114	78,3	78,8	77,5	0,117		N. N E	N. N E	N E
Dec. 1	105	016	072	77,8	78,5	75,7			E. N E	N E	N E
2	086	—	068	76,0	—	76,1			N W	——	N W
3	058	29,990	008	77,8	78,8	77,8			N. N W	N. N W	N
4	016	944	29,978	78,7	79,8	76,7			N W	N W. N	N
5	29,968	924	944	76,1	78,0	76,4	0,190	0,317	N	N	N
6	950	*874	906	75,1	76,5	75,7	1,781	0,232	N. N W	N. N W	N N W
7	*896	910	998	75,8	76,8	76,7	1,634	0,067	W. N W	S	S E
8	30,081	988	30,050	78,8	81,0	77,8			E. S E	S E	E N E
9	062	—	050	78,8	—	77,7			N E	——	N E
10	090	004	108	78,7	80,0	77,8			E	E	N

N. B.—The correction for cappillarity which remains to be applied=×,026.

* A very high sea and terrific surf—there had evidently been a strong gale of wind in the neighbourhood One dhoney came ashore and the Brig Maingay, *having broke her* anchor, was obliged to put to sea.

Cloudy Max. 10.	Weather.			Remarks.
	10 A. M.	4 P. M.	10 A. M.	
5	Fl. cl.	Clear	Haze	
3	Clear	do	Clear	Lightning to the E. at night.
7	Cloudy	Cloudy	Cloudy	Thunder and lightning to the E. do.
	Driz. rain	——	Driz. rain	Do. do. do.
9	do do	——	Fl. cl.	Lightning do.
9	do do	Cloudy	Cloudy	Do. do.
10	Cloudy	do	do	Do. and rain do.
6	Th. haz e	do	Fl. cl.	do.
3	Cloudy	Fl. cl.	Clear	Heavy dew.
5	do	Haze	Haze	Dew.
7	Fl. cl.	Fl. cl.	Driz. rain	Thunder and lightning at night.
9	Rain	——	do do	Do. do. do.
10	Cloudy	Cloudy	do do	Squally day and night.
9	do	Rain	do do	Heavy rain evening and night.
5	do	Th. haze	Clear	Vivid lightning do.
9	Fl. cl.	Cloudy	Cloudy	Vivid lightning and one loud and terrific crash of thunder at 7 P. M.
9	Cloudy	do	Fl cl.	Lightning at night.
9	do	do	Driz. rain	Do. do.
8	do	——	Fl. cl.	Thunder and lightning do.
8	Rain	Cloudy	Cloudy	Do. do. do.
6	Fl. cl.	do	Clear	Lightning do.
8	do	do	Rain	Thunder and lightning do.
7	Cloudy	Driz. rain	Clear	Lightning do. with rain.
7	Fl. cl.	Cloudy	Fl. cl.	Do. do.
6	Clear	Fl. cl.	Fl. cl.	
5	——	——	Clear	Hazy.
5	Fl. cl.	Fl. cl.	Haze	Hazy.
6	do	do	Th. haze	Hazy.
5	Th. haze	Th. haze	Clear	Heavy dew.
5	do do	do do	Haze	Do. do.
3	Haze	Haze	Clear	Do. do.
	Clear	Clear	do	Do. do.
1	do	——	do	Do. do.
6	Cloudy	Cloudy	Cloudy	Drizzling rain at night.
5	F. cl.	Fl. cl.	Fl. cl.	do.
5	do	Cloudy	do	
10	do	Driz. rain	Rain	
6	Cloudy	Cloudy	Fl. cl.	
3	Fl. cl.	Fl. cl.	Fl. cl.	Generally cloudy throughout the night, wind strong at times.
7	do	——	Cloudy	Generally cloudy throughout the night, wind strong at times.
8	Haze	Cloudy	do	
7	Fl. cl.	Fl. cl.	do	Squally.
8	Rain	Cloudy	do	Squally.
10	do	Rain	do	Strong wind or light gale at night—thunder & lightning.
9	do	Cloudy	do	Lightning.
5	Fl. cl.	Fl. cl.	Fl. cl.	Do.
3	do	——	do	Do.
3	do	Fl. cl.	do	

On comparing the foregoing register with similar ones during the last forty years, it appears that the monsoon of 1838 has not been particularly distinguished—either for its severity or mildness; and from the evidence of the shipping in the roads, it would appear that a monsoon of full ordinary strength has been experienced. With regard to the particulars of the observations from which this report has been drawn up, I may at once proceed to state, that

THE SITE chosen for making the observations, was a long range of verandah, situated in front of the Sea Custom House and Master Attendant's Office; at about 200 feet from the edge of the sea and 29 feet above its mean level—immediately opposite to the spot on which stones had been thrown down for the proposed breakwater. On this verandah two stations were selected, 205 feet apart (which I have distinguished as the north and south end of the verandah), from which I was enabled to determine the situation of buoys, &c.

THE INSTRUMENTS employed on shore, were, a five feet achromatic by Dollond (fitted with circles of 4 in. diameter, reading off to minutes, for the measurement of altitude and azimuth, and supplied with a position and double wire micrometer), and a 9 inch theodolite by Dollond—both circles reading off to minutes.

THE APPARATUS employed at sea, consisted of a small iron buoy (No. 1), anchored in 18 feet water, immediately opposite to and 828 feet distant from the S. station; and a similar one (No. 2), situated at 1131 feet distance from the same, and exactly in a line with No. 1: both of these buoys were held to their anchors, with 6 inch coir cable of 18 fathoms in length. In addition to this, a canoe of 16 feet in length, decked over and well caulked, was anchored opposite to, and 1200 feet distant from the north station; the canoe was furnished with a slender rod of 8 feet in length, nailed to the deck at right angles to its length, for the purpose of indicating the direction of the current: and an apparatus (fig. No. 1) for measuring its velocity:—where A represents an iron flanche, which is screwed on to the stern of the canoe and supports a double jimbol E, on which the connected iron rods D B and B C and wooden bob C, are free to move in every direction. In the case of no current—E

C would be perpendicular ; and corresponding to any given angle of inclination, it might readily be computed what was the velocity of the current: the rod E C being situated *in* the water, it was necessary to attach an index D B (whose inclination could be read off with the position micrometer attached to the 5 feet telescope).

The Times proper for making the observations were next to be considered; with regard to the tides, the observations on the days near to the new and full moon and at the quarters were evidently the most proper; and for the set of the sea, those days in which the surf was higher than usual should evidently be adopted; hence I selected the days following the 1st, 2d, 3d and 4th quarters of the moon, when hourly observations from 6 A. M. to 6 P. M. should be regularly registered, and on any intermediate days in case of a higher surf than ordinary.

The Run of the Sea has been measured by taking the difference between the greatest and least angles of depression of the iron buoy No. 1, which (as has been already stated) was anchored in 18 feet water with 18 fathoms of cable; these differences being reduced into feet, are as follows:

1838	Remarks.	6h.	7h.	8h.	9h.	10h.	11h.	12h.	1h.	2h.	3h.	4h.	5h.	6h.
		F. I.	F. I.	F. I.	F. I.	F. I.	F. I.	F. I.	F. I.	F. I.	F. I.	F. I.	F. I.	F. I.
October 16	Rough sea						4 9							
26							4 3			5 3		4 3		
27	Squally		4 6	4 9	4 4	4 4	4 9	4 9	4 9	4 9	4 9	4 1	3 6	4 4
November 3		4 7	3 4	3 2	3 2	3 2	2 4	3 4	4 1	4 1	3 4	2 9	3 9	
10	Very calm					1 9	2 2							
19			3 2	3 4	3 0	3 2	3 2	2 7	3 2	3 2	3 2	2 4	2 4	
26			2 2	2 4	2 2	2 4	2 0	2 2	4 2	2 6	3 2	3 0	3 2	
December 3	High surf		4 7	4 7	4 7	4 7	5 0	5 0	4 7	4 7	4 3	5 0	5 0	

On the morning of the 6th December the sea and surf had risen to an unusual height, but the only remaining buoy having been washed on shore, I was unable to make further observations. The difference in height between the summit and lowest point of the breakers could not have been less than 8 or 10 feet. Breakers or surf extending ¾ mile from the shore.

The Velocity of the Current.—It was my intention, to have measured the velocity of the current by the "*Indicator*" as already explained; but, either the iron work was not sufficiently strong, or it offered too great a temptation to some thievish catamaram man,—for the

canoe was overset, and the Indicator wrenched off on the morning of the 2d November ; and the canoe itself broke from its mooring and came ashore on the following day : thus circumstanced, I have caused a catamaram from time to time to be left to float over a measured space, from which the velocity of the current has been computed ; thus—

Date.	Velocity.	By what means measured.
Octr. 1 at 11 A. M.	No percep.current.	By catamaram
16—11 ——	0,80 miles per hour	do
25—11 ——	1,30 ,,	do
26—11 ——	2,50 ,,	By Massy's Patent Log
26— 1 P. M.	2,52 ,, *	By catamaram
27— 7 A. M.	1,87 ,,	By Indicator
—— 8 ——	1,87 ,,	do
—— 9 ——	1,87 ,,	do
——10 ——	1,87 ,,	do
——11 ——	1,87 ,,	do
——12 ——	1,90 ,,	do
—— 1 P. M.	2,50 ,,	do
—— 2 ——	2,50 ,,	do
—— 3 ——	2,50 ,,	do
—— 4 ——	2,90 ,,	do
—— 5 ——	2,90 ,,	do
Novr.3 11 A. M.	1,50 ,,	By catamaram
5 P. M.	3,00 ,,	do
8 11 A. M.	2,01 ,,	do
19 11,30 A. M.	1,40 ,,	do
5,30 P. M.	1,30 ,,	do
26 11,30 A. M.	0,76 ,,	do
5,0 P. M.	1,40 ,,	do
Decr. 3 11,30 A. M.	0,90 ,,	do
4,30 P. M.	1,40 ,,	do

The catamaram men refused to go off; but on being urged made the attempt;—after being washed off three times, they lost their catamaram which came ashore near the fort, leaving the men to swim ashore.—Rate of floating about 3 miles per hour.

THE TIDES.—The apparatus for determining the times of high and low water, was a pile of 34 feet in length ; which I had intended should be driven in the sea at about 300 yards from the shore : to the upper end of this pile was attached a hollow iron cylinder of 8 feet length, closed at the bottom—which would always be under water—with the exception of a very small hole ; and an aperture left in the top (which

* At 5 P. M. the current had evidently increased in strength, insomuch that the catamaram men refused to go off—saying they could not reach the nearest buoy under two hours.

The direction of the current noticed in the above, was generally parallel with the shore, but on one or two occasions I fancied it had a slight inclination (to the amount of 2 or 3 degrees) *towards* the shore.

would be above water) so as to admit a slight rod to pass freely; this rod being attached to a light hollow copper box—which would float on the surface of the water within the cylinder,—the variation in height of its upper end, would indicate to an observer on shore the variation of the level of the sea, &c. This apparatus was got ready and one attempt made to drive it, but the want of proper anchors, &c. produced a failure, and up to the present time I have not been able to procure the needful to make a second attempt. Under these circumstances I may be permitted to offer observations, which, although not nearly approaching to that degree of accuracy which might be desired, still will supply usefully approximate results. The observations to which I allude consist in deducing from the observed depressions of the sea and buoys, the height of the telescope above the level of the sea; thus, on the 3d of November at 6 A. M., I observed the line of floatation of the buoy No. 1 to be depressed 2° 5′ below the horizon of the sea, hence

	°	′	″	
Depression below the sea	2	5	0	
Dip.....		5	30	
Depression below the horizon.....	2	10	30	nat. sin.=,03796

distance of object—× 828 feet

height of telescope above the sea— 31.43 feet

Observed elevations of the Station above the level of the Sea and distance from the shore at which the outer Surf broke.

Date.	Observed with theodolite. 1st buoy	2d buoy	Surf bks.	5 feet achromatic. Canoe	1st buoy	Remarks
1838	Feet	Feet	Feet	Feet		
October 27 at 7 H. A.M.	32,50	33,06	287	32,78		
8 ,,	32,50	32,30	255	32,78		
9 ,,	33,23	33,06	295	33,31		
D. H. M. 10 ,,	33,23	33,40	375	33,13		
(☾ Oct. 26 2 19 11 ,,	32,26	32,24	373	32,47		
12 ,,	32,02	32,06	460	32,11		Sea too high for catamarams.
1 P. M.	32,02	31,75	420	32,11		
2 ,,	31,54	31,75	390	31,77		
3 ,,	31,92	31,75	330	31,64		
4 ,,	32,44	31,92	326	32,11		
5 ,,	33,02	32,50	282	32,61		
					Feet	
Mean	32,43	32,53		32,44	Mn 32,47	
Maximum	33,23	33,06	460	33,31		
Minimum	31,54	31,75	255	31,61		
Difference	1,69	1,31		1,70	Mn 1,57	
Approx. time of high water	h. m. 2 0	h. m. 2 0		h. m. 2 30 or mean—2 10	h. m.	
				☾ culminates at 7 8		
				High water bef. ☾ culm. 4 58		

Date.	Observed with theodolite 1st buoy	2d buoy	Surf bks	5 feet achromatic. 1st buoy	2d buoy	Remarks
1838	Feet	Feet	Feet	Feet	Feet	
November 3 at 6 A.M.	31,43	31,94	206	32,47	32,41	
7 ,,	31,18	31,57	206	32,21	32,07	
8 ,,	31,06	31,57	206	31,06	30,98	
D. H. M. 9 ,,	30,83	30,89	206	30,87	30,64	
(☽ Nov. 2 5 46) 10 ,,	31,31	31,22	245	30,37	32,01	
11 ,,	31,55	32,25	276	31,21	31,97	
12 ,,	32,79	32,76	310	32,27	32,97	
1 P.M.	33,23	33,11	340	32,97	32,48	
2 ,,	33,47	33,97	370	33,70	33,19	Rather high surf
3 ,,	33,23	33,97	397	33,20	33,19	
4 ,,	32,99	33,66	397	32,84	32,89	
5 ,,	32,54	32,94	340	32,62	32,27	
Mean	34,14	32,42		32,79	32,25	Mean—32,77
Maximum	34,97	33,97	397	33,70	33,19	
Minimum	30,79	30,89	206	30,87	30,64	
Difference	2,64	3,08		2,83	2,55	Mean—2,25
Approx. time of high water	h. m. 8 30	h. m. 9 0		h. m. 9 30	h. m. 8 30 or mean—8 52	h. m.
					☽ culminates infr. 12 53	
					High water bef. ☽ culm. 4 1	

Observed elevations of the Station above the level of the Sea, &c.

Date.	Observed with theodolite. 1st buoy		Surfbks	5 feet achromatic 1st buoy		Remark.
1838	Feet		Feet	Feet		
November 19 at 7 A.M	31,31	*	308	30,82	*	
8 ,,	30,58		332	30,70		
9 ,,	31,07		291	30,94		
10 ,,	31,79		308	31,66		
11 ,,	32,03		357	31,90		
D. H. M. 12 ,,	32,51		295	32,15		
(● Nov. 17 1 23) 1 P.M.	32,75		338	33,10		
2 ,,	32,99		338	33,10		
3 ,,	33,23		343	33,58		
4 ,,	32,75		310	33,20		
5 ,,	32,75		290	32,62		
						feet
Mean	32,16			32,16		Mean=32,16
Maximum	33,23		357	33,58		
Minimum	30,58		290	30,70		
Difference	2,65			2,88		Mean=2,76
Approx. time of high water	h. m. 8 30			h. m. 8 0 or mean=8 15 ☽ culminates 1 22		h. m.
				High water bef. ☽ culm 5 7		

Mem.—The outer buoy had broken from its mooring and come on shore on the morning of the 17th.

Date.	Observed with theodolite. 1st buoy		Surfbks	5 feet achromatic. 1st buoy		Remarks.
1838	Feet.		Feet.	Feet.		
November 26 at 8 A.M.	32,		—	—		
9 ,,	32,51		252	33,00		
10 ,,	32,75		260	33,20		
11 ,,	33,23		267	33,92		
D. H. M.						
(☽ Nov. 24 1 53) 12 ,,	32,51		265	32,96		
1 P.M.	32,27		260	32,48		
2 ,,	31,55		268	32,00		
3 ,,	31,55		316	31,52		
4 ,,	31,31		311	31,04		
5 ,,	81,11		296	31,76		
						feet
Mean	32.16			32,43		Mean=32,30
Maximum	33,23		316	33,92		
Minimum	31,31		252	31,04		
Difference	1,92			+ 2,88		
Approx. time of high water	h. m. 3 30			h. m. 4 0 or mean—3 45 ☽ culminates..7 30		h. m.
				High water bef. ☽ culm. 3 45		

* The second or outer buoy had parted from her anchor and come ashore.
† This result is evidently too large and had better be omitted.

Date.	Observed with theodolite. 1st buoy		Surf bks.	5 feet achromatic. 1st buoy		Remarks.
1838	Feet		Feet	Feet		
December 3 at 7 A. M.	32,27		390	31,99		
8 „	31,31		367	31,75		
9 „	31,31		367	31,03		
D. H. M. 10 „	31,07		361	31,75		* The disturbed state of
(☉ Decr. 1 4 55) 11 „	31,43		401	31,99		the sky and sea renders the
12 „	31,90		411	32,47		observations of this day less
1 P. M.	32,99		397	33,30		satisfactory.
2 „	33,71		413	33,67		
3 „	34,19		421	33,91		
4 „	33,71		449	33,43		
5 „	32,99		397	32,71		
						feet
Mean	32,44			32,54		Mean=32,49
Maximum	34,19		449	33,91		
Minimum	31,07		367	31,03		
Difference	3,12			2,88		Mean 3,00

Approximate time of high water	h. m. 9 30	h. m. 9 0 or mean=9 15	h. m.
		☽ culminates inf. 13 37	
		High water bef. ☽ culminates	4 22

Collecting these several results it appears that the amount of tide experienced at Madras, is

Amount of tide.		High water.	
	F. I.	H. M.	
At the new and full moon	2 10	4 26 bef. ☽ culminates.	
At the quarters.....	1 9		

The above observations and results are the best under the circumstances attending them that I have been able to obtain ; in addition to these I have but little to state, and that little being more the result of casual than precise observation, of course is entitled to proportionally less credit. To sum up the whole, it appears that, on an average of 40 years, the north-east monsoon sets in on the 19th day of October, being very rarely as much as 10 days earlier or later ; and that, although the north-east wind continues generally until the middle of February, still the force of its effect seldom extends beyond the 10th of December. It further appears that commencing with the N. E. wind, a current of variable velocity sets in from the north, in a direction parallel with the shore; and that it generally increases in strength in the course of the day, and decreases during the night,* and is moreover influenced by the strength of the wind ; the current appears to reach its maximum velocity about the 1st of November, when in conjunction with the tide it amounts to three miles per hour; and from this time decreases until the 10th of December, when it amounts to a small fraction of a mile per hour only. During this interval, the sea, upon a squally day—such as it would be dangerous if not impossible for boats to go off on,—may be stated to rise two and a half feet above, and to sink as much below, its mean level:—and in the case of a gale of wind it may possibly reach to the double of this amount.

Varying with the run of the sea is the height of the surf, and the distance from the shore at which the outer surf breaks ; being modified however by the wind and current. In a squally day, such as would be dangerous to catamarams or boats, the outer surf breaks at a distance of 400 feet from the shore, and in the case of a gale of wind,† the surf broke on the outside of the nearest buoy (which is 828 feet from the shore‡) : but on occasions of this nature the swell, breakers, and surf

* This remark although not invariably confirmed by the foregoing observations, is nevertheless I believe generally true : the catamaram men and boat men state that the current is always stronger in the afternoon than in the morning

† The very high surf experienced on the 6th December, although not resulting from a gale of wind at Madras, evidently had its origin in one at no great distance.

‡ I was not at the beach on this day ; but from the testimony of the Master Attendant and his deputy there can be but little doubt of this statement being correct.

merge the one into the other, so as to render it difficult to decide at what point the surf first breaks. The particulars with regard to the tides (already given at the beginning of the last page) differ in some respects from those found some years ago by Col. De Havilland: it is probable, however, that his observations were not made during the north-east monsoon, to which the results here given particularly belong.

MADRAS, 19*th December*, 1838.

N. B.—The above elevations of the *Station* above the level of the sea with the 5 feet telescope, have for the sake of comparison been reduced to the same elevation as those of the theodolite—we have— F. I.

Elevation of theodolite station above mean level of the sea	32 4
——————————above the floor of the verandah	5 1
Floor of verandah above mean level of sea	27 3

VII.—*The comparative cheapness of Large and Small arched Bridges.*

To the Editor of the Madras Journal of Literature and Science.

DEAR SIR,—It is some time since we heard that Government was going to construct a work of vast public utility near Trichinopoly, namely a permanent bridge across the river Cauvery, and it is now rumoured that the Court of Directors have liberally sanctioned this beneficial undertaking; and determined, as the most economical mode of construction, that it shall consist of 40 small arches.

Now as I feel rather sceptical whether this notion of economy is correct, and it would be a pity to see a work of this kind constructed without regard to appearance, if nothing is gained by the neglect, I have determined to submit the question of the comparative cheapness of large and small arched bridges, to the learned among your readers; in hopes, if I am wrong, of having my doubts removed; or, if I am right, of confering a benefit on our Trichinopoly public by promoting the better ornamenting of the town.

There are two ways in which people commonly talk of bridges: either as an artificial platform, from one side of a river to the other, which is cheap in proportion as it is thin; or as a road-way, supported by piers,

and less costly, as it has fewer of these piers. In these summaries the first position only seems to deserve investigation; for, if I am rightly informed, the difference in the amount of materials in the two cases, varies only as the span of the arch, and is not affected at all, by the number of piers; that is, the strength of the piers may be regulated in direct proportion to the span of arch; if the span be double, the piers too must be twice as thick; so that in the whole length of the bridge, the solid dimensions of the pier work are equal, whatever be the distance apart; but on the other hand, wider arches must be thicker than narrow, or they will not stand.

Architects tell us, that a bridge arch (of any but the very smallest dimensions), is not safe, unless it have at least one and a half feet of thickness at the apex, and it seems to be further agreed, that this thickness is sufficient for a span of 36 feet; all smaller arches therefore would seem to involve a waste of strength, or have a thicker platform than is required, and therefore they ought not to be built.

In proportion as this limit is exceeded, it appears, then, that the platform must be thickened, whilst the piers must also be augmented, as before described, in such a ratio, as to make the total of their thickness, just what it would be, if the spans were no more than 36 feet: we may therefore conclude that a brick bridge contains the smallest possible quantity of materials compatible with strength, if its arches have a span of 36 feet: but is it therefore less expensive?

To determine this, keeping out of sight for the present the question of risk from more impeded water-way, the following propositions should be solved: namely, whether, two piers, say of 6 feet, can be built for the same money as one of 12 feet; whether the difficulty and consequent liability to error is increased or diminished by multiplying the works in the bed of a river; whether (remembering that bricklayers are paid by the day and not by the quantity of work done) we are to suppose that more or fewer tiers of arch-work will be laid in the same time, each series requiring a fresh adjustment, by having fewer or more angles of direction to consult for the joints; whether (all arches being considered works of skill), the likelihood of individual or partial failure is diminished or increased by the numerical amount of such works of skill; whether a sinking of the piers is more to be anticipated when the foundations are many and narrow, or few and broad; whether danger of unequal subsidence of the arches is greater or less, as there are many or few arches to subside; and, lastly, whether all these sources of error and hindrances to the workmen would not in the end render the many arched bridge a work costing more money than one, more nearly ap-

proaching the dimensions which are now usually adopted in Europe: I will end my queries by asking whether I am still entitled to subscribe myself,

A non contributing reader ?

AMICO-PONTICULUS.

TRICHINOPOLY, *5th August*, 1838.

VIII.—*A remarkable Appearance in the Indian Seas; in a Letter from Lieutenant* DAWSON. *Communicated by* WILLIAM NEWNHAM, ESQ.

I beg leave to lay before the meeting an extract from the private journal of Lieutenant Henry Dawson, a very intelligent officer of the Royal Navy, at present employed on civil duties with the Indian Navy at Bombay, containing an account of a very extraordinary phenomenon, which was observed on the passage from Bombay to the Persian Gulf (the southern passage), on board the Honourable Company's sloop of war Clive, in 1832. On my first going to India, I was in the habit of intimacy with the late Captain David Seton, who was many years resident at Muscat, and I well remember hearing him relate the circumstance of falling in with the *white sea*, described by Mr. Dawson, on his occasional voyages to Muscat, during the period of the south-west monsoon.* So many years, however, have since elapsed, I am unable to give any more detail of the circumstance related by that officer, and merely here allude to it in proof of the phenomenon having been before observed.

WILLIAM NEWNHAM.

During a passage from Bombay to the Persian Gulf, on board the Honourable Company's sloop Clive, on the 22nd of August, 1832, at a quarter before eight o'clock at night, a phenomenon appeared of the following nature, and to all on board, of an unheard-of-kind, which gave

* Our subsequent inquiries serve to confirm this statement, inasmuch as few navigators appear to have passed along the eastern coast of Arabia, in the months of June, July, and August, without noticing the discolourment of the water (but *during the night only*), and which, on examination when brought on board, is said to exhibit no difference whatever from sea-water in other parts of the ocean.—ED. *Jour. R. A. S.*

rise to transitory feelings of apprehension as to the vessel's contiguity to danger. Sailing under double-reefed top-sails and foresail, at the rate of nine and a half miles per hour, before a strong south-west monsoon wind, and a high sea, without any indication of a change in the elements, the ship was surrounded *instanter* by water as white as milk or snow; it seemed to have no termination until it reached an altitude of seventy-five or eighty degrees, where it subsided in a strongly marked ecliptic, above which the heavens presented a beautiful and bright blueish cast, not dissimilar to polished steel. No line of horizon was visible; the dead white colour of the water close to the ship, as it increased in distance from her very gradually brightened, until, where I supposed the horizon to be, it assumed a silvery aspect, which, increasing as it ascended, became brilliant and dazzling towards the zenith, obscuring the stars and clouds which had before this visitation been distinctly visible. The sea in a moment became smooth: the ship, from rolling and labouring considerably, quite steady; no diminution in the wind occurred, but a sensation that it had fallen, even to a calm, was general, but momentary. This delusion was occasioned by the instantaneous steadiness of the vessel, as well as the cessation of the previous noise from the lashing of a mountainous and confused sea against the vessel's sides, and on her decks; her progress through the sea, however closely scrutinised, could not be observed; the disturbed water alongside and in her wake, as well as the foam around her bows, did not contrast with the adjoining unagitated fluid, notwithstanding, from the velocity of the ship through the water, these must have been considerable. Not a particle of phosphoric matter was once observable, either in the surrounding ocean, or in the water immediately displaced by the ship's passage through it; but when taken up in a bucket, and agitated with the hand, such was visible, but not in a greater proportion then is usual, nor did the water vary in appearance from common sea-water: nothing could be perceived to attribute this strange phenomenon to.

Animalcules of a minute kind were perceptible, as likewise a few pieces of a glutinous substance of a purple colour, but neither in any considerable quantity, nor differing from what is usually found in the seas of the Indian Ocean.

We sailed the distance of fifteen miles without the slightest change in the appearance of the sea or sky, when in a moment this extraordinary phenomenon vanished, the ship at the same instant encountering the like high and turbulent sea as previous to her envelopement.

The ship was not within one hundred miles of the eastern coast of Arabia, or of soundings, but sailing in what is termed deep ocean water.

I have before mentioned that the ship was quite steady during her progress through the white water: this was the case, with the exception, that in a few instances she gave a heavy roll, as if influenced by a following swell: these were not more frequent than once in a quarter of an hour. Latitude 21° 46′ north, 58° 40′ east; thermometer 87°, barometer twenty-nine inches and nine-tenths.

The phenomenon I have attempted to describe appeared twice after we were first extricated from it, for periods of about twenty minutes; its brilliancy, as well as influence over the waves, as previously described; the transition from high and mountainous seas to a smooth and seemingly quiet ocean, and change again to turbulence, was as sudden as a flash of lightning.

On my arrival at Muscat, a few days after, I endeavoured to gain some information on the foregoing matter, but beyond finding that the phenomenon was occasionally met during the strength of the south-west monsoon, about the limit noted, and that the water was then *quite fresh*, I could ascertain nothing satisfactory. My informants were the Nakodas, or captains of His Highness the Imam's ships of war, who frequently navigate between Muscat and Zanzibar, consequently must pass about the spot the Clive met what I have related. The Arab captains were firm in their assertion in the particular of the fresh water, although they confessed that they had never tasted it. I did, as also the surgeon of the vessel, and, as I mentioned before, it did not vary in any way from ordinary sea-water.—*Journal of the Royal Asiatic Society*, No. 9—p. 198-200.

H. D.

IX.—*Special Report on the Statistics of the Four Collectorates of Dukhun, under the British Government.*

[In spelling Oriental words, the *a* is the *a* in *all*, the *u* as in *hut*; the rest have the usual English sound.]

THE General Committee of the British Association which met at Cambridge in 1833, did me the honour to pass a resolution that I should prepare for publication my manuscripts respecting the Statistics of Dukhun (Deccan). I have been anxious to respond to so flattering a desire at an earlier period, but having placed my manuscripts in the hands of a distinguished person, as auxiliary to his scientific labours, I have been

deterred from reclaiming them until the objects for which they had been placed at his disposal were realized.

In responding at last to the call of the British Association, I feel very considerable embarrassment in adapting my materials to the space which can be afforded to me in its annual volume. The materials, in fact, are very voluminous; and the nature of my subject embracing multitudinous details, figured statements, and lengthened tables, makes it a work of no ordinary difficulty to digest, abridge, and condense them without involving my subject in obscurity, and exposing myself to the imputation of inefficient inquiry from the hiatus which must appear. I beg, therefore, distinctly to state, that the absence of information observable in the following Report, is attributable, not to paucity of matter, but to the want of a sufficient field in which to display it.

Extent and Physical Circumstances.

I propose to give but a meagre sketch of the statistics of Dukhun; a mere enumeration of its population, products, manufactures, revenues, civil divisions, &c., with little more comment than may be necessary to ensure perspicuity.

In the execution of my public duties as Statistical Reporter to the government of Bombay, my researches made me acquainted with the statistics of the four collectorates of Dukhun, denominated the Poona, Ahmednuggur, Candeish or Khandesh, and Dharwar Collectorates; facts were also collected respecting the territories of the Rajah of Sattarah, and some few details came to hand illustrative of the state of the possessions of the southern Mahratta Jagheerdars, which are under British protection. In adverting to the whole of these territories, although I shall name them separately in describing their extent, physical circumstances, and civil divisions, it will only be to notice where they differ from each other.

The whole of the above territories, containing 3,285,985 inhabitants, spread over 48,987 square miles, and averaging 67 inhabitants to the square mile, lie upon that elevated plateau, which has an abrupt termination on the western side of India, in what are usually denominated the Ghâts, but which plateau gradually declines, occasionally by a succession of low steps, as is seen by the courses of rivers to the Coromandel coast, excepting in Khandesh (Khind meaning a gap or trench, and Desh a country), where the river Tapty disembogues to the westward, from the peculiar configuration of the narrow valley in which this collectorate lies. Some of the platforms on the summit of the Ghâts have an elevation of 5000 feet above the sea, but the general level of the

main plateau of Dukhun is about 2000 feet high near the Ghàts, and scarcely exceeds 1000 feet in the eastern limits of the collectorates. The whole territory is mountainous near to the Ghàts, and has numerous valleys, some of them narrow and tortuous, others broad, open, and flat. At from thirty to fifty miles eastward from the Ghàts, most of the mountain spurs which produce the valleys terminate, and the country becomes open and tolerably level for considerable distances, with an occasional step down to the eastward: the country, in fact, being made up of beds of trap, the beds extending the further to the eastward the lower they are in the series. There is much forest and underwood and jungle along the line of the Ghàts: but to the eastward the country is open, and there is a want of wood: parts of Khandesh and Dharwar are exceptions to this description. The western tracts along the Ghàts are called the Mawuls, in contradistinction to the open country, which is called the Desh or Dès.

It may be as well to state here that all lands in Dukhun are classed within some village boundary or other, and this boundary is maintained with such jealousy and tenacity by the inhabitants, as to lead to frequent feuds and bloodshed on the slightest invasion of village rights. The village constitution and the occupancy of lands will be mentioned under land-tenures.

Rivers.—The rivers of Dukhun, which in the monsoon flow with a magnificent volume of water, in the hot season present a broad gravelly bed, with only a thread-like stream in many of them, but from natural barriers of rock in the bed of the Beemà, Godavery, Kistnah, and other large rivers of Dukhun, extensive sheets of water, called Dhò or Dhào, are formed, which abound with fish.

Roads and Bridges.—The roads in Dukhun, with the exception of two great military roads, are untouched by art: and few of the rivers can boast of a bridge.*

Climate.

A detailed account of the atmospheric tides, and meteorology of Dukhun having been published in the *Philosophical Transactions*, I shall limit myself to a description of such broad features as characterize the climate. The Ghàts and the Desh have distinct features. The tract along the line of the former has a lower mean temperature, much more

* The *Geology of the Deccan*, which follows in this place, was re-published by us from the *Transactions of the Geological Society of London*, in the 17th Number of this Journal, p. 344.—EDITOR, *Madras Journal*.

moisture, greater prevalence of westerly winds, a more limited range of the thermometer; but a greater prevalence of fogs before, during, and after the rains, but not in the winter months; and, finally, is characterized by the absence of hot winds. The Desh, on the contrary, has the air excessively dry in the hot months; a great diurnal and annual range of the thermometer, a comparatively small fall of rain in the monsoon, the frequent occurrence of hot winds, and the rareness of fogs.

Barometer.—The mean monthly pressure of the atmosphere is greatest in the winter months of December and January; it gradually diminishes until July or August, the most damp months, when it is at its minimum; it gradually increases again until the cold months. The greatest diurnal oscillation recorded by me in several years' observations was ·1950, or less than two-tenths of an inch; the smallest oscillation ·0150. The mean rise of the barometer from sunrise to 9—10 A. M. for three years was ·0445, thermometer + 7°·15′. The mean fall from 9—10 A. M. to 4—5 P. M., for four years, was ·1066, thermometer + 5°·21′; and the mean rise from 4—5 A. M. to 10—11 P. M., for one year, is ·0884, thermometer —7°·2′. The maximum range of the barometer at Poona, in the year 1830, at 1823 feet above the sea, was only ·672, or not seven-tenths of an inch. The mean height of the barometer for that year was 27°·9254, and the mean height in the monsoon was 27°·8447; so that the constant moisture of the monsoon only occasioned a mean diminution of pressure of ·0807, or less than one-tenth of an inch. At Madras, for twenty-one years, the mean height of the barometer was 29°·958′ inches; at Calcutta, the means of three years make it 29·764. M. Arago, at Paris, by nine years' observations, reduced to the level of the sea, makes the mean height 29·9546 inches, being almost identical with the mean height at Madras.

Atmospheric tides.—There are four tides of the atmosphere in Dukhun, as indicated by the movement of the barometer: two diurnal, and two nocturnal: the diurnal rising tide is from 4—5 A. M. to 9 - 10 A. M., and varies from ·0200 inches to ·0500 inches; the falling tide is from 9—10 A. M. to 4—5 P. M., and varies from ·1950 inches to ·0150 inches. The nocturnal rising tide is from 4—5 P. M. to 10—11 P. M., and varies from ·0450 inches to ·1140 inches; the nocturnal falling tide is from 10—11 P. M. to 4—5 A. M., and is about ·0442 inches. This order was never deranged or inverted in one single instance in many thousand observations.

Temperature.—The climate of Dukhun is subject to very considerable variations of temperature; more, however, in the diurnal than in the monthly or annual ranges; indeed, less so in the last particular than in Europe. In 1827, the extreme range of the thermometer at Edmonton

was 75° Fahrenheit; at Cheltenham, 61°·6. In St. Petersburgh, the thermometer has been as low as 35°·7′ *below zero*, and as high as 91°·4; the range, therefore, 127°·1. At Berne, the annual range has been more than 75°. In 1826, I observed a range of 53°·4, viz., from 93°·9 on the 12th March, to 40°·50 on the 15th January at sunrise. In 1827, the maximum range observed by me was 48°·8, viz., from 96°·8 on the 28th March, to 48° on the 12th December at sunrise. In 1828, the maximum occurred on the 7th May, being 101°, and the minimum was 56°, the range, therefore, 45°; but, for a very short time, the thermometer rose on the 7th May, between two and three o'clock, to 105°; and this was the more remarkable as I was then encamped on the edge of the Ghàts at the source of the Beema river, at an elevation of 3090 feet above the level of the sea. This instance of unusual height of the thermometer, however, is not confined to Dukhun, for we learn from M. Arago, that it has been higher than 101° Fahrenheit in the shade in Paris.

Monthly means.—The monthly *means* do not differ more than from 13° to 17° from each other. In 1826, the difference between the hottest month (May, 83°·28), and the coldest (January, 65°·90), was only 17°·38. And in 1829, March was the hottest month, and November the coldest, their difference of means being 13°·66.

Diurnal range.—The greatest diurnal range in 1826 was on the 5th March, being 37°·30, from 50°·5 to 87°·8. In 1827, it was 32°·5, on the 12th December, from 49°·5 to 89°. In 1828, it was 34°·8, on the 16th July, from 56° to 90°·8. In 1829, the maximum diurnal range was 37°·5 in December. The minimum diurnal range occurs in the monsoon months of June, July, August, and September; indeed, occasionally, on some days in those months, the mercury does not move at all.

Mean Temperature.—In 1828, Dr. Walker, at Ahmednuggur, at an elevation of 1900 feet above the sea, made the mean temperature 78°; and though I was living in tents, and moving about the country, I made it only 77°·93. Of course, on higher or lower levels this mean temperature will be diminished or increased. It is necessary, however, to note one remarkable fact, namely, that the mean temperature of places on the table-land of the continent of India is much higher than the calculated mean temperature of the *same* places agreeably to Mayer's formula. The calculated mean temperature of Ahmednuggur is 72°·27, observed 78°; of Poona 72°·78, observed 77°·7; of Mhow, in Malwa, 69°·86, observed 74°: temperature of a spring in the hill fort of Hurreechundurghur 69°·5, calculated temperature 65°·15.

The results of several years' observations indicate that the annual mean temperature of 9°·30 A. M., is nearly identical with the mean temperature deduced from the maxima and the minima.

With respect to the greatest diurnal, and the greatest monthly range of the thermometer, the winter months have a range nearly in a quadruple ratio to the monsoon months. The latter have mostly the temperature very equable, the difference of the monthly means rarely exceeding 3°, and the greatest diurnal range in five years only once amounted to 13°·6. The latter end of March, and April, and May are the hottest periods of the year, from the position of a nearly vertical sun, the intensity of whose influence is but slightly modified by the occasionally cloudy weather: the temperature falls in June, and continues nearly stationary until the end of September: it then rises in October, but falls at the end of the month, until its annual minimum in December or January. It is low the early part of March, but rises *suddenly* after the middle of the month, occasioning a difference of 6° or 8° between the means of February and March, which is more than double that of other consecutive months in the year. The rise in October is also sudden, but does not occasion so great a difference of means as between February and March. It will thus be remarked that the temperature does not follow the sun's declination, owing to the interference of the monsoon.

Moisture.—A remarkable feature in the climate of Dukhun is the small quantity of aqueous vapour generally suspended in the air, compared with the proximate climate of Bombay and the coast, or even the hilly tracts of the Ghàts. My observations were made with Daniell's hygrometer, and extended over several years. There is a gradual increase of moisture in a cubic foot of air, from the most dry month, February, until June and July. Hence the moisture remains nearly stationary until the beginning of October, when it diminishes somewhat rapidly and regularly until February. The annual mean dewing point is greater at 9½ A. M. than at sunrise or at 4 P. M., but this does not uniformly hold good in each month of the year. In 1826, the highest dewing point was at four o'clock on the 21st October, being 76°, temperature of the air 84°·5, a cubic foot of air holding 9·945 grains of water. The lowest dewing point was on the 4th December, at sunrise, being 44°, temperature of the air 56°, a cubic foot of air containing 3·673 grains of aqueous vapour; but the lowest dewing point did not indicate the driest state of the atmosphere, as a dewing point of 45° in November, with a temperature of 87° at 4 P. M., gave only 3·587 grains.

The most moist month was July; the mean weight of water in a cubic foot of air was 8·775 grains, and the point of saturation was only 4°·85 from the dewing point. The greatest monthly range of the dewing point was, in October, 30°, and the smallest range, 7°, was in July and August. The monthly range was not coincident with the movements of

the barometer and thermometer; but there were curious approximations. The extreme dewing points differed 32°. The dewing point has been as high as 76°, temperature of the air 79°, a cubic foot of air containing 10·049 grains of aqueous vapour; but this is a rare occurrence. An instance occurred of the dewing point being obtained at 3° below the point of the congelation of water, the temperature of the air being 62°, and a cubic foot of air holding 2·146 grains of water. There is also an instance of a dewing point, in February, 1823, being 61° below the temperature of the air, viz., from 90° to 29°, but I never afterwards succeeded in determining anything like so great a depression.

In January, 1827, there was a range of the dewing point of 38°, and the extreme range of the year was 47°, viz., from 29°, temperature 62°, in January, to 76°, temperature 79°, in June. In 1829, the mean dewing point for the monsoon was 69°·62, temperature 75°·83; the cubic foot of air containing 8·191 grains of water. In 1830, the observations are only complete for 9—10 A. M.; the mean dewing point was 61°·9, temperature 78°·4, and a cubic foot of air contained 6·351 grains of water: the extreme range of the hygrometer was 47°, the lowest dewing point 31°, temperature 50°, in December. It might be supposed that the hottest months in the year, March, April, and May, would also be the driest; but such is not the fact. The powerful action of the sun on the ocean, in the middle of March, raises a large quantity of aqueous vapour, which continues to increase in the ratio of the sun's progress north: the westerly winds waft this vapour into Dukhun; much of it is arrested by the Ghâts and hilly tracts eastward of these mountains; accounting for the sensible moistness of the air, the frequent night fogs, and deposition of dew in this line, in the end of March, and in all April and May. The supply of moisture diminishes in proportion to the distance eastward from the sea, to the limits of the Coromandel coast monsoon. We in consequence find the Ghâts, Poona, Ahmednuggur, and the Bala Ghât, all with very different dewing points in the hot months.

The hygrometric state of the air in Bombay and Dukhun is remarkably contrasted: in fact, there is more aqueous vapour suspended in the air in Bombay in the hot months, than there is at Poona at any time during the monsoon. In April and May, 1826, in Bombay, the monthly mean dewing points were respectively 78°·84 and 79°·59, temperature 83°·48 and 84°·52, a cubic foot of air holding 8·988 grains, and 9·743 grains of water suspended: whilst July, the most rainy month during the monsoon, at Poona, had only a mean of 8·775 grains of water suspended. In 1827, the means of ten days' observations in Bombay, in April, gave 10·243 grains of aqueous vapour in a cubic foot of air: and

the greatest mean quantity at Poona was in June, and it amounted only to 8·931 grains. In 1828, in the month of March, the following were the dewing points in consecutive days, travelling from Bombay to Poona: Bombay, 10th March, 4 P. M., 11·205 grains of water in a cubic foot of air; at Poona, at the same hour, on the 14th March, 2·273 grains. At Bombay, on the 10th, at sunrise, and at 9½ A. M., the dewing points were respectively 72° and 71°, temperature 75° and 81°·5, a cubic foot of air containing 8·873 grains at the former hour, and 8·487 grains at the latter hour. The following morning at Kundaliah, on the top of the Ghâts, 1744 feet above the sea, at the same hours, the dewing points were 36° and 40°, temperature 72° and 78°, equivalent only to 2·690 grains, and 3·094 grains of water in a cubic foot of air. In the afternoon of the same day, at Karleh, 2015 feet above the sea, seven miles east of Kundallah, a cubic foot of air held 2·954 grains, and on the 12th, at 4 P. M., 2·611 grains of aqueous vapour. On the summit of the hill fort of Loghur, 3381 feet above the sea, and 1366 above Karleh, the dewing point at sunrise on the 13th, was 5° Fahr. below the freezing point, temperature of the air 67°, and a cubic foot of air held only 1·995 grains of water in a state of vapour. These facts fully establish the remarkable discrepancies between the hygrometric state of the air in Bombay and Dukhun, and that too within a difference of a few miles of latitude and longitude. A comparison of the absolute falls of rain in Bombay and in Poona, for the years 8826-7-8, shows an agreement (to a certain extent) in their ratio to the hygrometric state of the air at Poona and Bombay, above noticed. The mean fall of rain at Bombay in those years was 93·62 inches, and at Poona 26·926 inches, or 28¾ per cent. only of the fall in Bombay.

Rain.—In Dukhun the rains are light, uncertain, and, in all years, barely sufficient for the wants of the husbandman, and a slight failure occasions much distress. They usually commence at the end of May, with some heavy thunder showers from E. to S. E., the lightning being terrific and frequently fatal, and the wind furious; but they do not set in regularly until the first ten days in June, and continue until the end of September from the W. to the S. W., and break up with thunder-storms from the E. to the S. E. before the middle of October. During the remaining months of the year an accidental shower or two may fall from the Coromandel monsoon: and the further the distance eastward from Poona, the greater the chance of showers in the cold months. The monsoon temperature is equable and agreeable, and the rain occurs almost always in showers, rarely continuing uninterruptedly for a day or more, as is common on the coast and in the Konkun. The greatest

quantity of rain falls in the months of June and July. The greatest fall of rain in any one day was 2·58 inches, on the 6th July, 1826; at Bombay, on the 24th June, 1828, there fell 8·67 inches; and at Hurnee, on the 15th June, 1829, there fell 8·133 inches in 24 hours.

The mean annual fall of rain for all England, from many years' observations, appears to be 32·2 inches, but the means of different counties vary from 67 inches in Cumberland to 19 inches in Essex.

The clouds supplying the monsoon rains in Dukhun would appear to have a low elevation, as I have frequently seen through breaks as they were passing swiftly from west to east, a superior stratum, apparently stationary, or moving slowly in a contrary direction, and gilded by the sun's rays.

Winds.—The great features in the observations respecting the winds, are the prevalence of winds from the west and westerly quarters, east and easterly quarters, and the extreme rareness of winds from the north and south, and the points approximating to them; and these features appear to be constant in successive years. In 5229 observations the wind blew from the west, or points adjoining, 2409 times; and in this number the S. W. (305), and N. W. (122), amount only to 427. From easterly points 949 times, including 246 from the N. E. and S. E., thus leaving 703 from the east. From the north 115 times, and from the south 36 times only. Another feature is the frequent absence of wind, particularly at sunrise, and more so in the months of January, February, March, October, and November than in other months of the year. The cessation of wind from May to September inclusive is comparatively rare; and, generally, throughout the year the absence of wind at 4 P. M., may be looked upon as unusual. In my records there are 1720 observations of "*No* wind," and 847 of these belong to sunrise, 452 to 9—10 A. M., and 304 only to 4 P. M.

The observations were continued through five years, three times daily; sunrise, 9—10 A. M., and 4 P. M. There is considerable uniformity in the direction of the wind in the same months in consecutive years. The westerly winds begin to *prevail* in March, alternating with easterly winds, which blow the latter part of the night; but the easterly winds disappear as the monsoon approaches, and do not re-appear again till October. In October the winds are variable, and the records of "No wind," increase suddenly and rapidly. A few easterly winds, however, about the end of the month, indicate the change which is to take place; they gradually increase, and with those from the N. E. and S. E., almost entirely supersede the winds from the westerly points during the cold months.

In March, from the sun's approach, the interior land during the day gets heated; an influx of air from the sea coast commences daily after 10 A. M.; but as the earth, at this period, cools more rapidly than the sea at night, the interior is cooler than the coasts, and there is a reflux of air towards the ocean; the easterly and westerly winds thus alternate day and night. This alternation, however, diminishes in the ratio of the sun's increasing power; and when the earth gets so thoroughly heated that it cannot reduce its temperature by radiation below that of the sea, the consequence is the prevalence of winds from the westerly points to the almost entire exclusion of those from easterly points. In June the westerly winds set in regularly. There are occasional instances of the wind blowing with much steady violence from the west for many hours in the hot months with a sunny sky. In the early part of March some unaccountably cold winds, affecting vegetation even, have been known to blow.

Hot Winds.—The well-known hot winds of tropical continents do not prevail near the Ghàts; but the same wind, which is pleasant in their neighbourhood, may become a hot wind as it travels to Ahmednuggur and Arungabad. The east wind is characterized by its extreme dryness, and it is dangerous to sleep exposed to it.

Whirlwinds.—Those curious whirlwinds noticed by travellers in Africa, and which in the deserts are dangerous, are of common occurrence in Dukhun in the hot months. A score or more columns of dust, in the form of a speaking trumpet or water-spout, may be seen rapidly coursing over the treeless plains, marking a vortex of heated air. They are sufficiently powerful to unroof a thatched house, strike tents, and whisk away all light matters.

Hail Stones.—Hail stones of considerable magnitude sometimes fall in the thunder-storms of the hot months.

Dews.—Dews appear plentifully after the monsoon, and during the nights of the cold months; but their frequent local occurrence has often excited surprise.

Fogs.—Fogs are of so rare occurrence in the Desh, or country eastward of the Ghàts, that I have only nineteen records of them during five years. Along the Ghàts they are much more common; and during April and May, for three or four nights in the week, fogs drift rapidly to the eastward from the Konkun, or low country at the foot of the Ghàts. On some nights no drift takes place, and the fog remains resting on the Konkun; and, seen from the crest of the Ghàts at sunrise, has the appearance of a sea of milk. As the sun rises the fog creeps up the chasms of the Ghàts, and finally disappears by 10 A. M.

Salubrity of the Climate.—With respect to the salubrity of the open parts of the country, it will only be necessary to state that, in my little camp, consisting of more than a hundred souls (natives), I had not a single death of an adult during 6 years; nor a case of illness (excepting one) that I did not cure without regular medical aid. Dr. Walker, long civil surgeon in the city of Ahmednuggur, found the casualties in 1828 in that city (exclusive of losses from spasmodic cholera) to be only 1·82 per cent., or 1 in 55·1 persons; and, including cholera, 2·48 per cent., or 1 in 40·2 persons. Dr. Lawrence, in charge of a regiment of natives 1,000 strong, lost only 0·85 parts of an integer per cent., per annum, or about 5 men in 600 during the years the regiment was in Dukhun.

Parts of Khandesh have not credit from the same salubrity.

Botany.

Under this head I shall confine myself to a simple enumeration of the agricultural and garden products, and wild fruits. To enter into the botany of Dukhun generally would be misplaced in this digest. And first with regard to cultivated native fruits; there are forty-five in number, viz.

Cultivated Fruits.—Amba, *Mangifera indica*[a]; Oombur, *Ficus glomerata*; Phunnus, *Artocarpus integrifolia*[b]; Cheents, *Tamarindus indica*[c]; Ambarra, *spondias Mangifera*[d]; Hurparewree, *Cicca disticha*; Ramphal, *Annona reticulata*[e]; Seetaphul, *Annona squamosa*; Raeebor, *Zizyphus jujuba*; Jamblee, *Calyptranthes caryophyllifolia*; Awlee, *Phyllanthus emblica*; Bail, *Ægle Marmelos*[f]; Wowulee, *Mimusops elengi*; Narlee, *Cocos nucifera*[g]; Jamb, *Eugenia Jambos*[h]; Mohha, *Bassia latifolia*; Toot, *Morus alba*[i]; Shatoot, *Morus indica*[k]; Chooochoo, *Morus*———[l]; Kurumbul, *Averrhoa Carambola*[m]; Kuweet, *Feronia elephantum*[n]; Bhokur, *Cordia latifolia*; Anjeer, *Ficus Carica*[o]; Daleemb, *Punica granatum*, (two kinds)[p]; Weer, *Citrus limon*[q]; Chukotur, *Citrus decumanus*[r]; Maloong, *Citrus medica*[s]; Nareeng, *Citrus aurantium*[t]; of these there are several kinds; Ambut neemboo, *Citrus acida*[u]; Sakur neemboo, *Citrus limon* var.[x]; Peroo, *Psidium Pyriferiferum*[y]; Peroo tambra, Red Guava; Kajoo, *Anacardium occiden-*

a Mango. b Jack fruit. c Tamarind. d Hog-plum.
e Sweep-sop. f Bengal quince. g Cocoa nut. h Rose apple.
i White mulberry. k Red mulberry. l Small mulberry. m Coun. gooseberry
n Wood apple. o The garden fig. p Pomegranate. q Lemon.
r Shadock. s Citron. t Orange. u Lime.
x Sweet lime. y Guava.

tale [a]; Gondnea, *Cordia myxa;* Tarh, *Borassus flabelliformis;* Phopy, *Pupeea Carica;* Badam, *Terminalia catappa;* Sooparee, *Areca faufel* [b]; Kujoor, *Phœnix dactilifera* [c]; Kel or Kail, *Musa paradisiaca* [d], there are several species or varieties. Sonkel, *Musa sapientum;* Draxhs, *Vitis Vinifera* [e]. There are seven species of grapes in Dukhun, the Mahratta names of which are Kalee, or black; Ahbee, or watery; Phukree, or Muscadina; Sabeebee, Bedana, or seedless; Sooltanee; and Suckree, or sugary. Khurbooz, *Cucumis Melo* [f]; Phoot, *Cucumis momordica;* and Kulungrah, *Cucurbita Citrullus* [g]. There are several species or varieties of the melon.

Wild Fruits.—The wild fruits are twenty-two in number, viz. Beebah, *Semicarpus anacardium* [h]; Cher, *Chirongia sapida;* Ratambee, *Garcinia*——— [i]; Torun, *Zizyphus albens;* Kurwund, *Carissa Carandas* and *diffusa*, both of them excellent fruits; Seendee, *Phœnix Sylvestris*, or *Elate Sylvestris* [j]; Jungle Jaeephul, *Myristica dactyloides* [k]; Peempree, *Ficus comosa;* Rahbor, *Zizyphus Xylopyrus*; Bunkeil, *Musa troglodytarum*, [l] two varieties; Gooloom, *Loranthus bicolor;* Lotowl, a genus and species not determined; Ambgoolee, *Elæagnus*———, a very nice fruit, tasting like a gooseberry. Ulloo, *Vanqueria spinosa;* Temboornee, *Gardenia*, ——— ; Thurtee, *Capparis erythrocarpus*; Neptee, *Capparis aphylla;* Wagatee, *Capparis Zeylanica;* Makur Neembonee, *Citrus*——— [m]; Wuhr, *Ficus Indica;* Loheer, *Ficus*———, a noble tree, 80 to 100 feet high.

The above comprise the wild fruits of Dukhun; many of them are not only passable, but very palatable, particularly the Ambgoolee, the Kurwund, and the Char. The Ratambee, or wild mangostein, is in extensive use as an acid seasoner, and is met with for sale in most markets in a dried state. The wild nutmeg is frequently imposed upon the ignorant for the real nutmeg. The oil of the Beebah is used for marking linen, like indelible ink; but the kernel roasted is agreeable. The wild lime *(Citrus)* is only met with in the Ghàts; it forms a handsome dense tree, but the cultivated fruit is so abundant that the wild is not made any use of. Many of the above fruit trees produce good timber. With respect to the mango, which is met with both cultivated and wild, it is considered by the people less as a luxury, than as an auxiliary to the necessaries of life, or as a substitute for them in seasons of scarcity; for the

a Cashew nut. b Beetle nut.
c Date. d Plantain. e Grapes. f Musk melon.
g Water melon. h The marking nut. i The wild mangostein j Wild date.
k Wild nutmeg. l Wild plantain. m The original apparently of some of the species of *Citrus* in Dukhun.

mango is in fruit, and seldom fails an abundant crop, at a time when the earth is parched up by the heats of May and beginning of June.

Agricultural Products.—A brief notice only of the agricultural products can be given. The harvests are of two distinct kinds; one is the Khurreef, or rainy season harvest; the other is the Rubee, or dry, or cold, or spring season, harvest.

Wet Season Harvest.—This harvest produces twenty-two kinds of grain and pulse; but the products of the Desh, or open country, are different from those of the Mawuls, or hilly tracts along the Ghâts. The following are the products of the monsoon crop in the Desh: Jondla, *Andropogon Sorghum*, and of these there are many varieties; Sujgoora, *Panicum spicatum*; Rahleh, *Panicum Italicum*; Bhadlee, *Paspalum pilosum*; Kodroo, *Paspalum frumentaceum*; Mukka, *Zea Mays*[a]; Moog, *Phascolus Mungo*, Ooreed, *Phascolus radiatus*; Tooree, *Cytisus cajan*; Muht, *Phaseolus aconitifolius*; Teel, *Sesamum orientale*, two kinds; Ambaree, *Hibiscus Cannabinus*; Oolgeea, *Dolichos biflorus*; Waal, *Dolichos spicatus*; Rajgeerah, *Amaranthus oleraceus candidus*; Chuwluya, *Dolichos catiang*; and Gowarya, *Dolichos fabæformis*: there are thus seventeen products of the monsoon harvest of the Desh. The first six are bread grains, and are reduced to flour; Teel and Rajgeerah are eaten unground; Ambaree is a cordage plant, the rest are pulse, and are cooked in a variety of ways. Tooree is the universal substitute for the split pea of Europe; it is much more agreeable than the pea, and is more commonly used.

The produce of the rainy season harvest in the hilly tracts is Dhan, *Oryza sativa*,[b] seventeen or eighteen kinds; Natchnee, *Eleusine coracana*, or *Cynosurus coracanus*; Sawa, *Panicum miliaceum*; Wuree, *Panicum miliare*; and, finally, Karleh, *Verbesina sativa*. All these require a superabundance of water. The rice, which is the chief support of the people of the hilly tracts, is sown in the valleys, because it can be constantly flooded. Karleh is an oil plant only; the others are sown on the sides of the mountains, in places inaccessible to the plough. They are either used whole, or are reduced to flour for bread. Rice is never reduced to flour.

It is not to be understood, that the above products, as separated into those of the hilly tracts and Desh, are rigidly confined to those tracts; where the physical circumstances permit of it, they are indiscriminately cultivated in both tracts. The returns of some of the above plants are prodigiously great. I have seen a plant of *Paspalum frumentaceum*

a Indian corn. b Rice.

with twenty stalks radiating from a common root, and with thirty-three spikes of grain, giving the astonishing return of 61,380 for 1 ; a single head of *Andropogon Sorghum* gave 2895 for 1 ; eight stalks of *Panicum spicatum* from a single root 16,960 for 1 ; and a single head of *Panicum Italicum* produced 1850 for 1 !!

Dry or Spring Season Harvest.—The next harvest is that of the Rubee, or dry or spring season of the Desh. In this harvest, of twenty-three products, there are four species of fine wheat, viz. Guhoo Bukshee, *Triticum spelta*; Kupleh Guhoo, *Triticum* ——— ; Kateh Guhoo, *Triticum* ——— ; and Pohteeyai, *Triticum* ———, called bellied wheat, from the seed being very much swelled out in the middle. Urburee, *Cicer Arietinum ;* Shaloo, *Andropogon saccharatum ;* Juw, *Hordeum hexastichon* [a] ; Watanah, *Pisum sativum* [b] ; Kurdee, *Carthamus Persicus ;* Juwus, *Linum usitatissimum ;* Mohuree, *Sinapis racemosa*, and two other kinds ; Taag, *Crotolarea juncea* ; Yerund Tambra, *Ricinus communis* [c] ; Yerund Eerwa, *Ricinus viridis ;* Oos Tambra, *Saccharum officinarum* [d] ; Oos Poonda, *Saccharum* ——— [e] ; Oos Pandra, *Saccharum* ——— [f] ; Oos Bèt, *Saccharum,* ——— [g] ; Shet Wallook, *Cucumis* ———, the literal meaning is field cucumber ; Pawteh, *Dolichos* ——— ; Tumbakoo, *Nicotiana tabacam* ; Shet Kapoos, *Gossypium herbaceum* [h] ; Bhoeemoong, *Arachis hypogæa.* [i]

The above are chiefly produced in the Desh, in the dry season. Urburee, *Cicer arietinum*, is the universal substitute for oats for horses: and, excepting in the rains when green grass is obtainable, the juicy, sweet, and nutritious stalks of the Shaloo, *Andropogon sorghum*, and varieties, is their only forage. Oil is expressed from the seeds of Kurdee, Juwus, Mohuree, and Yerand. Juwus is not used for its flax. Although there are four kinds of sugar-cane, and much raw sugar is produced, the processes of refining are not carried on. The bark of Taag is used for ropes and coarse canvas. The returns from the wheat are very considerable ; I have a specimen of Kupleh Guhoo, with twenty-five stalks from one root, giving a return of 1450 for 1 ; ten stalks are very common ; a specimen of the Kateh Guhoo, also in my possession, with fifteen stalks from a single root, giving a return of 480 for 1. The average on tolerable land is eight stalks or ears to a plant. The tobacco from some parts of the country is reckoned very fine.

The dry season harvest of the hilly tracts is almost entirely confined to Mussoor, *Ervum hirsutum* ; and Pawta, a variety of *Dolichos Lablab.*

a Barley. b Peas. c Castor oil. d Red sugar cane.
e Variegated sugar cane. f White sugar cane. g Reed-like sugar cane.
h Field cotton. i The earth nut.

Garden produce.—The produce of the gardens is of great importance to the natives of India, from their poverty limiting them very much to a vegetable diet, corrected by aromatic seeds and condiments. Most of the plants cultivated in the gardens of the Desh are also produced in the gardens, where they exist, (which is rarely) of the hilly tracts. The products are forty-six in number, viz., Dhunya, *Coriandrum sativum*[a]; Mehtee, *Trigonella fœnugrecum*; Shepoo, *Anethum sowa*; Bureeshep, *Anethum fœniculum*[b]; Wowa, *Ligusticum agivaen*; Hulwee, *Lepidum sativum*; Meerchya, *Capsicum annuum*[c]; of this there are many species. Patee, *Allium cepa*, [d] red, white, and yellow; some of which are so mild as to be used as vegetables. Chakweet, *Chenopodium album*; Chooka, *Rumex Vesicarius*[e]; Wahlea, *Basella rubra* and *alba*; Aaloo, *Arum campanulatum*; Tandoolja, *Amaranthus polygamus*; Maat Tambree, *Amaranthus oleraceus*, var.; Paluk, *Beta Bengalensis*; Mohtee gohl, *Oxalis monadelphus*; Gohl, *Portulaca oleracea*; Pokulla, *Amaranthus*, ——; Poodna, *Mentha viridis*; Chundun Butwa, *Chenopodium*, ——; Bhang, *Cannabis sativa*[f]; and Nagwail, *Piper Betel*. The most valuable of the above plants produce aromatic or pungent seeds; most of the rest are pot-herbs held in considerable estimation.

Edible roots.—The next division of garden produce is denominated Mool Bojee, which literally means "root-greens," properly edible roots. Mooleh, *Raphanus sativus*[g]; Rutalee, *Convolvulus batatas*[h]; Kohn, *Dioscorea purpurea* or *alata*[i]; Gajur, *Daucus carota*[j]; Lussoon, *Allium sativum*[k]; Soorun, *Arum*, ——; Rungeh, *Dioscorea fasciculata*; Alluh, *Amomum Zingiber*[l].

Fruit vegetables.—A further division is made of Phul bajee or fruit greens, which means fruits eaten as vegetables, viz., Bhendee, *Hibiscus esculentus*; Wangee, *Solanum melongena*, [m] several species or varieties; Gewree, *Dolichos*, ——; the seeds are eaten as pulse, and there are several varieties; Dorkee, *Cucumis acutangulus*; Gosaled, *Luffa pentandria*; Karlee, *Momordica Charantia*; Tondlee, *Momordica monadelphia*; Purwal, *Trichosanthes anguina*; Purwar, *Trichosanthes cucumerina*; Turkakree, *Cucumis usitatissimus*; [n] Kateh Wallook, *Cucumis sativus*, warty, prickly cucumber; Doodh Boplah, *Cucurbita longa*; Boplah-tambra, *Cucurbita Pepo*, red pumpkin; specimens of this fruit are sometimes more than eighteen inches in diameter; Kohwall, *Cucurbita alba*; Dhendsee, *Cucurbita*, ——; Kasee Boplah, *Cucurbita lagenaria*.

a Coriander. b Sweet fennel. c Chilly. d Onions.
e Blister sorrel. f Hemp. g Radishes. h Sweet potatoe.
i Yam. j Carrots. k Garlic. l Ginger m Egg plant.
n Common cucumber.

Such are the cultivated garden products of the natives: it will be seen that they are rich in the cucurbitaceous family, and not less so in the aromatic and pungent plants; and the edible roots are various. Edible leaves, used as greens, are very numerous, particularly those produced spontaneously. My limits do not permit me to give even the names of wild plants producing greens, fruits used as vegetables, or edible roots; the flowers of some plants are used as greens; such as the Angustee, *Æschynomene grandiflora*; the Shewga, *Hyperanthera morunga*, or horse-radish tree; and those of the Kanchun, *Bauhinia purpurea*; the foot-stalks of the flowers of the splendid *Convolvulus candicans* are used in a similar way. The tender twigs of the common bamboo are good as greens, and they are also made into a pickle. The flower, stalks, and roots of the Lotus *(Nympha esculenta)* are reckoned fine; but I must stop.

Grasses.—The grasses are innumerable, and are not less distinguished for their beauty than their variety. One of the most common is that highly nourishing grass the *Agrostis linearis*, which, it appears, is a native of Cornwall, under the name of *Panicon dactylon*. In biting the knots or joints of the Ghateea *(Andropogon Martini ?)* there is a strong, pungent, aromatic, and oleaginous exudation. The well-known aromatic Khus Khus *(Andropogon muricatus)* is abundant in Dukhun, as well as the sacred grass Durb, *Poa cynosuroides*. In speaking of the grasses it may be as well to say that it is not the practice of the natives to make hay from meadows; they allow the grass on waste lands to become perfectly dry, and then cut it down with the sickle, as a substitute for hay.

Wild cordage plants.—The spontaneous cordage plants are the Gayal, *Agave vivipara*; the Kaswuree, *Sida patens*; and some others.

Wild oil plants.—The wild oil plants are the Kurunj, *Galedupa arborea*; and the Kurd Kangonee, a small tree of the class and order *Pentandria monogynia*.

Wild tanning plants.—The plants used in preparing leather are the Chambar Heerda, *Terminalia Chebula*; Rahn Turwur, *Cassia auriculata*; the Sadrah or Aaeen, *Terminalia alata glabra*; and the Baubul, *Mimosa arabica*, the bark of which is in great repute.

Medicinal plants.—The medicinal plants are numerous. Amongst the most useful are the Khyr, *Mimosa catechu*; the Seegeekaee, *Mimosa abstergens*; many species of *Datura*; Kuntuh Kareeka, *Solanum jacquini*; Sagurgotta, *Cæsalpinia bonduccella*; Korpur, *Aloe succotrina*; Dadmaree, *Euphorbia tiruculli*; Gooleea Eendrawun, *Cucumis colocynthis*; Reeta, *Sapindus detergens*; Sahl Phul, *Boswellia thurifera*; Bawcheea, *Psoralea corylifolia*; some of the *Ocimums*, and many of the *Asclepias*

family. Of the powerfully scented plants, the *Michelia Champaca*, (Champa), *Pandanus odoratissimus*, several species of Jasmine, Polyanthus, Rose, &c., abound.

European fruits.—Very few of the European fruits are cultivated in Dukhun: indeed, those produced are almost confined to peaches and strawberries, both of which are as fine as in Europe. All the European vegetables thrive, such as cauliflowers, cabbages, asparagus, spinach, and broccoli. Potatoes, when properly attended to, are also good. Carrots, turnips, and radishes are indigenous.

Flowering plants.—It is not within my present view to attempt an enumeration of the wild flowering plants of Dukhun, many of which are splendid and curious. Nothing can exceed the magnificence and beauty of the vegetation in the Ghâts during the monsoon. The brilliancy of the *Erythrinæ*, the *Cassiæ* (particularly the *Cassia fistularia*,) the lofty *Bombax*, the varieties of the *Liliaceæ*, *Cannæ*, *Convolvulaceæ*, and *Malvaceæ*, would surprise and delight a European florist.

In the Desh, the dwarf *Cassia auriculata*, with its numerous yellow flowers, enlivens the whole country; and the numerous species of *Mimosa* (particularly the *Mimosa odoratissima*), perfume the air.

The Dukhun produces few ferns and no heaths, and none of the coniferous family, excepting *Cupressus*; the Musci (true mosses) are rare; there are many of the *Euphorbiaceæ*; no oaks, elms, or hazels, or indeed any of the *Amentaceæ*, excepting *Salix tetrasperma*; multiplied genera and species of the *Jasmineæ*, *Labiatæ*, *Compositæ*, *Umbelliferæ*, *Leguminosæ*, and *Cucurbitaceæ*; the *Cruciferæ* are not abundant; but the *Capparides* are very much so. The rosaceous plants are rare; but the *Solanaceæ (Luridæ)* are very abundant; although the potatoe is not indigenous.

Such is the meagre sketch of the botany of Dukhun; for the elaboration of which there are abundant materials at the India House, in a Hortus Siccus collected by myself.

I must not omit to notice that the Sandal-wood tree, *Santalum album*, is met with, both in the cultivated and wild state.

Timber trees.—The Warsa, *Bignonia quadrilocularis*; the Tamarind, *Tamarindus Indica*; the Jack, *Artocarpus integrifolia*; and the *Bauhineæ*, produce excellent wood for furniture; and all the species of *Mimosa* furnish hard durable wood for tools and machinery.

Zoology.

Like the account of the botany, the zoology must be confined to little more than a mere catalogue of the beasts and birds of the country.

The inhabitants of Dukhun have the Georgian form of skull: their stature is low, but not very slender; the colour of the skin is brown, with shades running into yellow and white in the higher classes, and black in the lower; the females are not distinguished for beauty or fertility, the average number of births to a marriage being less than in Europe; more males are born than females, and, unlike Europe, they preponderate through all periods of life.

Quadrumana.—Of the monkey tribe I met with only two kinds, *Semnopithecus Entellus* and *Macacus radiatus*. A new species described by me, *Cercopithecus albogularis*, was not from Dukhun.

Cheiroptera.—Three species of bats, Wurbagool, *Pteropus medius; Nyctinomus plicatus;* and *Rhinolphus Dukhunensis*.

Plantigrada.—Chuchoondur, *Sorex Indicus*, or musk-rat; Aswail, *Ursus labiatus*, or labiated bear; Juhl Manjur, *Lutra Nair*, otter.

Digitigrada.—Of these animals, the first is the Kolsun or wild dog, *Canis Dukhunensis*, which was first described and brought to Europe by myself; Landguh, *Canis pallipes*, wolf, a new species; Kholah, *Canis aureus*, jackal; Kokree, *Canis Kokree*, a new species of fox; of the *Viveridæ*, the Juwadee Manjur, *Viverra Indica* or civet cat of Dukhun; Moongus, *Herpestes griseus*, Mungoose; Ood, *Paradoxurus Typus*. The *Hyæna*, *Turrus* of the Mahrattas, *Hyæna vulgaris*, is common in Dukhun, and is capable of domestication like a dog. The *Felinidæ* are numerous, not only in individuals, but in species, excepting the lion, which is not met with. Puttite Wagh, *Felis tigris*, royal tiger: Cheeta, *Felis leopardus* or genuine leopard, is rare; but the Beebeea Wagh, or panther, *Felis Panthar*, is most abundant. Cheeta, *Felis jubata*, or hunting leopard, is common. Mota Rahn Manjur, *Felis chaus;* Lhan Rahn Manjur, *Felis torquatus*, or lesser wild cat; the preceding being considered the larger wild cat. The species of the genus *Felis* here terminate. Of the rat family there is the Ghoos, *Mus giganteus*, or Bandikoot rat; Chooa, *Mus decumanus*, or Norway rat; *Mus musculus*, the mouse; and a very pretty field mouse of a bright chesnut colour, which is a new *Mus oleraceus*, also a second new mouse, *Mus platythrix*. Of the squirrel family there are only two species; the first, a splendid animal as large as the *Sciurus maximus*, of a chesnut colour, with a whitish tail; I have called it *Sciurus Elphinstonii*, the Mahratta name is Shekroo: the other species is the Khurree, or *Sciurus palmarum*. The porcupine, Sayal, is a new species, which I have called *Hystrix leucurus*. The hare, Sussuh, which abounds in Dukhun, is the *Lepus nigricollis* of F. Cuvier. That very curious animal, the Pangolin, *Manis crassicaudata*, is common: the Mahrattas call it Kuwlee Manjur, or tiled cat, the scales being im-

bricated as tiles on the roof of a house. The Dookur, or wild hog, *Sus scrofa*, abounds: every village also has a number of tame hogs, which are the public scavengers, but all property in them is abjured by the inhabitants. The Dukhun is celebrated for a breed of fine horses with a dash of the Arabian blood in them: the pony also is bred to a great extent to carry baggage. The Ass, Gudha, *Equus asinus*, is not much larger then a good-sized Newfoundland dog; it is not met with in the wild state.

Ruminantia.—The Dromedary, Oont, *Camelus dromedarius*, is rarely bred in Dukhun, but is in general use; the two-humped camel is unknown. Of the other Ruminants, the first is a beautiful little creature called Peesoreh, *Moschus memina;* the next is the Sambur, *Cervus equinus*, of the size of a small cow; the third is the Baikur, *Cervus muntjak:* all the above are inhabitants of dense woods. Of the antelopes there are four species; Bahmunee Hurn, *Antilope cervicapra;* Kalesepee, or black tail, a new species, *Antilope Bennettii; Antilope quadricornis;* and finally, the Rooee, *Antilope picta*, or Nylgau: the two former are only found on the open plains; the two latter prefer the woods, but are sometimes seen on the plains. Goats, Bukree, *Capra hircus*, abound; and sheep are so extensively bred in Dukhun, that flocks of many thousands are constantly met with grazing on the uncultivated lands; the wool is coarse and crisp; the price of a sheep is from two to four shillings; they afford excellent, although small mutton. The Pohl is the Brahmany bull, with its remarkable hump, *Bos taurus* var. *Indicus*, and is a noble animal; when put into the yoke, or when employed in carrying loads, he is called Byhl, and he loses his hump and his fine appearance. The cow does not yield much milk. Cattle are extensively bred, as it is chiefly by their means the transit of merchandize is effected. The female buffalo, Muhees, *Bos bubalus*, is highly valued for the quantity of milk she gives. The male, called Tondgah, is used in the hilly tracts in ploughing the muddy fields for rice. The above is the catalogue of the *Mammalia* of Dukhun, and a few comments will suffice respecting it. The musk-rat is a pest, from its infecting with its nauseous odour everything with which it comes into contact, even a bottle of wine, although corked. The bear is harmless. The wild-dog hunts in troops in the woods, and runs down the fleetest of the ruminants. The wolves sometimes attack women and children, but never men. The jackals are in large troops, and do much damage in the vineyards. The fox is mostly solitary or in pairs. The moongus is useful in destroying snakes. The hyæna is cowardly, entirely nocturnal in his movements, and never attacks live animals. The royal tiger and the leopard are formidable to

man and beast: but the people consider themselves safe against the attacks of the panther and smaller cats, when armed with a good stout stick. The *Mus giganteus* undermines buildings. Of the rest of the wild animals it is not necessary to say more, than that they, like those just enumerated, are most of them objects of the chase with the Mahrattas, who are capital horsemen, and many of them keen sportsmen.

Birds.—The birds are very numerous: many of them not less useful to man, than agreeable from their plumage. Song-birds are, however, rare. My catalogue contains 232 species of the several orders, families, and genera.

Raptores.—There are 13 genera of the first order Raptores,—*Vultur Indicus, Vultur Ponticerianus, Vultur Bengalensis, Neophron Percnopterus, Haliaëtus Ponticerianus, Circaëtus brachydactylus, Aquila chrysaëta, Aquila bifasciata, Hæmatornus Bucha, Accipiter Dukhunensis, Accipiter Dussumieri, Astur Hyder, Falco Tinnunculus, Falco Chicquera, Circus pallidus, Circus variegatus, Milvus Govinda, Otus Bengalensis, Strix Javanica, Strix Indranee, Ketupa Leschenaulti,* and *Noctua Indica.* Of the above order there are two new *Accipiters,* one new species of *Circus,* one *Milvus,* and a *Strix.* The *Neophron* is the Ractamah of Bruce, the sacred vulture of the Egyptians, and it is a most useful scavenger, removing all offal matters. The golden eagle is the same as that of Europe, and so is the *Falco Tinnunculus;* and the harriers are scarcely distinguishable from the European birds. The falcons, hawks, and goshawks, are used by the natives in hawking.

Insessores.—There are 53 genera, and 116 species of the order *Insessores.* Few or none of these can be said to be useful to man, and only two of the species are songsters:—*Merops viridis, Hirundo filifera, Hirundo Jewan, Hirundo concolor, Hirundo erythropygia, Cypselus affinis, Caprimulgus monticulus, Caprimulgus Asiaticus, Caprimulgus Mahrattensis, Halcyon Smyrnensis, Alcedo rudis, Alcedo Bengalensis, Ceyx tridactyla, Muscipeta Paradisi, Muscipeta Indica, Muscipeta flammea, Muscipeta peregrina, Muscicapa melanops, Muscicapa Banyamus, Muscicapa Poonensis, Muscicapa cæruleocephala, Muscicapa picata, Rhipidura albofrontata, Rhipidura fuscoventris, Dicrurus Balicassius, Dicrurus cærulescens, Hypsipetes Ganeesa, Collurio Lahtora, Collurio erythronotus, Collurio Hardwickii, Lanius Muscicapoides, Graucalus Papuensis, Ceblepyris fimbriatus, Ceblepyris canus, Oriolus galbula, Oriolus melanocephalus, Oriolus Kundoo, Turdus macrourus, Turdus Saularis, Turdus cyanotus, Petrocincla Pandoo, Petrocincla Maal, Petrocincla cinclorhyncha, Timalia Malcolmi, Timalia Somervillei, Timalia Chatarea, Ixos jocosus, Ixos ea-*

fer, Ixos fulicatus, Pomatorhinus Horsfieldii, Iora Tiphia, Sylvia montana, Sylvia sylviella, Sylvia Rama, Prinia socialis, Prinia inornata, Orthotomus Bennettii, Orthotomus Lingoo, Budytes citreola, Budytes melanocephala, Budytes Beema, Motacilla variegata, Motacilla Dukhunensis, Megalurus ruficeps, Anthus agilis, Saxicola rubicola, Saxicola bicolor, Saxicola rubeculoides, Saxicola erythropygia, Phœnicura atrata, Phœnicura Suecica, Parus atriceps, Parus xanthogenys, Alauda Gulgula, Alauda Deva, Alauda Dukhunensis, Mirafra phœnicura, Emberiza melanocephala, Emberiza hortulana, Emberiza cristata, Emberiza subcristata, Linaria Amandava, Ploceus Philippensis, Ploceus flavicollis, Fringilla crucigera, Lonchura nisoria, Lonchura cheet, Lonchura leuconota, Passer domesticus, Pastor tristis, Pastor Mahrattensis, Pastor roseus, Pastor Pagodarum, Corvus culminatus, Corvus splendens, Coracias Indica, Buceros, several species, *Palæornis torquatus, Palæornis melanorhynchus, Bucco Philippensis, Bucco caniceps, Picus Mahrattensis, Upupa minor, Leptosomus Afer, Eudynamys orientalis, Cuculus canorus, Cuculus fugax, Centropus Philippensis, Chloropsis aurifrons, Cinnyris lepida, Cinnyris curruca, Cinnyris Vigorsii, Cinnyris minima, Cinnyris Mahrattensis,* and finally, *Cinnyris concolor.* The above catalogue requires very few observations. The weaver-bird, *Ploceus Philippensis,* is remarkable for its pendent nest, woven in the most curious and ingenious manner from fibres of grass. Not less curious are the nests produced by the tailor-birds, the *Prinia socialis* and the *Orthotomus Bennettii,* which sew leaves together to inclose their nests, with the skill of a veritable knight of the thimble. The lark, *Alauda Gulgula,* has the habits and delightful song of the skylark of Europe; and two or three species of the genera *Budytes* and *Motacilla* have sweet notes: the *Collurio Lahtora* has also a sweet note. The *Muscipeta Paradisa* and *Indica* are distinguished for their beautifully elongated tail-feathers. The *Coracias Indica* is characterized by its splendid colouring; and not less so is the *Cinnyris Vigorsii.* The cuckoo is the identical bird of Europe, and so is the sparrow. In the above list I have named many new species of *Insessores,* and have introduced one new genus.

Rasores.—That order so highly useful to man, the *Rasores,* does not contain one single species in Dukhun that is not valuable as an article of food. There are 12 genera and 40 species. *Ptilinopus Elphinstonii, Columba mœna, Columba tigrina, Columba humilis, Columba rasoria, Columba Cambayensis, Columba Ænas, Meleagris Gallopavo, Pavo cristatus, Gallus giganteus, Gallus Sonneratii, Gallus domesticus, Gallus morio, Gallus crispus, Numida Meleagris, Coturnix dactylisonans, Cotur-*

nix textilis, Coturnix Argoondah, Coturnix Pentah, Coturnix erythrorhyncha, Perdix picta, Francolinus Pondicerianus, Francolinus spadiceus, Pterocles exustus, Pterocles quadricinctus, Hemipodius pugnax, Hemipodius Taigoor, Hemipodius Dussumier, Otis nigriceps, and *Otis fulva.* Of the above, turkeys and guinea fowls are not indigenous, and it may be doubted whether the gigantic cock be a native. The original of the domestic fowl is most abundant in the woods of the Ghàts. The real partridge, *Perdix picta,* is found in the valleys of the Ghàts. What is usually denominated a partridge in Dukhun, is the *Francolinus Pondicerianus ;* it is numerous, and affects cultivated lands and garden grounds. The common quail of Europe is a native of Dukhun ; and three new species, which I have described, as well as the *Coturnix textilis,* literally swarm. That noble bird the *Otis nigriceps* is met with in large flocks, and the floriken is by no means scarce.

Grallatores.—Of the fourth order, *Grallatores* or Waders, there are 25 genera and 46 species, and very many of the species are common to Europe. *Grus Antigone, Ardea Egretta, Ardea Garzetta, Ardea Asha, Ardea cinerea, Ardea nigrirostris, Ardea Malaccensis, Ardea Caboga, Ardea Grayii, Ardea Javanica, Ardea cinnamomea, Botaurus stellaris, Nycticorax Europæus, Phœnicopterus ruber, Platalea leucorodia, Platalea junior, Ciconia leucocephala, Ciconia Argala, Anastomus Typus, Tantalus leucocephalus, Ibis religiosa, Ibis ignea, Ibis papillosa, Ibis falcinella, Totanus ochropus, Totanus Glareola, Totanus hypoleucos, Limosa Glottoides, Limosa Horsfieldii, Gallinago media, Gallinago minima, Rhynchea picta, Pelidna Temminckii, Parra Sinensis, Gallinula Javanica, Rallus Akool, Porphyrio Smaragnotus, Fulica atra, Cursorius Asiaticus, Vanellus Goensis, Vanellus bilobus, Charadrius pluvialis, Charadrius Philippensis, Himantopus melanopterus,* and *Œdicnemus crepitans.* Of the above, the *Ibis religiosa* is undoubtedly the sacred or mummy *Ibis* of the ancient Egyptians, according to Cuvier's description. The species of the family of the *Ardeidæ* are varied and beautiful. The snipes are those of Europe, as well as most of the species of the *Scolopacidæ,* and some of the *Rallidæ.*

Natatores.—The last order, *Natatores,* or swimmers, contains 13 genera and 20 species, and, as in the preceding order, several of the species are common to Europe. *Plectropterus melanotus, Anser Giria, Tadorna rutila, Anas strepera, Rhynchaspis virescens, Mareca pœcilorhyncha, Mareca fistularis, Mareca Awsuree, Querquedula* Circia, *Querquedula* Crecca, *Fuligula rufina, Fuligula* ——, *Fuligula cristata, Podiceps Philippensis, Phalacrocorax Javanicus, Plotus melanogaster, Sterna acuticauda, Sterna similis, Sterna Seena,* and *Viralva Anglica.* The geese,

ducks, and teals abound most in the cold season, and are at that period excellent eating. The domestic goose and duck of Europe is not included in the above list, but both are extensively bred in Dukhun. That rare English bird the *Viralva Anglica* is very common in Dukhun. I did not meet with the Pelican, although it is a native of India.

Ichthyology.—The rivers of Dukhun abound with fish, and some of them are not only palatable, but very fine flavoured, particularly the Tambra, a new species of *Cyprinus*, and the Waam, *Macrognathus armatus;* the Singhala or *Pimelodus* is also in very general use by the people, but is not esteemed by Europeans. The fish observed by me consisted of forty-six species; two belonged to the sub-order *Apodes*, three to *Thoracici*, and forty-one to *Abdominales*. The whole were comprised in twelve genera. There was one *Murena*, one *Macrognathus*, one *Chanda*, one *Ophiocephalus*, one *Gobius*, two species of *Silurus*, nine of *Pimelodus* and sub-genera, one *Ageneiosus*, one *Mystus*, twenty-four of *Cyprinus* and sub-genera, one *Essox*, and three species of *Cobitus*. It is remarkable that the fresh water *Essox* of Dukhun so closely resembles the salt water species of England, as to be scarcely distinguished from it, not only in external characters, but in the colour of its bones.

Reptilia.—Reptiles are numerous in Dukhun. The *Trionyx Indica* abounds in the rivers, and there are two smaller species. Many genera of the Saurian family are met with from the four to five feet *Monitor* to the minutest *Lacerta*. Serpents of all kinds, from the gigantic Boa Constrictor to the small and beautiful carpet snake. The first, however, I have only seen carried about the country by people who exhibit the feats of the reptile in swallowing small animals. Independently of the deadly *Cobra da Capello*, (*Caluber Naag*) there are some other poisonous species, but in general the snakes are harmless.

Crustacea.—Of the *Crustacea*, I shall have only to notice the Kenkra, *Thelphusa cunicularis*, a new species which pervades the valleys and table-lands of the Ghâts, and whose numbers are so great that their burrows riddle the earth; they remain quiet in their holes during the cold and dry seasons, but, in the monsoon, they are abroad in such numbers, that travellers drive over them, ride over them, and trample upon them in the high roads: they are not an article of food with the natives, but are, I believe, wholesome.

Testacea.—There are some few genera and species of land and fluviatile shells, the largest of which is a *Unio*; but they do not call for notice.

Entomology.—Like all tropical climates, the Dukhun teems with insects. The domestic fly is a pest at certain seasons; the most rigid precautions and the greatest cleanliness cannot secure the most fastidious person from the inroads of the bed-bug; and there is no getting beyond the "*maximum leap of a flea*"; the fact is, these plagues are not only the constant companions of the people, but the flea inflicts serious injury on poultry, dogs, and cattle. Domestic, and indeed wild animals are subject also to the attacks of a small blue tick, *(Acarus,)* which multiplies upon them in such an incredible manner as to affect the vital functions and produce paralysis and death. There are three species of honey-bee in Dukhun, the honey from the whole of which is remarkably fine. It boasts also its lac insect, *Coccus laccus*; and several silk-producing moths, particularly the Kolesurra, *Bombyx Paphia.*

The most destructive of the insect tribe is the white ant, *Termes*, which, working under cover with the most indefatigable perseverance, finds its way everywhere, and everywhere occasions loss and injury; books, papers, clothes, leather, wood, &c., are indiscriminately devoured. Several species of genuine ants are also a great nuisance. A species of sphex makes its earthen nest within the locks of the doors, and blocks up the key-holes. The musquito, *Culex*, is not quite so troublesome in Dukhun as on the coast. The scorpion, of which there are two or three species, so abounds in the stony lands of Dukhun, that on encamping my regiment, on the march from Punderpoor to Ahmednuggur in 1818, I had from two to three hundred brought to me in the course of a day by my men: their sting produces intolerable pain for a few hours, but is not dangerous unless to the diseased and weakly. The centipede does not attain the growth of its type in South America, nor is it very numerous.

As in other countries, the *Coleopterous* order is the most numerous. Some of the genera are remarkable for their habits, *(Copridæ,)* and some are remarkable for their beauty *(Buprestidæ)*. Amongst the *Lepidoptera* many are very handsome, both in the diurnal and nocturnal families *(Papilio Hector* and *Bombyx Atlas)*. In the *Hemipterous* order, the *Cimicidæ* abound, and are cursed with all imaginable abominable smells. In the order *Orthoptera*, the *Gryllidæ* are numerous: but the locust is unknown as a scourge. In this order also, the multiplied and strange forms of the *Mant's* and *Phasma* are very striking. The *Blatta* is troublesome and injurious. The *Hymenoptera* includes some valuable and interesting genera. Of the *Apterous* insects I have already spoken. The *Neuroptera* are both numerous and beautiful, some of the *Libellula* and *Myrmeleons* particularly so. Of the *Diptera* the genera *Musca*,

Culex, *Bombilius*, *Hippobosca*, and *Tipula*, exhibit the greatest number of species and individuals. In *Arachnida* the genera are endless. The prevalence of scorpions I have spoken of.

Civil Divisions.

The British territories in Dukhun are divided into four collectorates, Poona, Ahmednuggur, Dharwar, and Khandesh or Candeish. Over each of these there is a European civil servant of the Company, with several European assistants, for the purpose of collecting the revenue. These gentlemen are armed with magisterial powers, and can call upon the military authorities for assistance. These collectorates are divided into Talooks (great divisions), provinces, Pergunnahs (counties), and Turrufs (hundreds);* and native officers called Mamlutdars, aided by inspectors of cultivation, accountants, treasurers, and a police force, are placed over one or more Pergunnahs. All these terms are of Moosulman introduction; the ancient Hindoo civil officers being differently named, and their territorial divisions were Prânt, Deshmookee, and Naikwaree. The aggregations of habitations are called Sher (city), Kusbeh (market-town), Mouzeh or Gaòn (village), and Waree (hamlet). The cities and towns may comprise several villages, and they have their suburbs called Peit. The village constitution is noticed under land tenures.

Poona Collectorate.—The Poona Collectorate is the nearest of the four collectorates of Dukhun to Bombay: its boundaries towards the coast approach within about fifty miles of that presidency, but they do not descend the Ghàts into the strip of land at the foot of the Ghàts, called the Konkun (Concan). This collectorate has an area of 8231 square miles, including the lands held in military tenure (Jagheer). It contains 550,313 inhabitants, 1897 towns† and villages, and 114,887 houses; averaging 66·45 inhabitants to a square mile, 4·79 to a house, 247·36 to a village, exclusive of the population of Poona. The chief town is Poona, recently the capital of the Mahratta empire, containing a population of 81,315 souls. The other principal towns are Tullegaon (2050 males, 2007 females), Joonur (4218 males, 3759 females), Kheir (1999 males, 1794 females), Goreh (1154 males, 1145 females), Ootoor (2521 males, 1928 females), Narraingaon (1286 males, 1180 females),

* Provinces, counties, and hundreds are not the exact equivalents of the native territorial divisions, but they afford sufficiently approximate types.

† Trifling transfers have taken place between the different collectorates, so that this may not be the exact amount at the present moment.

Alley (1396 males, 1064 females), Sassor (1880 males, 1696 females), Jeejooree (885 males, 860 females), Tullegaon, *Turruf Paubul* (1710 males, 1427 females), and some others; but the most populous of the number, as is seen above, contains only 7977 souls. There are, excluding Sholapoor, 8 pergunnahs and 32 turruffs in the Poona collectorate. In Sholapoor sub-collectorate there are 4 talooks, 19 pergunnahs, and 12 turruffs: but as divisions which in the other collectorates are called turruffs, are here called pergu nnahs, there are few turruffs. My limits will not permit of detailed descriptions of these pergunnahs, although there are many physical facts of interest connected with some of them.

The following number of towns and villages constitute the different pergunnahs and talooks: Sewnere 190, Indapoor 86, Kheir 236, Pabul 65, Poorundhur 130, Beemthuree 92, Hawailee 165, the Mawuls 233, Sholapoor 122, Mohol 145, Indee 236, and Moodebehal 226. This makes a total of 1926, which is 29 villages more than was previously stated, but this is owing to depopulated villages being included; of this 1926, 47 towns and 1429½ villages belong to the British; 4 towns and 264½ villages are held in free gilt (Eenam), and 3 towns and 178 villages are held on tenure of military service (Surinjam).

Hill forts.—In the Poona Collectorate are situated many remarkable hill forts, impregnable in fact if properly defended, from their geological structure, which consists of beds of basalt, with vertical edges, alternating with beds of amygdaloids, whose edges form a talus. Many of these in their superficial plane manifest a strong disposition to a trigonal character. Such is the case with Teekonee (the word being almost Greek,) or three-angled, Koaree, and some others. Koaree is situated at the edge of the Ghâts in the civil division called the Powar Khoreh; its summit is 2910 feet above the sea; and some parts of the rock within its area are so powerfully magnetic, as to draw the needle quite round the compass. The hill forts of Singhur, Poorundhur, and Wuzeerghur are seen from Poona: the summit of the first is elevated 4192 feet above the sea, and the second 4471 feet. The hill-fort of Sewnair, in which the celebrated Sewajee was born, is situated close to the city of Joonur (Jooneer). Jewdun, is on the edge of the Ghâts, a few miles westward of Joonur, and Hurreechundurghur, which is said to be eighteen miles in circumference at its base, is situated a few miles N. W. of Joonur. But I have not space to enumerate all these points of defence provided by nature,—Loghur, Eesapoor, &c. &c.

Boodh cave-temples.—Some works of art must not be overlooked. The first is that magnificent cave-temple situated in the civil division called Naneh Mawul; it is usually denominated the cave of Karleh (Carlee),

from being within two miles of a village of that name; the temple is associated with many cave-chambers. The other Boodh excavations are pierced in the hills around the city of Joonur, under the hill-fort of Joonur, and at the crest of the pass into the Konkun from Joonur, called the Naneh Ghàt. Numerous inscriptions, in so antique a form of the Sanscrit alphabet as not to be readable by modern Sanscrit scholars, abound in these caves.* These astonishing works of art, resulting from the labour of ages, and which are met with, not only in the Poona Collectorate, but in many other parts of India, would seem to indicate that the country was once inhabited by a Boodhist population, although it has so entirely disappeared, that not a solitary worshipper of Boodh remains in the peninsula of India.

In the Under Mawul, at the village of Mhow, there is an extraordinary large Wuhr-tree (*Ficus Indica*); it has sixty-eight stems, most of them thicker than a man's body, and, with the exception of the original stem, the whole of them originate in roots let down from the branches; it was capable of affording shade, with a vertical sun, to 20,000 men, being 201 feet long by 150 feet broad. At the town of Munchur, in the pergunnah of Pabool and Turruf Wurgaon, there is a Baubel-tree (*Mimosa Arabica*), of surprising magnitude; at eighteen inches from the ground the trunk measures nine feet and half an inch in circumference; its head is ramous and dense, and it gives a vertical shade covering 5964 square feet: this species produces gum arabic. In the turruf of Chakun, pergunnah Kheir, near to Mahloongah, on the slopes of some hills, the shrub or small tree, producing the gum olibanum, (*Boswellia thurifera*), is met with; and it is seen also in other parts of the country. At Mahloongah there is a garden of flourishing cocoa-nut trees; and considering that they are at 2000 feet above the sea, and 100 miles inland, the fact is sufficiently remarkable: clumps of them are also met with at Pabool and other places.

Rivers.—The rivers flowing through the Poona Collectorate are the Mota, the Mola, the Inderanee, Under, Beema, Goreh, and Kokree, and some smaller streams. All these have their sources in the Ghàts, within the limits of the collectorate; they converge to the Beema, which falls into the Kistnah, and thus finally reach the Bay of Bengal. The rivers are only navigable during the monsoon, and then only partially. Boats with sails are not seen upon them.

* Within the last year, those indefatigable and learned orientalists, Principal Mill, Mr. James Prinsep, and Mr. Stevenson have succeeded in reading most of the inscriptions which are found to relate exclusively to Boodhism and Boodhists.

Ahmednuggur Collectorate.—The Ahmednuggur Collectorate adjoins the Poona Collectorate on the east and north. Part of its frontier is along the Ghàts; the rest is bounded by the Chandore range of hills on the north, and by the Nizam's territories on the east and S. E.

Ahmednuggur has an area of 9910 square miles; it contains 666,376 inhabitants, dispersed in 2465 towns and villages, averaging 263·47 inhabitants to a village, (exclusively of the population of Ahmednuggur); 67·24 inhabitants to a square mile; 136,273 houses and 4·89 inhabitants to a house*.

Ahmednuggur is divided into 14 talooks, 36 pergunnahs, and 51 turuffs. Talook Ahmednuggur contains 157 towns and villages, Kurdeh 172, Sungumnair 226, Akoleh 194, Newassa 359, Nasseek 280, Sinnur 107, Chandwur 153, Patodeh 255, Wun Dindooree 175, Barsee 124, Kurmulleh 82, Jamkheir 90, and Kortee 115. The total of these is 2438, instead of 2465; the difference originates in 23 depopulated villages being included. Of the above, 43 towns and 1858½ villages belong to the British; in 27 towns and 551½ villages the British government has a quit rent, these villages being called Doomaleh,† alienated. Only one village in free gift was returned to me, and one town and three villages in military or feudal tenure; but the villages in free gift (Eenam) are included in the Doomaleh villages.

The chief town is Ahmednuggur, with a population of 17,838 souls in 1822: men 5953, boys 3350, total males 9303; women 5976, girls 2559, total 8535. The other chief towns are Kurdeh, Nasseek, Chandore, Sungumnair, Parnair, &c.; but their population I cannot state, as the total amount of the population of pergunnahs only was sent to me by the collector‡. The most populous pergunnah would appear to be Nasseek, containing 71,581 inhabitants. The least populous pergunnah was Soagaon, containing only 9400 inhabitants.

Rivers.—The rivers running through the collectorate are formed by numerous streams originating in the Ghàts and Chandore range,—such as the Peera, the Mool, the Doornah, and the Goore, which converge to that noble stream the Godavery, which also has its rise in this collectorate, near Trimbuck, and flows to the eastward to the Bay of Bengal.

* This return is for 16 pergunnahs only.

† The proper meaning of Doomaleh is "two properties," the chief part of the revenue being alienated, but the government having a quit rent.

‡ The population returns forwarded by me not having been filled up, in consequence of a census of the population having been made by the collector himself within three years preceding.

The Seena is the only river of consequence which does not originate in the Ghâts. It has its course at the edge of the plateau on which the city of Ahmednuggur stands, about ten miles north of the city, and flows in a S. S. E. direction into the Beema.

There are several remarkable hill forts in the western part of the collectorate, such as Trimbuck, &c. Ahmednuggur was once the capital of the Ahmed Shahee dynasty of kings.

Khandesh or Candeish Collectorate.—The area of the province or collectorate of Candeish, deduced from a map in the Deputy Surveyor General's Office, including tracts belonging to foreign states and to Jagheerdars, is 12,527 square miles. It is bounded on the north by the Sautpoora mountains; on the east by the province of Berar, belonging to the Nizam; on the south by the Indyadree range of mountains, which separate it from Ahmednuggur; and, on the west, by Dang and Raj Peeplee, which bring it into contact with Goojrat. It is literally a Khind or Khund, a great *gap* between ranges of mountains, whence its name of Khandesh or Candeish. Some of the northern and western parts are little better than a jungle, and the whole province is miserably depopulated. The populated part of the collectorate belonging to the British, derived from the returns of the lands of 1982 populated villages, give an area of 6760 square miles, with a population of nearly 55 inhabitants to the square mile; but supposing 1684 alienated and deserted villages to have a proportionate quantity of lands, the area will be 12,504 square miles, with 38$\frac{1}{4}$ inhabitants only to the square mile, and this I believe to be very near to the truth. It is curious that the area derived from the village lands should approximate so closely to the area determined trigonometrically.

The collectorate is divided into sixty-six pergunnahs, some of which do not contain more than one village each, whilst the largest, Nandoorbar, has 259 towns and villages, Nowapoor 236, Sooltanpoor 232, Rawere 160, Jamnair 144, Amulnair 140, and Bhamere 150, including deserted villages. The total number of towns and villages is 3666; but of this number 330 are *pyegusta*, which means that the villages are deserted, but that part of the lands are cultivated; 999 are entirely deserted; but great confusion and uncertainty prevails in the details, for of this number there are 51 whose limits are unknown, 12 whose sites are unknown but names known, and 135 whose *names* and sites are unknown but a record remains of their number. There are 227 populated Jagheer, or alienated villages; and many amongst the Pyegusta, and deserted also, belong to Jagheerdars, so that it does not appear that more

than 2032 populated villages belong to the British *; of this number 1968 sent in population returns. The most populous town in Khandesh was Nandoorbar, and it had only 6429 inhabitants; and only one other town (Chopra) had a population of 6000. The towns and villages average only 178 inhabitants, and each house averages 3·96 inmates. The total of the inhabitants is 478,457.

From the village lands in Khandesh being kept universally in Beegahs, the amount of land under cultivation is readily determined. It would appear that 15,958 acres were watered by perennial streamlets. Lands so watered are called *pahtstul*, and are the most valuable of all, as the supply of water is mostly permanent, and the chief labour required is to open the channels and let it flow over the lands; 46,064 acres were watered from wells, and lands so watered are called *Mohtstul* :† 600,556 acres were under field cultivation, and are not watered,—these lands are called *Zerhaeet*. The per centage of cultivated and waste lands in this collectorate is as follows:—

Watered by perennial streams Watered from wells..... Field cultivation.....	15·32 per cent.
Waste land.....	84·68 do.
	100...

Rivers.—The River Tapty runs through the whole length of the collectorate, and, unlike the rivers of the other collectorates, disembogues into the Gulf of Cambay, below Surat; the water-shed of the country being in fact from the east to the west, instead of from the west to the east: there are some exceptions in rivers which rise in the Western Ghats, or the Chandore range, and run to the east for some distance, then sweep round in a segment of a circle and join the Tapty; such are the Guirna, Roharee, the Moosum, &c. Timber is floated down the Tapty in the monsoon.

Boodh Cave Temples.—Near to the Adjunta Pass, through the Chandore range, from Ahmednuggur into Khandesh, or a multitude of those astonishing remains of Boodhist art, consisting of excavations in the mural faces of the trap rocks, the interior walls of which excavations are

* In the Collector's revenue return for 1827-8 the number of villages is stated to be 2067½, so that 33½ of the deserted villages had become inhabited, independently of 330 uninhabited villages whose lands were included in the return.

† Paht means a water-channel, and Moht means a well-bucket; implying in the first instance that lands are watered from streamlets, and in the second instance from wells.

covered with bas-reliefs; indeed, with fresco paintings also, illustrative of the arts and social relations of life, like the paintings on the tombs of the Egyptian kings.

Dharwar Collectorate.—Agreeably to information obtained from the Revenue Survey Department, that part of the southern Mahratta country, bounded on the north by the Kolapoor territory and the Kristna river, on the east by the Nizam's dominions, on the south by Mysore and the Toomboodra river, and on the west by Soonda and the Syhadree Ghâts, comprises an area of 11,747 square miles, namely,

	Square Miles.
British possessions	8378·439
Do. Manowlee Talook, from the Kolapoor territory	390·474
Sawanoor Jagheer	74·750
Sawuntwaree territory	188·934
Nizam's territory	47·930
Gudjundurghur jagheer	69·344
Putwurdun and other jagheers	2597·167
Total	11747·038

The Talooks of *Cheekooree*, 354 square miles, and *Munowlee*, 390 square miles, have been added to Dharwar, so that the area of the collectorate now amounts to 9122·913 square miles; but 39 per cent. of this consists of wood and jungle, and uncultivated lands, and 61 per cent. appears upon the returns as cultivated.

Dharwar is divided into 22 Talooks and 137 *Turruffs*, *Mahls*, *Summuts*, or *Khiryats*, independently of the subdivisions of the Talooks of Cheekooree and Munowlee. The Talook of Dharwar has 136 towns and villages, Meesreekoht 133, Purusghur 59, Nowlgoond 43, Hoongoond 170, Dumbul 96, Bunkapoor 115, Nuwee Hooblee 97, Ranee Beednoor 139, Kettoor 81, Sumpgaon 70, Beereeh 135, Rhone 77, Bagulkoht 141, Hangull 173, Goottull 123, Badamee 148, Padshapoor 202, Kohr 182, Talooks of Cheekooree, and Munowlee 225. To the above are to be added 189 villages, 47 of which sent in poppulation returns, although their names were not in the government list; 108 were not included because they were Jagheer or Eenam villages; and 34 were depopulated and overlooked. The total number of villages in the collectorate amounted to 2734; of this number 2491 were populated, and 243 were deserted. Of the above, 1890 British villages sent in returns, 225 did not send returns; 155 were deserted, but their lands were under cultivation by neighbouring villagers; 230 alienated villages sent in returns, 137 alienated vil-

lages did not send in returns; and 88 deserted villages had not their lands under cultivation. With the aid of some trifling estimates the total amount of population appeared to be 838,757, averaging 91·94 inhabitants to the square mile, 336·71 to a village, and 4·48 to a house. Of the 119 British towns, there are only three whose population exceeds 10,000 souls, viz. Dharwar 11,802; Belgaon 11,037; and Mujeedpoor 15,387. One town has above 8000 inhabitants, (Bagulkoht); two with 6000; one 5000; thirty-six with from 2000 to 4000; and seventy-seven with from 1000 to 2000 souls. All the village lands being kept in definite measurements, it appeared that the cultivated land of the whole collectorate was 61·11 per cent., and waste only 38·89 per cent.

Rivers.—All the chief rivers of Dharwar flow to the eastward; they have their source in the Ghàts, and join the Kistnah. The principal are the Gutpurba, the Malpurba, and the Wurdah: the falls of the Gutpurba, near to Gokank, are said to be strikingly fine.

Hill Forts.—Dharwar, like the other collectorates, has to boast of its hill forts.

Viewing Dharwar, whether with respect to its numerous towns and well-peopled villages, the comparative density of its population, the size of its farms, the quantity of land in cultivation, the amount of its revenues, the lightness with which they press supposing they were raised as a poll tax, the indications of manufacturing industry (so languishing elsewhere) in the number of its weavers, and its superior means of school instruction, it is unquestionably the finest of the British possessions in Dukhun.

Population.

The great feature in the population of Dukhun is the excess of males over females in a greater proportion than exists in Europe. By the last census in England there were 100 males to 93 females. In the British possessions in Dukhun, in a population from which returns have been received of 2,302,902 souls, there are 100 males to 87·36 females, and this difference obtains, with very little variation, throughout the different casts. It is subject to modification, however, by a very singular fact, exhibited in the excess of grown up women over men wherever the returns distinguish the adults from children; but the excess of male children over female leaves the ultimate preponderance in favour of the males. From Sir Stamford Raffles' *History of Java*, the same relative proportion of the sexes would appear to exist in that island. He states that the proportion of males and females born in Bantam, and over the whole of Java, is nearly the same as in Europe, and as is found generally

to exist wherever accurate statements can be obtained. From the information he collected in a very careful survey of one province, the preponderance seemed to be on the side of male children to an extraordinary degree; the male children being about 42,000, and the female 35,500, i. e. 100 males to 84·52 females. He says also there were formerly great drains on the male population, and which, in advanced stages of life, might turn the balance on the other side; indeed, in some of his returns this is shown to be the case.

In Dukhun, wherever the means have been afforded to me of ascertaining, I have found the preponderance of male over female children to be marked, not only in births, but as long as they continue to be classed as children: although a great mortality, at a subsequent period, makes the grown up females outnumber the grown up males.

Males and females.—In the Poona Collectorate in 1826 the births of males in 32 turruffs were 100 to 94·27 females, or very nearly 20 males to 19 females. The result of eighteen years' very careful observations for all France, from 1817 to 1834 inclusive, gives 17 males for 16 females; and as this is derived from more than seventeen and a half millions of births, it is worthy of every confidence. Taking each year of the above period, the extreme variation was from 15 males to 14 females as far as 19 males to 18 females. My deduction varies so little, that we may fairly say the same law equally obtains, whether in a tropical or an extra-tropical climate. Amongst illegitimate births in France it would appear that the number of females approximates more nearly to males than in the legitimate births: the numbers, according to the French tables, being 24 males to 23 females: reducing all these to a common denomination, we have in the

Poona Collectorate.....	94·27	per cent. of female births.		
In France, the average of 18 years, legitimate.....	94·11	do.	do.	
In France, legitimate for 1 year,.....	93·33	do.	do.	extremes.
In France, legitimate for 1 year.....	94·73	do.	do.	extremes.
In France *illegitimate*, average of 18 years,	95·83	do	do.	

It would thus appear that amongst illegitimate children there are nearly two more females born to every hundred males than amongst legitimate births.

In the abstract of the census of the population of the Ahmednuggur Collectorate, taken in 1822, the boys were to the girls as 100 to 62·16; a singular disproportion; there being in the whole collectorate 96,447 boys, and only 59,956 girls; but the men were to the women only as 100 to 102·18, the number of men being 146,750, and the women 149,945. In the city of Poona, in 1822, the boys were to the girls as 100 to 73·26, a greater disproportion than Sir Stamford Raffles found in Java; at the same time the adult men were to the women as 100 to 103·40. In the classes only of the Brahman priests, mendicants, and traders, were the men found to exceed the women. In the city of Ahmednuggur, in 1826, there were 100 boys to 67·62 girls, but 100 men only to 106·06 women; but the ultimate relation of males to females was as 100 males to 92·46 females.

The following table shows the proportion of males to females in the different collectorates, and their principal cities and towns:

Collectorates.	Males to Females.	Cities and Towns.	Males to Females.
Poona Collectorate	100 to 88	Poona	100 to 94
Ahmednuggur do.	100 to 86	Ahmednuggur	100 to 92
Khandesh do.....	100 to 85	Joonur.....	100 to 89
Dharwar do.	100 to 89	Dharwar	100 to 98
		Belgaon	100 to 91
		Bagulkoht	100 to 101·25
		Gunness Part.....	100 to 101·14

Births, Deaths, and Marriages.—Returns of births, deaths, and marriages, in an available form, were received only from 32 turruffs of the Poona Collectorate, comprising 1109 towns and villages, but not including the city of Poona, containing 81,315 inhabitants; my information, therefore, on these subjects must necessarily be circumscribed, but the little there is is valuable from its novelty. Some returns came to hand from the Collectorate of Dharwar, but they were merely additions of the totals of irregular numbers of villages, (from 2 to 12,) and I hesitated

to trust to results which I could not test by the original returns. Respecting births, deaths, and marriages in the Ahmednuggur and Khandesh Collectorates, I am totally without information, excepting a solitary return of deaths in the city of Ahmednuggur in 1823, which is worthy of every confidence, as it was compiled by my friend Dr. Walker, late Civil Surgeon at Ahmednuggur.

Births.—In the Poona Collectorate the average births, in a population of 250,300, amounted only to one in 50·52 persons, or not quite two per cent.; the Brahmans having the smallest proportion, (1 in 57·29), and the Moosulmans the greatest proportion, (1 in 40·80); the range of births in the different turruffs was from 1 in 15·70 to 1 in 153·60 persons; and, on the whole, the hilly tracts had a greater number than the plains.

Deaths.—The deaths were 1 in 37·34 persons in the 32 turruffs, or 2·67 per cent., indicating a somewhat alarming diminution in the population;* the range varied from 1 in 17·21 to 1 in 70 persons, the fewest deaths being in the hilly tracts. It must be considered, however, that the spasmodic cholera was raging in the country in that year, and that the deaths from that unaccountable and dreadful malady in two turruffs amounted to nearly 5 per cent., and in one turruff to 6 per cent. of the whole population. It is to be presumed, therefore, in the absence of cholera, the births would exceed the deaths, as was in fact the case in some of the Mawuls, or hilly tracts, where it was known the cholera did not penetrate. In deaths the Moosulmans were the greatest average sufferers, (1 in 20·15) and the low casts were the least sufferers, (1 in 42·91).

As Dr. Walker found that the cholera in the city of Ahmednuggur increased the usual deaths 0·66 per cent., the loss being 2·48, while the cholera raged, and only 1·82 per cent. when the scourge ceased, it is but fair to infer that such would have been the case in the country at large; and this element, applied to the mortality in the Poona Collectorate, would reduce the annual loss to 2·01 per cent., or one death in 50 persons, which would indicate a greater degree of healthiness than all France, all Belgium, or the town of Glasgow, the loss in all these places being 1 in 39 and a fraction.

Marriages.—The average number of marriages in the Poona Collectorate is proportionably more than in England and France, being 1 in 125·87 souls; the proportion in England being 1 in 128, and in France 1 in 130·4 inhabitants. The range in the different turruffs is from 1 in 40·11 to 1 in 493.77; but in 14 turruffs the average is considerably un-

* The deaths in the kingdom of Naples for 1836—37 was 1 in 37 and a fraction.

der that for England. The Shoodruhs (Mahrattas proper) and Moosulmans are almost identical, in their proportional number of marriages, namely, 1 in 116·21 and 1 in 116·86, and they have the greatest number of marriages; the low casts have the fewest marriages. The births in 1826 being only 4954 and the marriages 1998, the average of children to a marriage was 2·48 or not quite 2½. In France the average is 3·72 children to a marriage; in England and Wales 3·55. In Java the births were 1 in 39, deaths 1 in 40 persons.

The constituents of the population in the different collectorates were

	Constituents of the Population.				
	Brahmans.	Rajpoots.	Shoodruhs, &c. Mahratta Cultivators, &c.	Atee Shoodruhs or low casts.	Moosulmans.
Poona.....	Per Cent. 11·58	Per Cent. 0·41	Per Cent. 73·85	Per Cent. 9·78	Per Cent. 4·38
Ahmednuggur...	Unknown.	Unknown.	Unknown.	Unknown.	Unknown.
Khandesh.....	5·40	3·47	69·58	14·72	6·38
Dharwar.....	4·48	0·60	74.53	11.895	8 495

In the above analysis the chief features are the permanent and nearly equal proportions of the Shoodruhs or Mahratta cultivators and other genuine Mahrattas, which obtain in the different collectorates; the fact being, that three-fourths of the population are of that most useful class the Shoodruhs; and it will be seen by the notice on agriculture, how large a proportion of them are engaged in tillage. In the Poona Collectorate, as might be expected from its having been the chief seat of a Brahman government, there is a considerable number of Brahmans; every ninth person, in fact, being a Brahman. In the other collectorates scarcely one in twenty persons is a Brahman. Genuine Rajpoots are little known in Dukhun, and I should doubt whether or not the 3½ per cent. of Rajpoots, in the returns from Khandesh, should be added to the Mahratta population; who, by the bye, have some pretensions to being descended from the Rajpoots. The proportion of low casts,* men who

* The low casts comprise all that part of the Hindoo population which cannot claim to be Shoodruhs, such as Mahrs, Dhers, Maangs, shoemakers, skinners, Ramoosees, Beruds, and Bheels. The Mahrs and Dhers are the scavengers, the Maangs, executioners; shoemakers and skinners speak for themselves; the Ramoosees and Beruds are born thieves, or are thieves by cast, and they are usually employed for the protection of villages, on the principle of setting a thief to catch a thief. The Bheels are supposed to be the aborigines of the countries where they are found.

are only engaged in vile or discreditable offices by the natives, although otherwise employed by the British, does not differ very much in the different collectorates; the increase in the Khandesh collectorate is attributable to large tracts of the country being inhabited by Bheels, who are a low cast; in fact, less than every seventh person is a low cast: in Poona about every tenth, and in Dharwar about every eighth. The Moosulmans are few in number in the Poona and Ahmednuggur Collectorates, not being one-twentieth of the population in the first, nor one-fifteenth in the second; but, in the Dharwar Collectorate they displace the Brahmans, and amount to nearly one-eleventh. Although the Moosulman power has been paramount nearly throughout all India for centuries, it is believed they have never constituted one-fifteenth of the whole population. In the abstract of the population returns from the Ahmednuggur Collectorate, the casts are not distinguished; but, in a return of 1828, from the city of Ahmednuggur, the Hindoo inhabitants are distinguished from the Moosulman; and it is found that there is the very unusual proportion of one Moosulman to 3·45 Hindoos, or 29 per cent. of the whole population. This is to be referred to the fact of Ahmednuggur having once been the capital of the Ahmed Shahee dynasty of Moosulman kings; with these exceptions, although I have not detailed returns to guide me, I believe that the constituents of the population of the Ahmednuggur Collectorate do not differ in their proportions from those of the Poona Collectorate. In the census of 1822, the families in the fifteen pergunnahs in the Ahmednuggur Collectorate, with a population of 409,279 souls, were enumerated, and it appeared that there were 4·53 persons to a family. With respect to the styles of building in the Ahmednuggur Collectorate, it will be fully illustrated by the facts, that the *tiled* houses amount only to 10·84 per cent. of the whole: the thatched houses to 32·27 per cent.: and the mud flat-terraced houses to 56·89 per cent.

Bearing in mind the clouds of horse that covered the Dukhun in the war of 1817, it is sufficiently remarkable that in 1822, in the whole Collectorate of Ahmednuggur there were only 405 full-grown horses, 1298 full-grown mares; the total, including colts and fillies, being only 2500; the ponies amounted to 12,632, of all kinds.

Proportions engaged in agriculture.—In 1828, in this collectorate, 1878 British villages contained 41,918 cultivators or farmers, and a population of 512,818 souls, and allowing five persons to a cultivator's family, 40·89 per cent. of the people were engaged in agriculture. In Poona there were 52,668 farmers, being a per centage of 55·50, with five persons to a family. In Dharwar 60,701 cultivators, being a per centage of

41·76*, and in Khandesh 44·608 cultivators, being a per centage of 53·16 occupied in agriculture. It is to be understood these proportions have reference to the population of British villages only, and not to the whole population of each collectorate. Moreover, as these proportions are derived from the registered farmers only, and as they are in the habit of sub-letting their lands, I have no hesitation in expressing my opinion that exact returns would prove that three-fourths of the population are directly engaged in agriculture. In the Poona Collectorate, families were not enumerated, excepting in the return from the city of Poona, and here families average 4·82 persons; each house in Poona averaged 6½ persons; but, for the whole collectorate 4·79 persons to a house; so that it is probable the returns of the number of houses would give the number of families. In Khandesh the proportion of inhabitants to a house falls short of the other collectorates, being only 3·96 persons. In Dharwar the number is 4·48 to a house, for the whole collectorate; but the towns exhibit other figures; namely, Belgaon 5·24, Chabee 5·78, and Gunness Pait 5·77 inhabitants to a house; England and Wales has 5·60. The average inhabitants to the square mile, in the different collectorates, has been noticed under the head of civil divisions; and the fewness will disappoint European expectations; but there is plainly a great mistake in the common estimation of the denseness of the Indian population. Bengal proper is said to have 203 inhabitants to a square mile, and Orissa, in the cultivated parts, agreeably to Mr. Stirling, the commissioner, has 135; but, for the whole area of Orissa, the average is only 14½ inhabitants to the square mile; England has 192.

Southern Jagheerdars.—The Southern Jagheerdars have 917 villages, with an *estimated* population of 263,236 souls.

Rajah of Sattarah's territories.—The Rajah of Sattarah, in his territories, has 1703 towns and villages, with an estimated population of 488,846 inhabitants.

With the data in my possession I am enabled to give an estimate of the population of the late Peshwa's territories in Dukhun; it affords a closer approximation to the truth than has hitherto been obtained.

* Including some returns of alienated villages, an estimate makes it 48 per cent.

Collectorate.	Towns and Villages.	Explanations.	Number of inhabitants.	Total inhabitants in each Collectorate.
Ahmednuggur.	1655¼	The census of 1822, in the Ahmednuggur Collectorate, in 1655¼ towns and villages, exclusive of the city of Ahmednuggur, each village averaging 263·47 inhabitants, gave..	453,098	
	223	223 British villages of Talooks, Kurmulleh, and Korteh, from which population returns were not received, averaging 263·47 souls, give.....	58,753	
	586½	586½ alienated towns and villages, from which returns were not received, averaging 267·47 souls, will give.....	154,525	666,376
	23	Depopulated villages		
	2488	Total villages in the Ahmednuggur Collectorate.		
Poona Collectorate.	895½	In the collector's revenue statement for 1828 there appeared 1469½ British villages; viz. 895½ towns and villages inclusive of the city of Poona, which sent in population returns in 1826, the villages averaging 226·10 inhabitants, exclusive of the population of the city, give.....	283,567	
	212½	212½ alienated villages sent in population returns.....	48,048	
	56	56 alienated towns and villages, and 4 British villages, did not send in returns, averaging a population of 226·10 souls each.....	13,566	
	4			
	574	574 British villages of the Sholapoor sub-collectorates did not send in returns, averaging by estimate 226·10 souls each.....	164,294	
		Had the average number of inhabitants to a village in the Ahmednuggur collectorate been used as an element, the result would have been 151,145		
	155	155 alienated towns and villages of the Sholapoor sub-col-		

Collectorate.	Towns and Villages.	Explanations.	Number of inhabitants.	Total inhabitants in each Collectorate.
		lectorate at 266·10 souls each	40,838	550,313
	29	Depopulated villages.		
	1926	Total towns and villages in the Poona Collectorate.		
Khandesh Collectorate.		In the collector's revenue statement for 1828, there were 2697½ villages; of this number,		
	1968	1968 British towns and villages sent in population returns in 1826, averaging 187·39 inhabitants to a village, equal to	368,781	
	64	64 villages, refused returns, at 127 souls each..... ...	8128	
	330	330 villages are cultivated, but not inhabited, making a total of 2362 villages. To make up the number in the		
	335½	collector's revenue statement therefore, 335½ villages must be added as having become populated since the population returns were sent in, at 127 souls each.....	42,608	
	14	14 Jagheer villages sent in returns.....	2623	
	300½	Jagheer, or alienated villages, did not send in returns, at an average of 187·39 souls each.....	56,317	478,457
	654	Depopulated villages, lands not cultivated.		
	3666	Total towns and villages in the Khandesh Collectorate.		
Dharwar Collectorate.		In the collector's revenue statement for 1828, there appeared 2279 towns and villages; of this number,		
	1899	1899 British towns and villages sent in population returns, averaging 348 inhabitants to each village..... ...	660,852	
	225	225 British villages in the talooks of Cheekoree and Munowlee did not send in returns: estimating their population		

Collectorate.	Towns and Villages.	Explanations.	Number of inhabitants.	Total inhabitants in each Collectorate.
		from the revenue they yield, falling as a poll-tax as in other parts of Dharwar, there are..	65,805	
	155	British depopulated villages, lands under cultivation.		
	230	Alienated villages sent in population returns.....	79,727	
	137	Alienated villages did not send in population returns, at the lowest average of population, 236·30 each.....	32,373	838,757
	88	Deserted villages, lands not under cultivation.		
	2734			
Southern Jagheerdars' lands.	917	The area of the Southern Jagheerdars' territories is 2978·125 square miles at 88·39 inhabitants to the square mile, the lowest average of the Dharwar Collectorate gives by estimate.....	263,236	263,236
Rajah of Sattarah's territories.	1703	1703 towns and villages under the Sattarah government, with an estimated population of 287·05 inhabitants to a village, which is the mean between Dharwar and Ahmednuggur, will give.....	488,846	488,846
	12,155	Populated villages.		
	1,279	Depopulated villages.		
	13,434	Total.		3,285,985

ABSTRACT OF THE ABOVE.

Collectorate or Territory.	Area, square miles.	Number of Towns and Villages.	Population.	Average to the square mile.	Average to a village for the whole Collectorate	Average to a house.
Poona	8281	1926	550,313	66·45	* 247·36	4·79
Ahmednuggur.....	9910	2488	666,376	67·24	† 263·47	4·89
Khandesh.....	12,527	3666	478,457	38·19	178·39	3·96
Dharwar.....	9122	2734	838,757	91·94	336·7	4·48
Southern Jagheerdars.....	2978	917	263,236	88·39	287·05	Not known.
Rajah of Sattarah's territories.....	6169	1703	488,846	79·25	287·05	Not known.
Total.....	48,987	‡13,434	3,285,985	67·07	270·34	

Average number of inhabitants to a village for all the collectorates, 270·34.

The above population does not include the army, camp followers, Bheels, or the wandering tribes.

It would appear there are 1279 uninhabited villages in the four collectorates of Dukhun, principally in Khandesh; making a total of 10,814 towns and villages in the British possessions, and of 13,434 in the late Peshwah's territories in Dukhun; exclusive of those belonging to the Kolapoor state.

Total alienated villages in the four collectorates, 1695¼. Total British populated villages, 7839¼; total deserted, 1279. Total villages in the *four collectorates*, 10,814.

Education.

Education, as a regular system, is certainly unknown amongst the people in Dukhun. The few schools existing are wholly disproportioned in number to the population; and even were they more numerous, the present general poverty of the Koonbees,§ and the imperious calls upon them for the services of their children in agriculture, and in attending their cattle, would disable them from letting their children profit by instruction, even though gratuitous. In a stage of civilization which is by

* Exclusive of the population of the city of Poona.

† Exclusive of the population of the city of Ahmednuggur.

‡ Of this number, 1279 are depopulated, and the depopulated villages of the Southern Jagheerdars and Rajah of Sattarah's territories are not known to me.

§ Mahratta cultivators.

no means contemptible, the general illiterateness of the cultivators is remarkable. It might have been supposed that the pressure of the inconveniencies and the risk of loss attending the solving their constantly recurring arithmetical computations, whether in settling their assessments with government, in ascertaining the amount of their produce, or in computing its saleable rate to ensure a profit, or in their money transactions with each other, would have stimulated some families of the past or present generations to have pursued steadily a course of instruction for their children, which, by its example and the visible beneficial results attending it, would have originated a thirst of knowledge, and advanced the march of intellectual improvement. The Shoodra, however, is led to believe by the wily Brahmans that letters and science are not within his province, and the farmer is content to go on mastering his arithmetical difficulties with the assistance of his fingers, and relying upon the village clerk for the keeping his accounts with the government, and on his ability, judgment, and secrecy in the management of his private correspondence, which, it may be supposed, will not be very important or voluminous. Were it ascertained, I believe not one cultivator in a hundred would be found able to write, or count up to 100 but by fives; and my daily unreserved intercourse for hours with numbers of this class of persons has given me facilities for forming this opinion. And yet the Koonbees are far from wanting intelligence; they are not slow in observing; they are quick in communicating, and the rationale of an agricultural process is frequently explained with a simplicity and effect which we might not always meet with in the educated English farmer. There would not be any difficulty in teaching the Koonbees, provided the instruction were gratuitous, and that the farmer could spare his children; and several important effects might attend this instruction: the mind of the cultivator would be invigorated with new ideas; enlarged views of action would break in upon him; a spirit of improvement, enterprise, and innovation might spring up, in place of the apathetic routine that at present prevails in rural œconomy and in the social relations of life; and an amelioration, both physical and moral, would take place in his condition. But at present the little education that exists is confined to the Brahmans and to the shopkeepers, Shaitees*, and Mahajuns.†

The Koolkurnees‡, or accountants and village-clerks, are always Brahmans; many of them are shrewd and very quick, and possessed of infi-

* Heads of trades. † Bankers.
‡ Village clerks and accountants.

nite ingenuity in avoiding the detection of a fraud or mistake in their papers; many of this class, however, I found too stupid to keep an individual's account, much less the complicated details of a village assessment. The shopkeepers being generally people from Goojrat, keep their accounts in the Goojratee language. The character in universal use for business is the Mohr in the districts. The following will show the number of schools, as far as the returns received from the collectors will permit,—not any account of schools was received from the collector of Ahmednuggur. In the Collectorate of Dharwar there is one school to 2452 inhabitants; in Khandesh there is only one school to 4369 souls; and, in the Poona Collectorate, deducting the population of the city of Poona, there is one school to 3337 souls. It is fair to infer therefore, that as Dharwar supports proportionably so many more schools than the other collectorates, that information is more generally spread amongst the people, and that they are better able to manage their affairs than others less instructed; and the breadth of cultivation, and general manufacturing and commercial industry of the people, would seem to justify the inference.—*Report of the Seventh Meeting of the British Association for the advancement of Science.*

(To be concluded in our next.)

X.—PROCEEDINGS OF SOCIETIES.

Proceedings of the Madras Literary Society and Auxiliary of the Royal Asiatic Society.

WEDNESDAY, *30th January* 1839.

PRESENT.

The Honourable Sir ROBERT COMYN, *President in the Chair*

A. F. Bruce, Esq.
Robert Cole, Esq.
John Carnac Morris, Esq.
Rev. F. Spring,
Rev. W. Taylor,
AND
J. MINCHIN, Esq. *Secretary.*

The Secretary submitted to the Meeting, statements of the Society's accounts for the past year.

Abstract Statement of the Funds of the Madras Literary Society and Auxiliary of the Royal Asiatic Society from the 1st January to the 31st December 1838.

	DISBURSEMENTS			RECEIPTS.		
Balance in favour of the Society as exhibited in the Statement submitted to the annual General Meeting held on the 31st January 1838	....	..	..	909	8	11
Total amount of Subscriptions received from the 1st January to the 31st December 1838	....	..	..	4875	11	7
Difference of interest in favour of the Society as stated in Messrs. Binny and Co.'s account closed on the 31st December 1838	....	..	..	22	8	0
Messrs. Binny and Co.'s commission on amount of receipts	48	12	1			
Remitted to Messrs. Wm. H. Allen and Co. booksellers	3130	6	10			
Pay of the Establishment	1594	10	0			
Postage	92	7	0			
Stationery	41	2	0			
Cooly hire	13	11	0			
Sundries	61	11	3			
Expenses incurred in binding books	35	8	5			
Subscription and postage for the Bombay Courier, &c	77	15	0			
Subscription and postage for the Bengal Herald, &c	23	12	6			
Books purchased at Madras	129	8	0			
Paid for printing advertisements, &c	29	0	0			
Paid Messrs. Ouchterlony and Co for salvage charges, &c. on one parcel of books saved from the wreck of the *Royal William* at the Cape	46	8	8			
	5325	0	9	5807	12	6
Deduct disbursements				5325	0	9
Balance in favour of the Society				482	11	9

Abstract Statement of the Funds of the Asiatic Department.

	Disbursements			Receipts.		
Balance in favour of the Society as exhibited in the Statement submitted to the General Meeting held on the 31st January 1838....	....	..	..	979	8	0
Total amount of Subscriptions received from the 1st January to the 31st December 1838.	....	..	..	1106	10	8
Amount realized by the sale of the Madras Journal of Literature and Science.....	....	..	..	*1265	8	0
Difference of interest in favour of the Society as stated in Messrs. Binny and Co.'s account closed on the 31st December 1838...	....	..	..	26	15	5
Messrs. Binny and Co.'s commission on amount of receipts.....	23	11	7			
Paid for printing the 18th, 19th, 20th and 21st Nos. of the Madras Journal of Literature and Science.....	1376	12	0			
Pay of the Establishment.....	798	0	0			
Sundries.....	47	0	6			
Paid Freight, &c. on four boxes of books to London.....	25	11	0			
	2271	3	1	3378	10	1
Deduct disbursements				2271	3	
Balance in favour of the Society.....				1107	7	0

The following donations having been made to the Society since the last annual general Meeting, the thanks of the Society were unanimously voted to the donors :—

10 Copies of Ancient and Modern Alphabets of the Southern Peninsula of India.....Madras Government.
2 Copies of Mr. Bruce's Report on the Manufacture of the Black Tea..... ditto
5 Copies of Mr. Turnour's Mahawanso..... ditto
Reports of a Committee for Investigating the Coal and Mineral Resources of India.....J. Prinsep Esq.
Khazanat ul ilm or the Treasury of Science.....Bengal Asiatic Society.
A Catalogue of Sanscrit books..... ditto
Auber's Rise and Progress of the British Power in India, 2d vol.....Madras Government
Result of the Madras Observations for 1836 and 1837.... ditto
5 Volumes of Reports on the Poor Laws.....Captain F. Senior.
Recollections of the Deccan.....Captain T. J. Taylor.
Fort St. George Gazette for 1832, 1833 and 1831.....J. C. Morris, Esq.
Government and Commerce of India..... ditto
Hodgson on the Law and Police of Nepál..... ditto

* Amount since realized and remitted to Messrs. Binny and Co. from the sale of the Journal Rupees 343.

Reeve's English and Canarese Dictionary.....College of Fort St. George.
Morris's English and Teloogoo Dictionary 1st vol.... ditto
Brown's Verses of Vémana..... ditto
Reeve's Canarese and English Dictionary..... ditto
Cural and Naladiyar (Tamil)..... ditto
Cadamunjari (Tamil)..... ditto
A Snake preserved in a bottle.....Z. Macaulay Esq.
A large beetle called the Bharine purugu ....C. P. Brown Esq.
A mutilated Jain image..... .....Lieut. Newbold.
Notice sur des Vêtements avec des Inscriptions Arabes, Persanes et Hindoustani—par M. De Tassy....The Author.
Notice du Traité Persan sur les Vertus De Huçaïn Waïz Kaschifi, intitulé Akhlaqu—i Muhcini—par M. De Tassy..... ditto

It was announced that the following gentlemen have been elected members of the Society since the last Annual General Meeting :—

J. C. Wroughton, Esq.
C. R. Howard, Esq.
A. F. Arbuthnot, Esq.
J Cadenhead, Esq.
Dr. Murray,
Lieut. W. T. Nicolls,
Lieut. G. Balfour,
E. C. Heywood, Esq.
A. J. Cherry, Esq.
Major Alexander,
Rt Rev. The Lord Bishop of Madras,
Rev. A. C. Thomson,
Lt. Gen. Sir Jasper Nicolls, K. C. B.

During the past year the Society have lost 18 members by death, retirement or departure for Europe.

It having been ascertained that the name of Baron Von Hammer, who was several years ago elected an Honorary Member of the Society, has been inadvertently omitted from the list—it is

Resolved, that his name be duly entered, and that a letter of explanation be addressed to the Baron on the subject.

The Meeting proceed to elect three members for the Committee of Management for the ensuing year, in succession to the Rev. F. Spring, Walter Elliot Esq. and R. Cole, Esq. who go out by rotation: when Dr. Murray was duly elected, and the Rev. F. Spring and R. Cole Esq. re-elected.

Moved by the Honourable Sir Robert Comyn and seconded by J. C. Morris Esq.—That the thanks of the Society be given to the Rev. W.

Taylor for the manner in which the 2d and 3d volumes of the Restored Mackenzie Manuscripts have been prepared for the Society, and bound at his own expense—Carried unanimously.

The Rev. W. Taylor being present returns thanks.

Read letter from Lieut. Newbold, enclosing copies of manuscript inscriptions from the Ceded Districts.

Resolved, that the thanks of the Society be given to Lieut. Newbold, and that the inscriptions be referred to the Committee of Papers.

The Secretary to the Committee of Papers in the Asiatic Department announces that the Committee has associated with him, as joint Secretary, C. P. Brown, Esq. of the Civil Service, who undertakes that office to the Class of *Oriental Literature*; while he will continue to officiate in the *Physical Class*.

The business of the Meeting being concluded, the thanks of the Meeting were unanimously voted to the Honourable the President for his able conduct in the chair.

(Signed) J. Minchin. *Secretary.*

(Signed) Robert Comyn. *President.*

XI.—*Horary Meteorological Observations made agreeably with the suggestions of Sir* JOHN HERSCHEL, *at the Madras Observatory— By* T. G. TAYLOR, Esq. *H. E. I. C. Astronomer.*

Time	Barmo.	Thermometer. Dry.	Thermometer. Wet	Direction of wind.	Strength.	Remarks.
Dec. 21						
6 A. M.	30.106	71.1	68.0	———	calm	Flying clouds to the south.
7 „	30.116	71.6	68.6	———	calm	do. do.
8 „	30.150	73.7	70.6	N. W.	1	do. do.
9 „	30.159	76.4	70.6	E. N. E.	2	Clear.
10 „	30.158	78.1	70.9	Do.	2	do.
11 „	30.136	78.2	71.0	N.	2	Flying clouds.
12 „	30.108	78.9	71.0	N. E.	1	Clear.
1 P. M.	30.082	79.4	70.9	E.	2	do.
2 „	30.064	79.9	71.0	N. E.	2	do.
3 „	30.054	79.8	71.0	E. N. E.	2	Flying clouds.
4 „	30.050	79.8	70.5	N. E. N.	2	do. do.
5 „	30.058	78.8	70.5	N. E. N.	2	do. do.
6 „	30.068	77.2	70.1	N. E.	1	Clear.
7 „	30.076	76.4	69.7	N. E.	1	do.
8 „	30.092	76.0	69.6	N. E.	1	Flying clouds.
9 „	30.102	75.9	69.4	N. E.	1	do. do.
10 „	30.100	75.7	69.0	N. E.	1	do. do.
11 „	30.094	75.5	68.5	N. E.	1	do. do.
12 „	30.086	74.9	68.5	———	calm	do. do.
1 A. M.	30.074	74.5	69.1	N. E.	1	do. do.
2 „	30.058	74.4	69.3	N. E.	1	do. do.
3 „	30.050	73.6	67 5	N.	1	do. do.
4 „	30.050	72.8	68.0	N. W.	1	Clear.
5 „	30.048	72.0	68.0	N. W.	1	Flying clouds.
6 „	30.064	72.0	68.0	N. W.	1	do. do.
7 „	30.088	72.3	68 6	N. W.	1	do. do.
8 „	30.118	72.7	69.5	N. W.	1	Clear.
9 „	30.140	74.6	70.7	N. W.	1	Clear.
10 „	30.132	76.5	71.0	N. W. N.	2	Flying clouds.
11 „	30.124	77.8	70.0	N. E.	2	Flying clouds.
12 „	30.098	78.4	70.5	N. E.	1	Clear.
1 P. M.	30.078	79.4	70.7	E.	2	do.
2 „	30.062	79.9	70.8	N. E.	1	do.
3 „	30.054	80.0	71.0	N. E.	2	Flying clouds.
4 „	30.058	79.9	71.0	N. E.	2	do. do.
5 „	30.064	79.0	70.5	N. E.	2	Clear.
6 „	30.076	78.0	71.0	N. E.	1	do.

Horary Meteorological Observations made at the Summer Solstice, 1838, *at the Trivandrum Observatory.—By* J. CALDECOTT, Esq.

Date.	Hour.	Wrench's bar. corrected for temp. 32° and for capillarity.	Standard ther.	Dep. of W. B. Ther.*	Dew point.	Direction of wind.	Velocity of the wind.	Solar radiation.	Clouds, aspect of the sky and remarks.
June 21	6 A. M.	29.800	74.0	1·3	72.13	N W	2		Sky obscured with thick cum.—cold wind.
	7	.807	75.0	1.1	73.43	N by W	2		do. at 7h. 30m. heavy rain.
	8	.808	77.5	1.2	75.83	N by W	2		Zenith clear; bank of cum. in N.W. horizon.
	9	.821	80.0	3.2	75.90	W	2		Fl. cl.; do. at 9h. 30m.—heavy rain.
	10	.824	80.5	2.9	76.49	S by W	6		Sky covered with cum. at 10h. 30m.
	11	.839	75.8	2.5	72.21	N W by W	7		do. with thunder.
	Noon.	.822	75.9	1.8	73.34	N W	2		do. strong cold wind.
	1 P. M.	.800	76.8	2.1	73.83	N N W	2		do. light cool air.
	2	.788	79 3	1.8	76.81	N N W	2		do. do.
	3	.778	77.5	2.4	74.12	N W	6		do. at 2h 30m rain.
	4	.766	78 3	1.7	75.95	N W	2		Somewhat clearer— fresh breeze.
	5	.780	79.2	3 3	74.58	W	4		Cloudy and threatening.
	6	.791	76.8	2.7	72.95	W	5		do. do. at 5h. 30m. rain—cold wind.
	7	.820	75.3	1.4	73.30	N N W	3		Sky covered with nimbi—raining do.
	8	.834	75.2	1.1	73.64	N N W	2		do. do.
	9	.844	75.5	0,8	74.37	——	0		do. do. slightly.
	10	.864	75.5	0.9	74.23	N N W	3		do. calm.
	11	.880	74.5	1.9	71.75	N W	10		do. at 10h. 15m. rain.
	Midn.	.880	74.0	0.4	73.43	N W	8		do, rain with strong wind.
„ 22	1 A. M.	.858	77.8	5.2	70.20	do	2		do. do. do.
	2	.859	74.4	1.1	72.86	do	2		do do.
	3	.839	74.2	1.1	72.62	N W by N	2		do. do. (slightly) lightn. in S.W.
	4	.829	74.0	0.7	73.00	N W by W	2		do. do
	5	.818	74.5	0.9	73.22	——	0		do. do. lightn. in S.W.
	6	.833	74.4	1.3	72.53	N W by W	1		do· calm.
	7	.855	73.6	1.2	71.86	N W by W	1		do a rain-bow at sun-rise, at
	8	.865	75.3	1.2	73.59	N N W	4		do. [at 6h.30m.heavy rain.
	9	.871	77.1	1.4	75.14	N N W	3		do.
	10	.911	77.3	2.8	73.33	W N W	12		do.
	11	.926	73.0	1.9	70.20	N W	8		do. raining with strong wind.
	Noon.	.921	73.3	1.6	70.96	N W	6		do. do. fresh breeze.
	1 P. M.	898	74.5	1.6	72.19	do	4		do. raining slightly,—modr. breeze.
	2	.851	77.0	2.7	73.16	do	3		do. do. do.
	3	.816	77.0	3.0	72.71	N by W	4		Clearing gentle breeze.
	4	.817	76.6	2.7	72.74	N W by N	2		Rather clearer do.
	5	.807	76.5	1.7	74.10	——	0		Flying clouds light do.
	6	.824	76.5	2.8	72.49	W	2		Sky again obscured calm.
									do. raining slightly, light breeze.

No observations—on account of the Actinometer being out of order.

* Rain prevailed so much throughout these 36 hours, that these depressions indicate the temperature of the rain, rather than the hygrometric state of the atmosphere.

June 21st fall of rain from
6 A. M. to 6 P. M. 1·38
do 6 P.M. to 22d 6 A. M. 1·59
June 22d fall of rain from
6 A M. to 6 P. M. 1·88

Total in the 36 hours 4.85 inches

The instruments are the same, and situated exactly as before.

Horary Meteorological Observations made at the Autumnal Equinox 183[illegible] *at the Trevandrum Observatory.—By* J. CALDECOTT, Esq.

Date.	Hour.	Newman's Standard bar. corrected for temp. and capillarity.	Standard ther.	Depress. of W. B. thermometer.	Dew point.	Direction of wind	Velocity of the wind.	Solar radiation.	Clouds, aspect of the sky, and remarks.
Sept. 21	6 A. M.	29.704	73.0	2.1	68.89	,,	,,	0.8	Zen. clear—cum. about hor. calm
	7	.727	75.6	2.9	71.40	,,	,,	3.0	do. do. do.
	8	.745	79.1	4.1	73.29	N W	3	7.3	do. do. gentle wind
	9	.761	82.1	6.1	73.52	W N W	6	2.5	Obscured. do.
	10	.759	84.0	7.9	72.85	do	4	0.5	do. do.
	11	.751	84.3	9.7	70.30	do	1	7.0	Fl. clds.—cum. about hor. light air
	Noon.	.728	85.4	10.3	70.60	do	1	12.0	do. do. do.
	1 P. M.	.705	82.0	8.4	69.77	s w by w	1	0	Sky obscured with thick cl. do
	2	.704	82.8	8.1	71.18	do	2	5.5	Clearing gentle wind
	3	.693	83.9	9.6	70.00	w by s	2	8.5	Zen. clear—flying clouds do.
	4	.697	81.8	8.1	70.03	do	2	0	Cloudy and threatening do.
	5	.673	80.5	6.3	71.45	do	2	0.5	Clearer do.
	6	.698	79.2	5.9	70.64	s w	1		do. do.
	7	.722	78.4	4.4	72.10	N W	1		Light clouds in zen—cum. about western horizon light air.
	8	.741	78.1	4.0	72.38	,,	,,		Drizzling and threatening calm
	9	.777	77.8	3.7	72.51	,,	,,		do. do.
	10	.805	77.0	2.9	72.86	s w	3		Raining moderate breeze
	11	.807	76.5	2.9	72.34	do	2		Overcast and threatening do.
	Midn.	.799	76.0	3.4	71.06	do	1		do. do. do.
,, 22	1 A. M.	.730	74.6	1.7	72.15	do	1		Raining almost calm
	2	.711	73.6	1.2	71.86	W N N	2		Overcast at 2h. 45m. drizzling
	3	.706	73.5	1.2	71.76	N W	1		Zen. clearing wind cold
	4	.703	73.5	0.9	72.20	do	2		Clear do.
	5	.753	73.5	0.9	72.20	do	2		Overcast again.
	6	.759	73.5	1.2	71.76	do	1		do. at 6h. 45m. drizzling a rainbow
	7	.758	74.5	0.9	73.22	do	1	3.2	Zen. clearing—otherwise cloudy.
	8	.782	77.9	2.6	74.24	W	2	5.0	Zen. clear—haze about horizon light breeze.
	9	.795	80.0	4.9	73.06	do	3	4.0	Light clouds about E. hor. otherwise cloudy moderate do.
	10	.789	82.0	6.1	73.41	do	2	5.0	do. do. do.
	11	.757	84.0	8.6	71.75	w s w	3	12.8	Quite clear do.
	Noon.	.750	85.2	9.6	71.52	w by s	4	12.0	do. wind increasing
	1 P. M.	.706	86.3	10.9	70.68	do	8	11.1	do. fresh breeze
	2	.787	86.0	10.0	70.15	do	8	8.1	do. do.
	3	.674	85.4	10.5	70.27	w s w	9	1.1	do. do.
	4	.673	84.5	9.4	72.23	do	8	1.9	Flying clouds in zen. do.
	5	.698	82.6	8.5	70.30	s w	4	0.2	Clear in the zen. clouds about S horizon gentle breeze
	6	.727	80.5	6.9	70.49	w	4	,,	do. do. do.

No observations.

The barometer is a Standard one by Newman (having an half inch tube) which has lately been received in excellent order—it is placed in the situation of the former one. The other instruments are the same as before.

September 21st fall of rain from
6 A. M. to 6 P. M. None
do. 6 P. M.
to 22d to A. M. .1010
September 22d do.
6 A. M. to 6 P. M. None
Total in the 36 hours 0.1010 inches

Horary Meteorological Observations made at the Winter Solstice, 1838, *at the Trevandrum Observatory.—By* G. SPERSCHNEIDER, *Superintendent.*

Date.	Hour.	Newman's Standard bar. corrected for temp. and for capillarity.	Standard ther.	Depress of wet bulb thermometer.	Dew point.	Direction of wind.	Velocity of the wind.	Solar radiation.	Clouds, aspect of the sky, and remarks.
Dec.									
21	6 A. M.	29.767	67.4	7 9	53.70	N E by N	3		Sky clear—cum. about the N. E. horizon gentle wind.
	7	.790	69.0	8.3	54.87	do	4		do. do. cold wind.
	8	.815	71.0	9 4	58.61	do	1	4.6	do do. wind hardly percept.
	9	.817	79 5	13.2	57 95	N E	2	6.0	do. do. do. just perceptible.
	10	.802	82.	15.4	57.38	do	3	7.5	do. do do gentle wind.
	11	.783	83.8	15.4	59 15	E N E	2	4.5	do. clear, cum. about the E. hor. do.
	Noon.	.753	85 9	16.9	58 81	W	1	2.0	do. do. nearly calm.
	1 P. M.	.729	86 4	14.5	64.20	S W	5	5.8	do. do. gentle wind.
	2	.705	85.8	14.7	63.04	S W by S	10	6.1	do. do. pleasant brisk gale.
	3	.694	85·2	13 9	63.77	S W	10	2.5	do. strata in the N. do.
	4	.704	84.4	12 9	64.64	S by W	8	1.5	Sky clear do.
	5	.716	82.6	12.5	63 09	S W	1		do. wind hardly percept.
	6	.724	80.6	10.7	63 93	"	"		do. nearly calm.
	7	.732	79.3	9 8	63.99	"	"		do. do.
	8	.747	77.0	8.1	64.30	"	"		do. do.
	9	.769	75.5	9.2	64.85	N"	1		do. wind hardly percept.
	10	.779	72.4	5.0	64.47	"	"		do. calm.
	11	.776	70.6	3.8	64.54	N E	1		do wind just perceptible.
	Mid.	.761	71.0	4.2	64.30	do	1		do. do.
22	1 A. M.	.752	69.0	3.4	63.54	do	2		Sky pretty clear cold wind.
	2	.737	68.5	3.4	63.04	do	2		do. do.
	3	.736	67.0	2.9	62.31	"	"		do. calm.
	4	.736	67.0	4 4	59.77	N E	3		do. do.
	5	.750	66.5	5.3	57 65	N E by N	4		do. do.
	6	.761	66.2	5.3	57.33	N N E	4		Sky covered with light clouds do.
	7	.781	67.7	5.8	58.11	do	1	1 3	do. wind hardly perceptible.
	8	.791	73 4	8.6	59.27	do	2	2.5	do. do. just do.
	9	.810	78.9	12.1	59 38	do	1	6.0	do. wind hardly do.
	10	.806	82.4	15.3	57.45	N N W	1	9 0	do. do.
	11	.782	84 3	17.0	55.50	N	1	9 5	Sky clear, do.
	Noon.	.748	86.8	19.3	55.05	S W	2	12.5	do. wind just perceptible.
	1 P. M.	.716	87.5	19.2	56.25	do	3	6 7	do. gentle wind.
	2	.696	87.5	18.8	57.08	do	3	3.8	do. do.
	3	.686	86.7	17.2	59.22	W	3	4.5	do. do.
	4	.689	85.6	16.5	59.21	do	2	3 3	do. do.
	5	.722	84 1	14 8	60.60	W S W	1	2.5	do. do.
	6	.741	81.4	12.3	61.94	W	1		do. do.

No observations.

No thunder, lightning nor rain throughout.

The instruments are situated exactly as before.

METEOROLOGICAL REGISTER KEPT AT THE MADRAS OBSERVATORY; FOR THE MONTH OF OCTOBER, 1838.

Days.	Barometer at 10 A. M.	Barometer at 4 P. M.	Barometer at 10 P. M.	Ther. at 10 A. M.	Ther. at 4 P. M.	Ther. at 10 P. M.	Wet Bulb. 10 A. M.	Wet Bulb. 4 P. M.	Wet Bulb. 10 P. M.	Rain. Sun-rise.	Rain. Sun-set.	Evaporation.	Direction of Wind 10 A. M.	Direction of Wind 4 P. M.	Direction of Wind 10 P. M.	Weather 10 A. M.	Weather 4 P. M.	Weather 10 P. M.	Remarks.
1838	Inch.	Inch.	Inch.	o	o	o	o	o	o										
Oct. 1	29,990	29,902	29,962	85,7	91,0	83,6	5,8	7,5	4,1	.....	.....	.....	SW	SE	SE	Clear	Clear	Clear	Lightning.
2	,980	,904	,968	86,8	91,0	84,3	7,6	8,0	4,0	.....	.....	.....	W	SE	SW	Clear	Clear	Cloudy	Do.
3	30,604	,934	30,012	87,9	87,7	86,0	9,6	7,7	5,1	.....	.....	2,476	W	Sbyse	SW	Cloudy	Cloudy	Cloudy	Thunder and lightning.
4	,036	,960	,044	86,2	86,0	84,6	5,9	5,5	4,2	.....	.....	.....	S	S	W	Fl. cl.	Cloudy	Cloudy	Do. Do.
5	,060	,976	,038	86,3	89,4	84,5	9,1	5,9	4,5	.....	0,321	.....	W	Sbyse	S	Clear	Th. hz.	Cloudy	Do. Do.
6	,064	,976	,038	86,3	92,0	82,6	7,5	10,0	3,3	.....	.....	.....	N	SE	SE	Fl. cl.	Clear	Clear	Do. Do.
7	,056	——	,030	86,0	——	82,0	6,3	——	3,6	.....	.....	.....	SE	——	S	Fl. cl.	——	Clear	——— Do.
8	,038	,990	,040	85,5	87,6	82,5	6,5	9,1	4,6	.....	.....	.....	SW	SEbys	SE	Clear	Clear	Clear	——— Do.
9	,046	,990	,040	84,8	87,8	83,5	7,1	8,9	7,3	.....	.....	.....	NW	E	SE	Fl. cl.	Clear	Clear	——— Do.
10	,040	,976	,034	85,3	87,6	80,7	8,1	10,1	5,2	.....	.....	2,646	E	E	E	Fl. cl.	Clear	Clear	Dew ———
11	,046	,970	,028	84,7	87,8	81,8	6,7	10,0	4,8	.....	.....	.....	S	E	E	Clear	Th. hz.	Clear	Lightning—dew
12	,034	,950	,008	85,7	87,4	83,4	10,0	8,3	5,1	.....	.....	.....	SE	E	E	Fl. cl.	Clear	Clear	Do. Do.
13	,078	,964	,016	85,8	86,5	84,5	6,1	7,8	5,4	.....	.....	.....	E	E	E	Fl. cl.	Th. hz.	Clear	Do. ——
14	,016	——	29,992	81,2	——	81,2	4,2	——	4,2	.....	0,347	.....	SW	——	NE	Cloudy	——	Fl. cl.	Do.
15	,012	,952	,986	79,5	81,0	79,2	2,2	6,0	2,5	.....	0,397	.....	N	NW	N	Cloudy	Cloudy	Cloudy	Do.
16	,008	,942	,970	78,6	76 6	78,5	3,4	3,7	3,7	0,087	0,437	.....	N	N	NW	Cloudy	Dr. rain	Cloudy	Do.
17	29,922	,892	,916	78,1	81,0	78,3	4,1	8,2	4,7	.....	.....	1,539	SW	W	SW	Cloudy	Cloudy	Cloudy	——
18	,964	,882	,930	81,8	85,8	80,7	7,9	10,5	4,6	.....	.....	.....	W	SW	SW	Haze	Th. hz.	Haze	——
19	,960	,900	,956	83,7	86,5	83,8	8,0	8,5	2,8	.....	.....	.....	W	S	S	Clear	Clear	Fl. cl.	——
20	30,000	,940	30,000	84,2	87,6	83,9	6,2	9,1	3,3	.....	.....	.....	SW	S	S	Clear	Cloudy	Clear	
21	,046	——	,044	84,8	——	84,8	5,6	——	1,8	.....	.....	.....	W	——	S	Clear	——	Cloudy	Lightning
22	,096	30,056	,086	85,1	85,6	82,5	7,1	7,1	3,5	.....	.....	.....	SE	SE	SE	Haze	Cloudy	Fl. cl.	——
23	,106	,026	,100	83,9	86,5	82,7	6,4	8,5	6,3	.....	.....	.....	SW	E	SE	Fl. cl.	Cloudy	Fl. cl.	——
24	,010	,028	,062	83,3	85,0	82,0	6,8	10,0	8,0	.....	.....	2,301	NE	NE	NE	Fl. cl.	Clear	Haze	
25	,074	,000	,024	84,0	85,0	80,3	9,7	9,8	5,6	.....	.....	.....	NE	E	N	Clear	Clear	Clear	Lightning to the east.
26	,022	29,974	,000	81,7	84,0	82,5	6,2	10,0	6,5	.....	.....	.....	NE	NE	N	Cloudy	Cloudy	Cloudy	Thunder and lightning to the E.
27	,018	,948	29,994	79,3	81,6	79,5	1,1	——	3,5	1,174	0,467	.....	N	——	N	Dr. rain	——	Dr. rain	Do. Do.
28	,008	——	,998	78,6	——	79,3	2,1	——	3,0	0,367	0,535	.....	NNE	——	N	Do.	——	Fl. cl.	Lightning.
29	,036	,960	30,018	78,6	80,0	78,7	1,3	2,5	2,0	0,147	.....	.....	N	N	NW	Do.	Cloudy	Cloudy	Do.
30	,068	,990	,056	79,0	79,4	78,2	2,2	2,9	2,0	0,934	0,117	.....	E	N	N	Cloudy	Cloudy	Cloudy	Do.
31	,040	,980	,024	78,7	79,6	79,4	1,5	2,6	1,7	0,944	.....	1,550	N W	N	N	Th. hz.	Cloudy	Fl. cl.	——
Mean	30,027	29,962	30,013	83,3	85,4	81,9	5,9	7,6	4,3										

METEOROLOGICAL REGISTER KEPT AT THE MADRAS OBSERVATORY; FOR THE MONTH OF NOVEMBER, 1838.

Days.	Barometer at			Ther. at			Wet Bulb.			Rain.		Evaporation.	Direction of Wind.			Weather.			Remarks.
	10 A. M.	4 P. M.	10 P. M.	10 A. M.	4 P. M.	10 P. M.	10 A. M.	4 P. M.	10 P. M.	Sun-rise.	Sun-set.		10 A. M.	4 P. M.	10 P. M.	10 A. M.	4 P. M.	10 P. M.	
1838	Inch.	Inch.	Inch.	o	o	o	o	o	o										
Nov. 1	30,016	29,978	29,990	80,4	82,5	78,5	3.4	5.0	2,0	0,217	.....	.....	NE	NE	Calm	Cloudy	Fl. cl.	Clear	Heavy dew.
2	,008	,958	30,000	80,7	83.8	79,9	2,7	6,8	4,2	.....	.....	.....	NW	NE	NE	Cloudy	Haze	Haze	Dew.
3	,008	,954	29,998	81,4	84,0	80,3	3,4	5,5	2,0	.....	.....	.....	NW	NW	N	Fl. cl.	Fl. cl.	Dr. rain	Thunder and lightning.
4	,024	——	30,000	78,0	—	78,9	2,0	—	1,0	0,667	0,167	.....	NE	——	NW	Rain	——	Do.	Lightning and thunder.
5	29,990	,930	29,976	77,6	76,2	76,4	1,9	1,7	2,2	5,009	0,637	.....	N	NW	N	Cloudy	Cloudy	Do.	Squally ——
6	,948	,910	,906	76,5	77,0	76,5	0,8	1,6	1,7	1,382	0,994	.....	NE	NW	N	Cloudy	Rain	Calm	Drizzling rain—heavy rain.
7	,920	,876	,916	77,7	79,8	78,4	1,3	3,8	1,4	4,700	.....	1,304	SW	SE. E	E	Cloudy	Th. hz.	Clear	Vivid lightning.
8	,952	,890	,940	80,7	81,8	79,1	3,2	3,8	1,9	0,067	.....	.....	E	E	NE	Fl. cl.	Cloudy	Cloudy	Do. and one loud and terrific
9	,966	,902	,958	80,1	82,0	79,9	2,2	4,0	2,5	3,825	0,037	.....	E	E	NE	Cloudy	Cloudy	Fl. cl.	Lightning. [crash of th.
10	30,034	,914	30,000	78,2	79,0	78,3	3,2	3,0	1,1	1,044	0,067	.....	E	E	NW	Cloudy	Cloudy	Dr. rain	Lightning.
11	,033	——	,003	78,8	—	79,8	0,8	—	1,4	1,534	0,107	.....	N. NW	——	N	Cloudy	——	Fl. cl	Thunder and lightning.
12	,063	,964	,028	78,2	79,4	78,3	1,7	1,9	1,9	0,127	0,147	.....	E. SE	E	N	Rain	Cloudy	Cloudy	Do. Do.
13	,076	,990	,064	81,8	81.4	79,7	3,3	4,9	3,2	0,247	.....	.....	NE	E	NE	Fl. cl.	Cloudy	Clear	Lightning.
14	,090	30,000	,090	81,6	79,9	79,7	3,9	3,9	2,5	.....	.....	1,066	NE. E	NE. E	NE. E	Fl. cl.	Cloudy	Rain	Thunder and lightning.
15	,124	,006	,068	77,5	79,9	78,3	1,5	3,4	2,2	0,187	0,377	.....	N	N	NE	Cloudy	Dr. rain	Clear	Lightning.
16	,102	,002	,088	81,1	80,5	79,5	3,3	4,0	2,9	.....	.....	.....	NE	NE	NE	Fl. cl.	Cloudy	Fl. cl.	Do.
17	,110	,022	,078	80,8	80,8	79;3	5,0	5,8	4,3	.....	.....	.....	NE	NE	NE	Clear	Fl. cl.	Fl. cl.	——
18	,076	——	,076	78.8	—	77.7	5,1	—	2,7	.....	.....	.....	——	——	NE	.....	——	Clear	——
19	,067	,012	,056	79,5	79,4	77,6	7,1	6 9	4,7	.....	.....	.....	E	NE	N	Fl. cl.	Fl. cl.	Haze	——
20	,030	29,958	,003	78,2	80,0	78,0	5,7	2,0	1,7	.....	.....	.....	N	N	Calm	Fl. cl.	Fl. cl.	Th. hz.	——
21	29,982	,940	29,952	76,3	78,8	74,7	4,3	2,3	2,3	.....	.....	1,620	N. NW	N	Calm	Th. hz.	Th. hz.	Clear	Heavy dew.
22	30,014	,960	30,006	76,9	79,6	76,0	4,6	10,1	3,5	.....	.....	.....	N. NW	NE	Calm	Th. hz.	Th. hz.	Haze	Do. Do.
23	,062	,974	,033	77,2	79,5	73,5	4,9	6,5	4,5	.....	.....	.....	W	NE, E	Calm	Haze	Haze	Clear	Do Do.
24	,088	,986	,035	76,4	79,5	76,0	5,5	7,5	6,3	.....	.....	.....	N	NE	NE	Clear	Clear	Clear	Do. Do.
25	,077	——	,054	77,2	—	75,7	6,2	—	5,7	.....	.....	.....	E	——	N	Clear	——	Clear	Do. Do.
26	,100	30,004	,086	77,3	78,0	76,3	5,3	6,5	3,3	.....	.....	.....	N	NE	NE	Cloudy	Cloudy	Cloudy	——
27	,112	,046	,126	79,1	80,4	77,3	4,1	5,9	2,3	0,147	.....	.....	NE	E	NE	Fl. cl.	Fl. cl.	Fl. cl.	——
28	,156	,072	,140	76,3	79,0	78.2	1,8	4,0	3,9	0,091	.....	1,990	NW	NE	NE	Fl. cl.	Cloudy	Fl. cl.	——
29	,126	,042	,124	79,0	78,8	76,5	4,7	4,8	2,1	.....	.....	.....	N	E. NE	E. NE	Fl. cl.	Dr. rain	Rain	——
30	,120	,042	,114	78,3	78,8	77,5	4,2	5,3	4,9	0,117	.....	.....	N. NE	N. NE	NE	Cloudy	Cloudy	Fl. cl.	——
Mean	30,049	29,974	30,030	78,7	80,0	77,9	3,6	4,6	2,9										

METEOROLOGICAL REGISTER KEPT AT THE MADRAS OBSERVATORY; FOR THE MONTH OF DEC[illegible], 1838

1838 Days.	Barometer at 10 A. M.	Barometer at 4 P. M.	Barometer at 10 P. M.	Ther. at 10 A. M.	Ther. at 4 P. M.	Ther. at 10 P. M.	Wet Bulb. 10 A. M.	Wet Bulb. 4 P. M.	Wet Bulb. 10 P. M.	Rain. Sun-rise.	Rain. Sun-set.	Evaporation.	Direction of Wind 10 A. M.	Direction of Wind 4 P. M.	Direction of Wind 10 P. M.	Weather. .0 A. M.	Weather. 4 P. M.	Weather. 10 P. M.	Remarks.
	Inch.	Inch.	Inch.	o	o	o	o	o	o										
Dec. 1	30,105	30,016	30,072	77,8	78,5	75,7	6,3	9,0	7,3	.....	.....	.....	E N E	N E	N E	Fl. cl.	Fl. cl.	Fl. cl	
2	,086	——	,068	76,0	—	76,1	5,6	—	3,1	.....	.....	.....	N W	——	N W	Fl. cl.	——	Cloudy	
3	,058	29,990	,008	77,8	78,8	77,8	3,8	4,4	2,3	.....	.....	.....	N. N W	N. N W	N	Haze	Cloudy	Cloudy	
4	,016	,944	29,978	78,7	79,8	76,7	3,5	4,8	2,4	.....	.....	.....	N W	N W. N	N	Fl. cl.	Fl. cl	Cloudy	
5	29,958	,924	,944	76,1	78,0	76,4	2,2	3,0	1,8	0,190	0,317	1,958	N	N	N	Rain	Cloudy	Cloudy	[night thr. & lig.
6	,950	,874	,906	75,1	76,5	75,7	1,5	2,1	1,1	1,781	0,232	.....	N. N W	N. N W	N. N W	Rain	Rain	Cloudy	Strong wind or light gale at
7	,896	,910	,998	75,8	76,8	76,7	0,7	1,8	0,7	1,634	0,067	.....	W. N W	S	S E	Rain	Cloudy	Cloudy	Lightning.
8	30,084	,988	30,050	78,8	81,0	77,8	1,5	4,0	1,7	.....	.....	.....	E. S E	S E	E. N E	Fl. cl.	Fl. cl.	Fl. cl.	Do.
9	,062	——	,050	78,8	—	77,7	2,8	—	4,6	.....	.....	.....	N E	——	N E	Fl. cl	——	Fl. cl.	Do.
10	,090	30,004	,108	78,7	80,0	77,8	4,0	6,0	4,6	.....	.....	.....	E	E	N	Fl. cl.	Fl. cl.	Fl. cl.	——
11	,120	,042	,112	78,6	78,6	76,6	4,6	5,1	3,0	.....	.....	.....	S E	N. N E	N	Fl. cl.	Cloudy	Clear	——
12	,126	,042	,104	77,7	78,6	76,4	2,3	3,6	2,3	.....	.....	2,063	N	N E	N	Fl. cl.	Fl. cl.	Clear.	Dew.
13	,116	——	,070	77,8	—	76,3	3,2	—	2,0	.....	.....	.....	N	——	N E	Fl. cl.	——	Fl. cl.	Do.
14	,080	——	,054	78,3	—	76,8	3,4	—	2,2	.....	.....	.....	E	——	N	Fl. cl.	——	Fl. cl.	Do.
15	,116	30,010	,110	78,5	81,4	78,3	2,9	6,4	2,3	.....	.....	.....	E	N E	N	Fl. cl.	Fl. cl.	Fl. cl.	Do.
16	,152	——	,142	79,8	—	78,0	3,7	—	4,4	.....	.....	.....	E	——	N E	Fl. cl.	——	Clear	Do.
17	,192	,104	,150	79,7	80,0	77,1	6,7	9,5	7,0	.....	.....	.....	E. N E	E. N E	N E	Fl. cl.	Fl. cl.	Clear	Do.
18	,150	,074	,134	78,1	79,0	76,0	6,8	8,0	6,1	.....	.....	.....	E. N E	N	N E	Clear	Clear	Fl. cl.	Do.
19	,128	,064	,132	76,9	78,5	74,4	5,5	7,5	5,1	.....	.....	1,027	N E	N E	N E	Cloudy	Haze	Clear	Heavy dew.
20	,150	,054	,140	75,6	78,5	75,3	4,9	8,0	4,9	.....	.....	.....	N W	N E	N	Fl. cl.	Fl. cl.	Fl. cl.	Do. do.
21	,158	,050	,100	78,1	79,8	75,7	7,2	9,3	6,7	.....	.....	.....	E. N E	N E. N	N E	Clear	Fl. cl.	Fl. cl.	Dew.
22	,132	,058	,146	76,5	79,9	75,6	5,5	8,9	5,1	.....	.....	.....	N W. N	N E	N	Fl. cl.	Fl. cl.	Fl. cl.	Heavy dew.
23	,134	——	,112	76,8	—	76,0	6,1	—	6,1	.....	.....	.....	N W	——	E	Fl. cl.	——	Fl. cl.	Dew.
24	,138	,066	,104	77,1	79,4	75,9	7,1	8,4	6,1	.....	.....	.....	N E	N E	N E	Fl. cl.	Fl. cl.	Clear	Heavy dew.
25	,124	——	,112	75,7	78,0	74,8	4,8	8,0	3,3	.....	.....	.....	N. N W	N E	N	Fl. cl.	——	Fl. cl.	Dew.
26	,140	,083	,157	78,0	78,0	76,9	4,0	8,0	4,4	.....	.....	1,227	N by E	N E	N E	Cloudy	Fl. cl.	Fl. cl.	——
27	,158	,082	,124	78,0	78,0	78,0	4,0	3,9	2,5	.....	.....	.....	N	N E	N E	Clear	Showry	Cloudy	
28	,170	,058	,120	77,5	83,0	77,8	3,5	8,5	3,6	.....	.....	.....	N by E	N E	N E	Clear	Fl. cl.	Fl. cl.	
29	,178	,084	,160	78,0	78,8	76,8	4,8	4,1	6,0	.....	.....	.....	N E	N E	N E	Fl. cl.	Fl. cl.	Fl. cl.	
30	,174	,080	,134	77,5	79,0	77,7	4,0	7,0	3,7	.....	.....	.....	N E	N E	N N E	Fl. cl.	Fl. cl.	Fl. cl.	
31	,138	——	,092	77,7	—	78,2	4,1	—	4,2	.....	.....	.....	N. N E	——	N E	overcast	——	Clear	
Mean	30,106	30,028	30,087	77,6	79,1	76,8													

The Instruments with which the foregoing observations are made, are placed in the Western Verandah of the Honourable Company's Observatory: at about 5 feet above the surface of the ground, and 27 feet above the level of the Sea.

The barometer employed is No. 1, one of two Standards which I had constructed at the end of the year 1836, to supply the place of those broken during the storm: the indications set down are those immediately read off from the instrument, and consequently require in addition to the ordinary correction for temperature, the correction +,051 for capillarity: from a late comparison of these with a magnificent standard by Newman which had been constructed with all the advantages of modern improvement for the Trevandrum Observatory, it appeared that when *corrected for capillarity*, the

Trevandrum Standard stood at		30,000	inches.
the Madras	No. 1	30,001	do.
	No. 2	29,993	do.

The thermometer was made on purpose for the Observatory, and at 75° (the only point at which a comparison has been made) it was found to differ insensibly from the Royal Society's Standard:

	h.	*m.*	*s.*	
Longitude	5	21	8	E.
Latitude	13°	4	8,5	N.

T. G. Taylor,
H. C. Astronomer.

MADRAS JOURNAL

OF

LITERATURE AND SCIENCE.

No. 23—*April* 1839.

I.—*Notes on the Duty of Government in periods of Famine.*—*By* JOHN F. THOMAS, ESQ. *Madras Civil Service.*

(Continued from the last Number page 78).

This enquiry,* which on a more extended examination of the subject I would confine to famine alone, is one at all times of such extreme importance to the people, and has acquired so much additional interest from the present circumstances of part of the Northern Circars, that I am induced to prosecute it more at length. I am anxious also to avoid a misconstruction to which the former remarks† are, I fear, liable; that because I am disposed to question in the present state of Southern India the reasoning, and the principle of the circular order of 1833, deprecating any interference on the part of Government; I would therefore advocate an opposite course; and recommend a constant and general tampering with the grain trade of the country. This is far from my intention The sole question I would raise, is the propriety of Government interference at periods of great exigency,—at those times only, when the drought has been general over large tracts of country, and there has been a failure of the standard crops throughout a whole province—when, in fact, we have either cause

* See former brief observations No. XXII. p. 78, viz. "Whether there are not, as Dr. Smith seems from his guarded language to admit, means open to the Government, which may not be improper for it to adopt in periods of drought, by which that most dreadful scourge, the absolute famines which now periodically desolate our provinces, may be wholly prevented, and scarcity at all times greatly mitigated, without a departure from sound general principles, and at no great charge on the finances of the State."

† See No. XXII. pp. 71-72.

to dread, or are experiencing famine with all its fearful destruction of life and property; such as has been witnessed in our provinces in 1807, in 1823-24, and recently in 1832. I need scarcely add, that it is further still from my views, to propose any measures for fixing, or regulating the price of grain, or similar arbitrary interference with the freedom of the grain merchant. Such measures, there can be no doubt must be injurious, by impeding the traffic in grain generally; but above all, by preventing that frugal use of the stock in hand, without which it would be impossible for the people, at periods even of partial scarcity, to escape all the horrors of famine.

In entering upon this investigation it is of great moment, that the real practical question for examination should be distinctly brought before us, it appears to me that it may be fairly stated in these terms. Is it the duty of the Government in periods of drought, to look on as at present, almost passively, whilst thousands and tens of thousands of the population are swept off in a few months: or, are there now safe, and legitimate means of interference within its power, through which it can secure much larger supplies of food for the people, than they could otherwise obtain, and thereby lessen the mortality of famine? It is only when the question is put in this form, and we keep in view, the enormous waste of life and of national wealth in this country in seasons of severe drought, that the subject is placed in its true light.

During the drought in Guntoor in 1832 there are grounds to conclude, that more than one third of the inhabitants of the district, or upwards of 200,000 persons perished, in a population of little more than 500,000, within a short period. The returns of population in the year prior to the famine, give

Population of Guntoor.	
Fusly....1241	512,517
1242	255,511
1244	267,714

512,000, in the year subsequent, but one half or 255,000, and four years later, but 267,000, and it is asserted that there was little or no emigration. Previous famines have also been estimated to have destroyed one third of the inhabitants of those districts, in which drought was general. And we might perhaps fairly assume this proportion, as the ratio of mortality in famines in India, when they are left to work out their natural effects unchecked. In examining therefore the present system of non-interference, under which the people depend solely on private enterprize for additions to their stock of food, the loss of life throughout the whole population must be calculated at this rate; and we might probably also safely estimate the loss of the labourers of

province, including men and women, at a higher average, for it is upon this class, that famine presses with such peculiar severity.

If this ratio, either of loss of life or of labour be considered too high, one much lower may be assumed, and the magnitude of the evil will still be readily admitted; and it will also I believe be admitted, that if the Government could afford relief without serious detriment to any class of society, and without involving its finances in inextricable difficulties, it would be both its duty, and its interest to give this relief.

This brings us immediately to the consideration of the arguments of Dr. Smith, and other great authorities, which go to shew, that a Government has no power to afford relief in such emergencies,—that its interference must do harm, and further,—that its interposition is uncalled for, as all available aid will best be rendered by the operation of self-interest, inducing the private trader to throw in additional supplies of food for his own profit:—and that non-interference is consequently the only sound policy of a state.

The validity of this doctrine in the circumstances of Europe, may be readily granted. Nor do I see, that Dr. Smith's arguments can be shaken on a single point, when applied to countries like Great Britain in an advanced stage of society, and situated within the temperate zones: which are never visited by absolute famine, as the effect of the season alone, but only by scarcity. But I hesitate, without further and more full investigation, to acknowledge its truth in respect to South India; for much of the reasoning of Smith appears to me inapplicable to this, or to any tropical country in an early stage of civilization. Where, the people are dependent for their food, almost wholly on the periodical rains, and where, as our experience has demonstrated, it is not merely scarcity with which we have to deal, but absolute famine extending at the same moment over immense tracts; and where we must add also,—the resources of the inhabitants are almost as nothing, compared with the resources and means of the inhabitants of Great Britain, or highly civilized European states.

But to proceed to the examination of Dr. Smith's views in detail. On analyzing them, his doctrine of total non-interference with the provisioning of the people, appears to be based chiefly on these grounds. First, that a famine is never the effect of a bad season *alone*, for that occasions only scarcity. Secondly, that it cannot be caused by unjust combinations on the part of the dealers in grain, for their interest is the same with the people. And thirdly, that there are, from facility of intercommunication and other circumstances, resources in Europe available

to the people, which, combined with a frugal consumption, effectually secure them against famine, if there is no interference with the corn trade by the Government.

He first remarks, that though a real scarcity is ordinarily occasioned by the fault of the season alone, a famine is *never* so occasioned; or to give his own words. "Whoever examines, with attention, the history "of the dearths and famines, which have afflicted any part of Europe "during either the course of the present or that of the two preceding cen- "turies, of several of which we have pretty exact accounts, will find, I "believe, that a dearth never has arisen from any combination among the "inland dealers in corn, nor from any other cause, but a real scarcity, "occasioned sometimes, perhaps, and in some particular places, by the "waste of war, but in by far the greatest number of cases by the fault of "the seasons, *and that a famine has never arisen from any other cause, but "the violence of Government attempting, by improper means, to remedy the "inconveniences of a dearth.*" And he adds, that "the scantiest crop, if "managed with frugality and economy will maintain through the year, "the same number of people that are commonly fed in a more affluent "manner by one of moderate plenty."* It is deserving of notice that throughout, Dr. Smith speaks only of the "inconveniences" of dearth; and never once contemplates apparently, a people in the fearful state of destitution, to which a season of general drought now reduces the population of this country: when if allowed to run its course, famine cuts off one third of the inhabitants, with the great mass of their cattle. For drought in the tropics, does not as drought or excessive wet in Europe, affect only the standard crops of the country; but it is in the expressive language of scripture, "a drought upon the land, and upon the moun- "tains, upon that which the ground bringeth forth, and upon men, and "upon cattle, and upon all the labour of the hands." This utter destruction of all the resources of the people, I apprehend to be the

* "In an extensive corn country between all the different parts of which there is a "free commerce and communication, the scarcity occasioned by the most unfavourable "seasons can never be so great as to produce a famine; and the scantiest crop, if "managed with frugality and economy, will maintain, through the year, the same number "of people, that are commonly fed in a more affluent manner by one of moderate plenty. "The seasons most unfavourable to the crop are those of excessive drought or excessive "rain. But as corn grows equally upon high and low lands, upon grounds that are "disposed to be too wet, and upon those that are disposed to be too dry, either the "drought or the rain, which is hurtful to one part of the country, is favourable to ano- "ther, and though, both in the wet and in the dry season, the crop is good deal less than "in one more properly tempered, yet, in both, what is lost in one part of the country is "in some measure compensated by what is gained in the other."—*Wealth of Nations Book IV chap. V. Digression concerning the corn trade and corn laws.*

true character of Indian droughts;* and I believe it also to be certain, that they do, without any adventitious cause save what may be found in the existing condition of society, of themselves constantly occasion the most desolating famines. If this be denied, and it is contended, as Dr. Smith is disposed, though with some hesitation to contend, that the droughts of India are not so intense, nor so universal as of *themselves* to occasion famine—I would ask, how has it then occurred, that tens and even hundreds of thousands have perished by actual starvation under British rule, whilst it is certain, that there has been no tampering on the part of Government with the grain trade of the country, and the people have been left to the freest use of their own resources. In opposition to Dr. Smith's supposition "that the drought is scarce ever so universal as necessary to occasion a famine if the Government would allow a free trade." I should maintain, that no fact is now perhaps better established in Indian statistics,—that not scarcity, but absolute famine in all its severity, is caused by the fault of *the season alone*, and that it is not brought on by any improper regulations on the part of the Government.†

Should this be conceded, it appears to me to strike at the root of the doctrine of non-interference in tropical countries, and consequently that we are not warranted in applying, as the circular order of Government does, Dr. Smith's principle without limitation to Southern India: but must confine its application to cases, similar in their character to scarcities in Europe. To seasons for example of very partial drought or of dearth, where, either from the previous stores of grain in the pits of

* The difference between the bad season of the tropical and the temperate zone, is strongly marked in the following report of the out turn of the late bad season in 1838 in Great Britain and Ireland.—*Results of the Harvest in Ireland.* In this country the harvest is at an end, with the exception of isolated mountain districts. The result may be thus shortly stated. Wheat is generally speaking, fully one-third short of an average crop, and the grain is deficient in yield. As far as the farmer is concerned, the price will, to some extent, make up for what is wanting in quality and quantity. But the superabundance of the oat crop is admitted in all quarters and barley and potatoes are, with very few exceptions, also beyond an average crop. In fact, allowing for the partial failure of wheat, this year will be one of the best the Irish farmers have had for a long time. We are much better off than our neighbours either in England or Scotland.—*Dublin Post, Tuesday week.*

† "In rice countries, where the crop not only requires a very moist soil, but where, "in a certain period of its growing, it must be laid under water, the effects of a "drought are much more dismal. Even in such countries, however, the drought is "perhaps, scarce ever so universal as necessarily to occasion a famine, if the Government "would allow a free trade. The drought in Bengal, a few years ago, might probably "have occasioned a very great *dearth*. Some improper regulation, some injudicious "restraints imposed by the servants of the East India Company upon the rice trade, "contributed, perhaps, to *turn that dearth* into a famine."—*Wealth of Nations Book IV chap. V. Digression concerning the corn trade and corn laws.*

the ryots, or from the limited area over which the drought extends (as it is probable is the case at present in the Northern Circars). The means of alleviation, and of staying off famine are accessible to the great bulk of the population.

That Dr. Smith's doctrine can only be justly applied to such cases, will I think be further evident, upon consideration of the arguments advanced in its support by himself and Dr. Chalmers, who has followed out his views at length,* both laying much stress, upon the natural alleviations, or the palliatives to scarcity, at all times within the reach of the people of Europe.

They observe, that the variety of soil and climate greatly modifies the effect of bad seasons, that there are substitutes for the food of man in the grain raised for cattle, (and we might add a certainty in the temperate zone of a supply of water for animal life), that the large amount of the external commerce of the different states of Europe, gives to each a command at all times over the products of the other, and that these, with other alleviating circumstances, amply secure the inhabitant of Europe against absolute famine or starvation. So effective indeed are these palliatives in Europe immediately within the reach of the people, and so dissimilar is European dearth, from Indian or tropical famine; that whilst we number deaths by tens of thousands in a few months, Dr. Chalmers hesitates not to affirm (see his late Bridgewater Treatise. "On the moral and intellectual constitution of man" vol. II. p. 46) "that the country emerges from the visitation of dearth, *without* "*in all probability, the starvation of one individual.*" And again at p. 49. "It is in these various, ways that a country is found to survive so "well its hardest and heaviest visitation, and even under a triple price "for the first articles of subsistence, it has been found to emerge into "prosperity again, without an authentic instance of starvation throughout "all its families." These passages must I think carry conviction of a truth, which I am anxious to establish, of the first importance in this enquiry—that there is nothing parallel in the case under the review of Smith, Chalmers, and other political economists of Europe, to the circumstances before us in India: and I would rest my first objection to the unlimited application of the principle of non-interference in periods of famine in South India, on the manifest dissimilarity between the circumstances of dearth in the two countries.

Should this objection be considered of any weight, we may then be permitted to question, whether the authority of Adam Smith's great name, can properly be thrown into the scale in favour of the doctrine of non-interference, in the peculiar exigency of famine by the fault of the

* See Dr. Chalmers' Political Economy, and his late Bridgewater Treatise.

season alone. And it may also then be open to discussion, whether the general principles of his work lead us to conclude, that it is the duty of a Government at periods of excessive drought, rigidly to abstain from all attempts to increase the quantity of food in the country, or whether it may not by a judicious application of its means, secure enlarged supplies, and lessen the mortality; and the consequent destruction of labour and of capital.

Certain it is, that Malthus* and other writers, who have ranked high as followers of Smith, have maintained, that the provisioning of the country cannot always be safely relinquished to the operation of the ordinary laws of supply and demand, which govern less necessary articles; and that there are considerations affecting the food of a people, which may take it out of the ordinary rules of Political Economy. The case of South India during famine, is, I am disposed to think precisely, one of these cases, requiring therefore to be dealt with under peculiar regulations. And as it is no argument against the corn laws of England, that there is always a compensation for the produce lost by a bad season in our own country, in the abundant crops reaped by our neighbours—unless we are at the same time assured, that that abundance will not be withheld from British ports, from hostile motives or commercial jealousy. So in like manner, it is no argument in favour of non-interference in this country, to urge, that the grain lost by the failure of the monsoon in some one of our provinces, is, in the merciful dispensations of God, invariably compensated by the superabundant crops of other kingdoms, or provinces. Unless it can also at the same time be clearly proved to us, that this excess of produce of the favoured province, will flow into those suffering from drought; and *that, in time* to prevent the destruction of the inhabitants, and with them the very sources of national prosperity. Unless this can be shewn, this peculiar dispensation of God's providence, by which the deficiency of one portion of the world might be supplied from the superabundance of another, is utterly unavailable, for it amounts to nothing to tell us that such extra supply does exist elsewhere, it might as well not exist, if we have not at the same time the assurance, that it will reach those who must perish without it.

We come now to the consideration of another of Dr. Smith's main averments, that this abundance of favoured districts will readily find its way into famine districts, if Government do not interfere. In establishing this

* See Tracts on the Corn Laws.

point he first ably disposes of the objection which might be made to his views, *in limine*, that famine or excessive dearth may be caused by a combination of the dealers to raise the price of corn at the cost of the people. This he shews to be impracticable, and proves that there is an identity of interest between the corn dealer and the consumer, which precludes injurious combination. His argument on this head, I believe to be in a great degree applicable to this country. At the same time it is quite possible under the peculiar circumstances of South India, that cases have occurred, and may again arise, in which the wholesale dealers and importers in our provinces, who are not in danger as in Europe of having their trade encroached upon, have combined to prevent additional supplies of grain being introduced: or, what amounts to the same thing, have remained inactive, with the view of enhancing the value of the stock in hand. But such cases must I should think be very rare, as in general, it is decidedly the interest of the dealers to bring in as large supplies as practicable, and obtain the high prices of scarcity.

But it is not upon this part of Dr. Smith's reasoning that I would remark. It may be readily granted that it is the interest of the dealer to supply the people in times of famine with food, as plentifully as he possibly can; but it is his power,—his ability to do so effectually, in the present condition of this country, that I question.

Dr. Smith assigns the facility of intercommunication between the different provinces of a state, and different countries, as one prominent ground of his opinion, that when a Government does not improperly interfere, the supply of grain will be ample and sufficient to prevent famine. And when the nations of Europe are at peace, and there is nothing to prevent her merchants from a free intercourse with every state, it is no doubt true, that the wants of one kingdom or province in periods of scarcity, will be immediately provided from the stores of others, by the ordinary motives and exertions of self-interest. But I hesitate to make a similar admission in the case of this country, for we must first ask, does this facility of intercommunication now exist in Southern India? And are not the defects and imperfections in the means of communication between the several provinces of this Presidency, and also distant markets, such, as to raise a barrier, which the private merchant cannot now overcome, to the *timely* importation of those large supplies of grain required in districts visited by severe drought. And may it not perhaps be fairly questionable, whether the just inference from Smith's reasoning under these circumstances, is not, that the Government of a half civilized country, of which this defect of intercommunication is the common feature, should

abstain from interference in the emergency of famine; but whether it should not for the time, come forward and afford such aid, as may place her grain merchants in the period of severe drought, as much as possible on a level in the means of communication, with the dealers in more advanced nations, by undertaking part of the labour, and bearing part of the charge of transit.* But whether this be a legitimate inference, or not, it is I think clear, that till there is that facility of intercommunication which Dr. Smith assumes, neither his principle, nor his reasoning can be justly applied to this country.

There can also I think be little doubt, that in laying down his great doctrine of non-interference, Dr. Smith had under consideration, the abundance of capital in private hands, the extensive credit, and the known enterprize, and spirit of adventure in British and European merchants; as well as the intimate connection of the whole mercantile body of Europe; by which, the merchants of London, Liverpool, or Dantzic can obtain with ease, an immediate consignment of corn from each other, or from any quarter, at the shortest notice.† Whilst the large and constant commerce by sea, and the good roads generally throughout European states, remove all impediments to an early augmentation of the food of the country, even from distant markets, whenever scarcity prices shall make this profitable. All these circumstances are, I apprehend, included as the grounds of Dr. Smith's views; and I cannot but think, they differ widely from the actual circumstances of this Presidency. Not only, are the means of intercommunication by land between our provinces very defective; but it must also be allowed, that the maritime commerce of the Presidency is in its infancy;—that the whole

* As an illustration I would propose the question, whether in the event of absolute famine in our provinces bordering on the Punjab, it would be an injudicious interference on the part of Government, at a moment of pressing exigency to offer the native merchant of Bengal and Bombay, the use of the Government steam vessels on the Indus and the Ganges at a low charge, and thus give him the means of introducing supplies in one-fifth of the ordinary time. And whether this increased facility of importation at such a period, and thus raising the country *pro tempore* to a level with more civilized states in the means of intercommunication, would not rather be in accordance with, than a departure from Smith's principles; if care were at the same time taken by bounties, that no merchant should suffer loss by his more tardy importations. Or, to apply the case to the Madras Presidency, would it be an improper act, if the Government were to offer the native merchant at periods of famine, the use of vessels to bring up his grain against the monsoon, when the native craft either could not, or would not move.

† The extensive credit which the European merchant enjoys, is the consequence of the general integrity of the class; and this integrity, not only gives him a command over the capital of others, but secures a faithful execution of his orders in foreign markets. It is, I have reason to believe, the difficulty the European capitalist in this country finds, in obtaining through native agency a similar upright and faithful execution of orders, and supplies of grain of good quality, which keeps him from embarking in the trade, even when large profits are to be made in it.

mercantile body is small, in proportion to the mass of the population, and its capital and credit limited: and that these causes, whatever may be the strength of the motives of self-interest, by which the dealers are prompted, must tend greatly to obstruct, if not to prevent the success of any effort, they may make to supply the urgent, and vast demand of districts visited by famine.

As already observed, the actual fact is, that they do not now in any measure meet this demand, even when supplies have been obtainable with comparative ease; and that grain has not hitherto been introduced by the private merchant in seasons of famine into districts, in time to prevent the starvation of the population. The single fact, *the great mortality of the labouring classes which now takes place in every season of general drought*, appears to me fully to demonstrate of itself, the total inefficacy of private exertion in the present state of South Indian commerce. But to place this point beyond dispute, I annex a table of the prices of grain at Ganjam, Vizagapatam, and the neighbouring provinces throughout the entire period of the late famine in Guntoor. It will be seen from this table, that in the year 1832, whilst tens of thousands were perishing in Guntoor from the want of food and consequent disease, and grain was there more than triple its ordinary price, it was to be had at near markets, with which there was moreover an open sea-communication, at the ordinary rate, or at one-third of the price; and that throughout the whole period of the famine, private enterprize never brought in enough, either to lower the prices considerably in Guntoor, or to raise them much in Ganjam and Vizagapatam. So manifest is it, that the abundance of one district in South India is not now made, through the instrumentality of private exertions, to supply the deficiency of another.

	Guntoor.		*Ganjam.*		*Vizagapatam.*		*Rajamundry.*		*Masulipatam.*	
	Rice	Raggy	Rice	Raggy	Rice	Raggy	Rice	Raggy	Rice	Raggy
Fusly 1231 AD. 1831-2	154	197	50	71	47	60	57	65	59	75
Fusly 1232 AD. 1832-3	200	218	61	87	69	90	102	141	123	184*

If it were possible to obtain them correctly, it would be desirable to add to these facts, data which might shew the limited amount of capital in the hands of the grain merchants, and the low state of trade

* The prices are given for these two important grains for the entire period of the famine, but it is necessary to observe, that Masulipatam also suffered partially from the same drought which afflicted Guntoor, and the high price there, is probably to be accounted for by that circumstance, and not by the supplies, withdrawn for the use of Guntoor.

in general, and from them also to prove the inability of the dealers to meet the extraordinarily large demand of famine. But on these points I must refer to the remarks made in the former part of these notes;* and I would ground my second and further objection to the application of Dr. Smith's doctrine to this country, upon the facts just adduced. They appear to me to establish this important point.—That how great soever may be the incentive of self-interest, and the intelligence of the mercantile body of this Presidency, there is not now practically, that intercommunication between our provinces or distant markets, which would enable the private dealer (as Dr. Smith assumes) readily to meet the wants of a district suffering from bad seasons; and that if left to private exertion, the country must experience all the horrors of famine every season of general drought. And such accordingly was the case in 1824, when hundreds and thousands perished at Madras and its neighbourhood, although it was then confidently predicted by the first authorities, that if left to himself, the private merchant would bring in ample supplies.

Though I do not think any thing further is required to establish the inadequacy of private effort to meet the exigency of famine, there is a consideration, applicable chiefly to the rural districts of the Presidency, which it may be well to bring under review. In such districts, a difficulty, wholly unknown in Europe, to the timely and adequate supply of food in seasons of famine, arises it is probable from the peculiar condition at this date of South Indian society. Nine-tenths and more of the population of those districts are agricultural, or subsist directly from the land; and a large proportion depends for entire support on the out-turn of the year. The agricultural labourers, the great bulk of the population, do not, as in Europe, receive their wages in money, and obtain their supplies of food from the baker, who has capital embarked in the grain trade, and who procures his corn from a distance or near, as may best suit his interest; but they are paid their *wages in kind*, when the harvest is gathered in, and on that they must subsist through the year. If the harvest fails, whence are their wants to be supplied? It is not, I conceive, in the nature of things, that the petty village grain merchant, whose ordinary traffic is confined to the supply of a few families, by purchases made on the spot, should have a stock in hand to meet the large extra demand of the labouring class, which he could give to them on credit. And even the substantial ryot, when he has no store left from the crops of former years, cannot I should suppose venture to give any aid at such a crisis—so that it may be doubted, unless supplies of grain are introduced by foreign agency, and

* No. XXII. p. 74.

brought to the door of the village chitty, if there is capital, or agency in the district, wherewith the demand of the labouring classes for food, can at such seasons be met. In a society differently constituted, like that of Great Britain, where more than one half of the population are non-agricultural, the labourers, both manufacturing and agricultural can fall back upon their employers; and wherever there is a large manufacturing and commercial class, there also, is a large grain trade, and a body of dealers accustomed to import supplies, who in time of high prices will greatly enlarge their transactions, and the increased demand of the people for *foreign grain* can be met without difficulty. But in the circumstances of the rural districts of this Presidency, I see no means of meeting a like demand; and hence there may be a necessity for Government interference whilst society is in its present condition.

Independently of the several considerations which have been already advanced, I would also remark that it appears necessary to the establishment of Dr. Smith's great principle of non-interference, that all the circumstances to which he adverts should exist combinedly. It is not enough for example, that it is physically true in any country, that scarcity only, and not famine is caused by a bad season; but it must also be established, that there is a total abstinence in that country at the same time from unjust combination by the dealers in corn. For if an unjust combination does exist, then I conclude, the Government must and ought to interfere, for its interference can alone prevent the starvation of the people, even in a period of scarcity. Again, let there be no unjust combination, yet if a facility of intercommunication does not co-exist simultaneously with perfect freedom of trade, and all barriers to the ready transfer of the grain of one province, or one market to another, are not removed; the Government may even in that case, be called upon to interpose, in order effectually to secure the timely introduction of the necessary supplies of food. So that in applying Dr. Smith's principle, we must not look only to specific points; but enquire, whether the circumstances of a country are the same, or very similar *in all points* to those he had under review, before we can recognize the validity of his principle. If the facts in South India are, that in a bad season, instead of scarcity, we have famine, and in lieu of an immense body of traders, too numerous to combine, with abundant capital, and intelligence equal to the greatest enterprizes, we have but comparatively a small body, who can combine, of limited credit and capital, and not ordinarily engaged in distant speculations. And if instead of a facility of intercommunication between the different provinces, and distant marts, there are great impediments existing, not to be readily surmounted by

private effort: then, not only if all these circumstances, but if any one exists, we have not, I am disposed to think, a foundation upon which Dr. Smith's doctrine can be safely erected, and we must question its applicability to this country.

But whilst this, with much of what has been advanced, may be admitted, yet the inference which would follow, that Government interference is called for, may not be conceded; for it will perhaps still be argued, that private exertion, if wholly unfettered, will be found the safest and *best* means of supplying, *even* the greatest and most urgent wants of the people. Or to use Dr. Smith's language "that the natural effort of every individual to better his own condition, when suffered to exert itself with freedom and security, is so powerful a principle, that it is alone, and without any assistance capable of carrying on a society to wealth and prosperity, and of surmounting a hundred obstructions with which the folly of human laws too often encumbers its operations." Book IV. chap. V. Digression, &c. There is so much force in this statement, that if the fact did not stare us in the face, that these natural efforts do not in any adequate measure now meet the case of famine in this Presidency, I should not venture to advocate even the most cautious Government interference; although I think it demonstrable that the reasoning by which the doctrine of non-interference has been hitherto supported, is, so far as South India is concerned, untenable. But so long as famine in this Presidency occasions any thing like the present fearful mortality, and destruction of property, and so long as entire provinces are desolated by a single season of severe drought: it appears almost a moral duty, before we rest satisfied with the present passive system, to institute the fullest enquiry, whether there are not at the command of the Government legitimate means of adding to the food of the country, and thereby lessening the misery and ruin of such periods. I would therefore ask, whether there are solid objections on general principles, to the Government, in the exigency of famine, throwing additional supplies into the market by the instrumentality of the grain merchants themselves, by offering them facilities for their commerce, not accessible to them at other times. In advances of Government capital,—in increased means of transit,—in premiums on importation in the form of bounties, or of return cargoes of Government salt; or similar public aid, which would not tend to supersede, but to stimulate their exertions. Nor am I prepared to allow, that—if the Government went a step further, and imported supplies of foreign grain at its own risk, *not to be brought into the market for sale to compete with* the grain merchant, but to be dealt out as rations to the people driven by extreme poverty to work on the roads,

or other public works—an interference with the provisioning of the people to this extent would be faulty in principle. For this class, it must be remembered, has no means of obtaining food from private sources in exchange for their labour, nor could they without Government aid, become at such times purchasers from the grain merchants. The payment for their labour in kind by rations, could not therefore trench unjustly upon the interests of the dealers, nor lessen the efficiency of the grain trade. And till some experiment of this character has been made, and failed, are we fairly in a position to carry out Dr. Smith's great principle of total non-interference, as the only sound policy of the state, at the sacrifice now periodically made of an enormous waste of life and of national wealth?

And, lastly, even if it shall be found upon the most ample examination, and after judicious experiment, that the magnitude of the evil of drought in this country is such, that the Government cannot safely meddle; from the just fear that it will lead to an undue expectation of relief, and to a less economic and frugal use of the stock in hand; and that any interference on the part of Government with the grain trade however cautiously attempted, paralyzes private effort, and aggravates the general distress, and that the present system is consequently right; there is one means of future alleviation, which might gradually lessen the present amount of evil, still open to the Government. If the well-lands of the country were relieved from taxation, and advances made generally to ryots (as practised partially in South Arcot in 1836) to deepen and enlarge their wells, or to construct new ones, it is probable, that the capability of the country to bear up under the visitation of famine, could be greatly increased, and the permanent resources of the Government proportionally improved. And if it be certain, that no measure for adding directly and immediately to the food of the people in periods of drought is practicable, this would then seem to be the best safeguard against famine with all its present horrors, and national loss; and this measure at least, might perhaps be pressed on the attention of the Government, as an act at once of duty, and of the soundest policy.

MADRAS, *March* 1839.

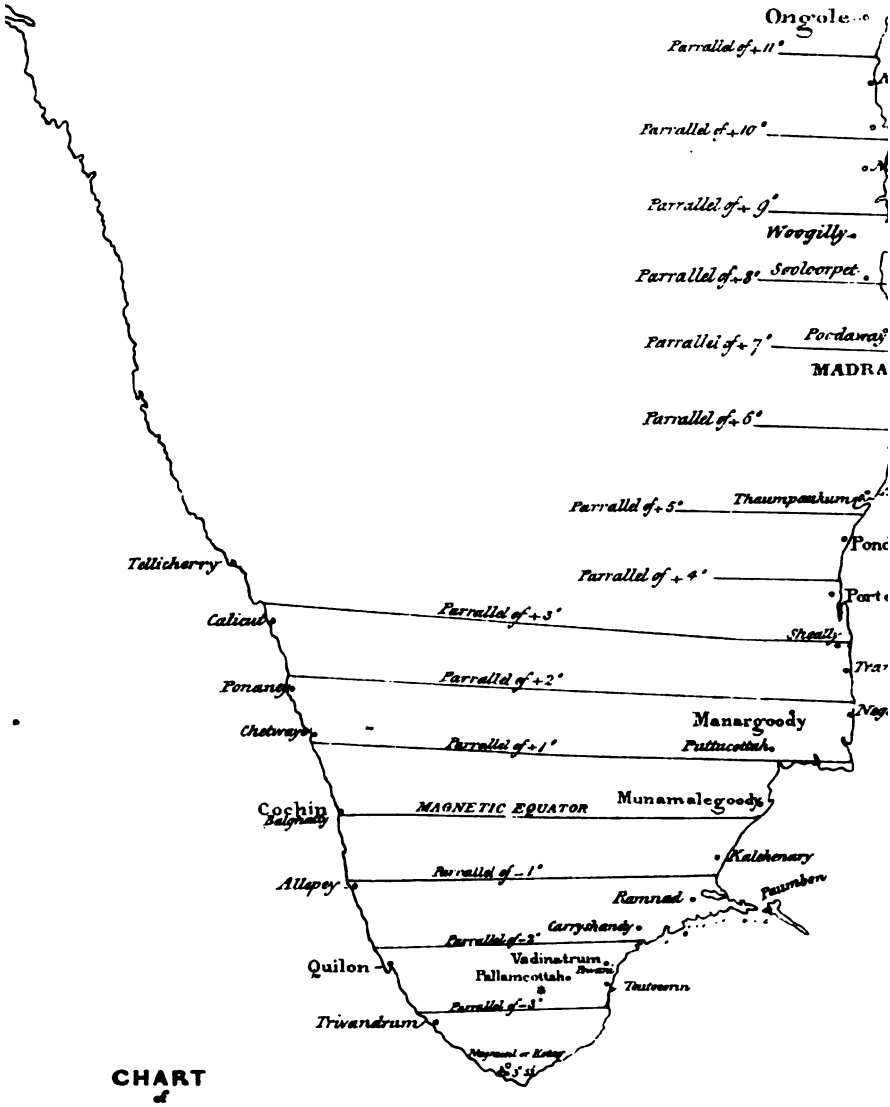


CHART
of
THE ISOCLINAL LINES
in
SOUTHERN INDIA,
A.D. 1836.

II.—*Observations on the Direction and Intensity of the Terrestrial Magnetic Force in Southern India, made by* THOMAS GLANVILLE TAYLOR, Esq. *Astronomer to the Honourable East India Company, and* JOHN CALDECOTT, Esq. *Director of the Trivandrum Observatory.—Communicated by the former Gentleman.*

As far back as the year 1831, at the suggestion of Professor Kupffer, I had projected making a series of observations upon the magnetic dip and intensity in India; but having failed in procuring the necessary apparatus here, and having been equally unfortunate in an application in England, I was necessarily compelled, *pro temp.* to give up my intention. In the year 1837, having been favoured by Captain Moresby, of the Indian Navy, with the loan of a dipping needle, which had been supplied to him by the Geographical Society of Bombay, for the express purpose of making observations upon the coast of India;* and having, through the kindness of Captain Drinkwater Bethune, R. N., been favoured with the temporary loan of two of the intensity needles, which had been employed in the magnetic survey of Ireland; I determined to employ the former, and to construct some needles of the latter description, wherewith to undertake for India, a series of observations similar to that so ably accomplished in Ireland.

With regard to the plan of observation: the lines of equal dip and intensity in India being nearly parallels of latitude, it was evident that the observations should be made in a line at right angles to these, or along the coast; accordingly I resolved on commencing at *Ongole*, in lat. 15° 12′ N., and proceeding at intervals of 20 or 30 miles along the coast to Cape Comorin (the southern extremity of the Peninsula); and from thence along the western coast to Goa.

To have performed the whole of this by myself, would have taken up more time than could be conveniently spared consistently with the prosecution of my astronomical duties; which determined me to invite the assistance of individuals resident in India, to take a part in the observations. My application was not long in meeting with attention from many in various parts of India; but the aid of only one of these (J. Caldecott, Esq. of the Trivandrum Observatory†) was available to an extent which promised to be useful. Accordingly I lost no time in making

* The Geographical Society of Bombay were pleased, subsequently, to allow me to retain the needles so long as I found occasion for them.

† The Observatory at Trivandrum, having been very lately established, is perhaps at present but little known, but the excellence of its arrangements, and the superiority of the instruments which have been ordered, added to the indefatigable zeal of its superintendent, cannot fail soon to render it an establishment of importance.

arrangements with Mr. Caldecott, as to the parts we should each take in the labour; when it was eventually agreed that I should undertake the observations on the eastern, and that Mr. Caldecott should make those upon the western, coast.

For this purpose I left Madras on the 23d day of July 1837, and proceeded to the southward, making observations every day, at intervals of about twenty-five miles; until on the 2d August I arrived at Tranquebar. Here I was met by Mr. Caldecott, whose zeal in the cause would not allow me to make my own observations unassisted. In the observations for dip, I had hitherto only found time to employ three out of the four needles supplied, viz. Nos. 1, 2 and 3; but the presence of Mr. Caldecott suggested the propriety of employing the remaining needle (No. 4), and of taking a double set of observations. This would have been accomplished, but that a few preliminary trials at Tranquebar with needle No. 4, convinced us of its utter uselessness for the purpose intended, in consequence of the want of roundness of the steel pivots. This discovery led to a minute examination of the other needles; when No. 2, (which had in the course of observation exhibited singularly discordant results), appeared likewise to differ from a cylinder in the form of its pivots. These circumstances naturally led to the rejection of the observations hitherto made with needle No. 2, and the *non*-employment of No. 4 in the remaining parts of the work. But, before proceeding further, I may as well give some

Account of the Instruments employed.

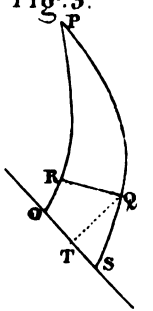
They consisted of a dip apparatus by Gilbert, furnished with four needles (two useless) of 4½ inches in length: a pocket chronometer by Arnold, and three intensity needles. The dipping needles were apparently cut out of flat plates of steel, and were hardened at the ends (see fig. 1); the agate planes, Ys for centering, and levels, &c. &c. differed in no respect from the ordinary construction. The intensity needles I had caused to be constructed here, after the plan of Captain Bethune's, to agree nearly with the model of those of Professor Hansteen: viz. each needle was 2.7 inches in length, and 15 inches in breadth, cylindrical, and rounded at the ends:* they were first turned in a lathe, from pieces of English steel wire, and then hardened by plunging them, when at a pale red heat, into cold water; after which they were softened in the middle by placing them upon a red-hot poker. They were now mag-

*Professor Hansteen's were pointed at the ends.

Fig. 1.

Fig. 2.

Fig. 3.



netized to saturation by a powerful magnet, and employed during two months previously to my departure, for the purpose of discovering if their intensities remained constant. Each needle was fitted into a brass stirrup (see fig. 2), for the purpose of being attached to a few filaments of untwisted silk, by which it was suspended when in use; and when unemployed, was fitted with an armature of soft iron. When the observation was to be made, the needle was suspended in a square wooden box, of four inches on the side, and 1¼ inches high: the top of this box was fitted with a plate of glass, in the centre of which the end of a hollow glass cylinder of eight inches in length (a piece of broken barometer tube) was cemented; to the upper end of this cylinder, one end of the silk filaments supporting the needle was secured, so as, passing through the cylinder, to leave the needle suspended by the other end at half an inch above the bottom of the box, when its oscillations could be seen through the glass plate at top, or through two glass windows, placed opposite to each other in the sides. At the bottom of the box inside, a line was drawn in the direction of the two windows; and at angles of 20 degrees on either side of this, were drawn two other lines; the centre line being made to correspond with the direction taken up by the needle when at rest (the magnetic meridian), and the other lines, exhibiting azimuths of 20° to the east and west of this, shewing the arcs at which the observations were always to commence. On one side of this box a delicate thermometer was fixed, whose indications could likewise be seen through the glass plate at top. The pocket chronometer by Arnold was one of ordinary goodness; in addition to which Mr. Caldecott had provided himself with a pocket chronometer by Barraud, and an artificial horizon and sextant, for determining the latitudes of places which could not be identified on the map. We will now mention one or two

Particulars with regard to the modes of observing.

Hitherto, it had been my custom to watch the decreasing vibrations of the dipping needle, and register its indication when stationary. Such a mode of observation, however, often led to unsatisfactory results; for, on tapping the apparatus gently, without un-centering the needle, it frequently exhibited an altered position, to the amount sometimes of forty or fifty minutes; and an approximate result only could be obtained, by taking the mean of the readings after repeatedly tapping and re-centering the needle. This circumstance led to an alteration in the mode of observing, which consisted of first centering the needle on the agate planes,

and then, by means of a magnet, causing it to vibrate through an arc 60° (i e. 30° on either side of the stationary position), and noting t successive diminishing arcs of vibration of one of the ends; after wh the needle was again centered, and the arcs of vibration of the ot end similarly read off &c. &c., when the stationary point was obtai by interpolation. Thus at Tranquebar, August 9th, Needle No. 1.—

End A Vibrated from		to	δ =
°		°	°
— 33,9	+	27,0	∴—2,75
— 31,1	+	24,2	2,77
— 28.4	+	21,6	2,75
— 25,8	+	19,2	2,70
— 23,4	+	16,9	2,65
— 21,0			
Mean	=		—2,72

End B Vibrated from		to	δ =
°		°	°
— 30,9	+	24,3	∴—2,(
— 28,2	+	21,7	2,(
— 25,6	+	19,3	2,(
— 23,2	+	16,9	2,(
— 20,8	+	14,6	2,(
— 18,5			
	=		— 2,

and the mean of both readings = 2°, 65 = 2° 39′.

In this way, five or six readings were generally obtained in eacl the eight several positions of the needle, and, in addition to this, readings, when the needle had come to rest, were likewise register thus, in the case just cited, the whole of the readings when reduc were as follows :—

	Readings when at rest.				Readings when oscillatin			
	°	′	°	′	°	′	°	
Face of Inst. east: axis direct	— 3	35	— 3	40	— 3	4	— 3	
—— west ——	— 3	5	— 3	5	— 2	52	— 2	
—— —— invd.	— 3	7	— 3	15	— 3	4	— 3	
—— east ——	— 3	20	— 3	10	— 2	43	— 2	
Reversed the poles								

• The observations of the needle when vibrating were read off in degrees and *tent* a degree, in consequence of the rapidity of the vibrations not affording time to rea two figures, which generally would occur in the minutes;—the error of reading rarely exceeded one-tenth of a degree, or six minutes.

			°	′	°	′	°	′	°	′
Face of Inst.	east :	axis direct	+ 8	10	+ 8	15	+ 7	54	+ 8	6
—	west	———	7	10	7	0	7	16	7	3
—	——	invd.	8	15	8	0	7	25	7	17
—	east	———	7	15	7	25	7	4	7	8

The mean = + 2° 12′ 52″ + 2° 11′ 15″ + 2° 14′ 30″ + 2° 12′ 15″

∴ The true dip or δ = + 2° 12′ 4″ + 2° 13′ 22″

The above is one case out of many which occur, in which although large differences are found in the several single readings, still the means are coincident; other cases there are, however, in which the means disagree: thus—

	Mean of Readings when at rest.	Mean of Readings when oscillating.	Difference.
At Negapatam Needle No. 1 gave	δ = + 2° 46′ 41″	+ 2° 31′ 30″	0° 15′ 11″
— No. 3 ——	= 1 6 30	1 22 51	0 16 24
Tranquebar No. 3	= 1 47 48	2 11 11	0 23 23

These results from the needles when vibrating appearing invariably more consistent than those derived in the usual way, I have not hesitated to give them the preference, and reject the stationary observations.

The observations with the intensity needles require but little notice here, beyond the mention that they have been uniformly made by noting the time of describing the first, second, and third hundred vibrations, commencing from an arc of 20 degrees on either side of the meridian. Added to this, it only remains to state that the observations both for dip and intensity were uniformly commenced between the hours of 9 and 10 in the morning, and finished at 2 or 3 in the afternoon.—We will now resume our journey.

We left Tranquebar on the evening of the 13th August, and proceeded to the southward, making observations every day (at distances of from 20 to 25 miles), and arrived at Trivandrum on the 26th August. Here we had leisure to examine our observations; and the result of it, as will appear in the sequel, was not so satisfactory as could be wished: it exhibited an uncertainty in the dip observations at several places, to some amount, and the intensity observations were not altogether free from blame. This determined me to re-observe on my return homeward, at those places at which doubtful results had been obtained; and, having met with a clever

workman (in the person attached to the Trivandrum Observatory, for the purpose of repairing instruments, &c.) I procured the re-turning of the pivots of the hitherto useless needles (No. 2 and 4), and the construction of two new intensity needles.

Thus equipped I left Trivandrum on the 20th September, and employing all four of the dipping needles and five intensity needles—which practice had now enabled me to accomplish unassisted—I again made observations at those places which had hitherto given contradictory results; and eventually arrived at Madras on the 15th October.

It had been agreed upon by Mr. Caldecott and myself, that, before completing the observations to the northward of Madras, the instruments should be sent to him, to perform a portion of the work to the northward of Trivandrum; this was done, and the observations, as far as Tellicherry, were made by Mr. Caldecott, in the month of November following. It had been Mr. Caldecott's intention to have completed the series on the western coast at a no very distant date; but the unsatisfactory results now arrived at, induced him to await the arrival of a new dip apparatus and needles from England (which he had ordered of Mr. Thomas Jones for this purpose), and to return the needles to me for the prosecution of the observations on this coast. I was anxious for the completion of the work, but had already been too long absent from the Observatory, whereby computations had accumulated, and observations had been neglected to some extent; thus circumstanced. I availed myself of the services of a very intelligent and careful native (Tannyachellum) who, after making observations on the dip and intensity every day during three months, had acquired as correct a habit of observing as could be expected or desired. Tannyachellum accordingly was despatched from Madras on the 27th April 1838, with directions to make observations of the dip and intensity at distances of about 25 miles apart, from hence, along the coast as far as Ongole; and to re-observe at the same places on his return. This was accomplished by the end of June; and with the exception that the dip observations were made in the usual way, *not by our method of "vibrations,"* I venture to assert that the results he has obtained, are not less accurate than I might have arrived at myself.

The new dip apparatus by Jones, much to our disappointment, did not arrive at Madras till September 1838, just before Mr. Caldecott's departure for England: on examination it appeared in every respect to be a very superior instrument; but the results arrived at here, both by Mr. Caldecott and myself (Mr. Caldecott being at Madras by this time) were

not more accordant than those already obtained from the other needles. Notwithstanding this, Mr. Caldecott, at some considerable inconvenience to himself, repeated his observations with the new needle at Cochin and Allepee, previously to his departure for Europe. I have thought it necessary to mention these particulars, in order to account for having so long delayed fulfilling my promise of giving these observations; but my desire to render the work complete, *even now makes it doubtful if I had not better wait for the observations on the western coast;* but, with thus much by way of apology, and the promise that, at some future, not far distant time, the observations on the western coast will be completed; we may at once turn to the observations, and their discussion: and, since there will be much to say in the way of discussion, it may be as well to leave the intensity observations for the present, and commence the

Discussion of the Dip Observations.

The discordant results which have been met with by Captain Sabine* and others in measuring the dip by different instruments, renders it desirable that a comparison of the needles now used with others should be instituted; accordingly I have availed myself of two observations made here with a dip apparatus belonging to Captain Drinkwater Bethune R. N., and of three observations made with Mr. Caldecott's needles—we get altogether as follows:—

			Dip for Madras.	
			° ′ ″	° ′ ″
Needle	D. B. No. 1 from 1 observation	δ = +	6 55 4	+6 52 30
—	D. B. „ 2 — 1 ———	=	6 49 56	
—	T. G. T. „ 1 — 2 ———	=	6 45 22	+6 50 9
—	T. G. T. „ 2 — 1 ———	=	6 41 13	
—	T. G. T. „ 3 — 2 ———	=	6 56 56	
—	T. G. T. „ 4 — 1 ———	=	6 54 4	
—	J. C. „ 1 — 1 ———	=	6 51 34	+6 52 30
—	J. C. „ 2 — 2 ———	=	6 53 26	
	Mean —— ———	=	6 51 19	

The discrepancies here met with, probably for the most part arise from error of observation; since only one or two results from each needle have

* In the observations lately made for the magnetic survey of Ireland, there appears, in an extreme case, a difference of 41′ between the results from two of the needles employed.

been obtained: we perceive, that, employing the needles 1 and 3 T. G. T., an error from the mean of a few seconds only would be committed; and that employing 1, 2, 3, and 4, T. G. T. or 1, and 2. J. C., in either case our results would, as far as constant error is concerned—possess nearly the same degree of accuracy as if made from the whole 8 needles.

In the Report of the British Association relative to the magnetic observations made in Ireland, it is mentioned, "of the eight results ob- "tained with needle (P), there is only one which differs from the mean "of the eight by a single minute." Such accuracy, however, cannot be the boast of the Madras observations; for, as it will be seen presently, a *single degree*, instead of a single minute, will occasionally be thrusting itself in, between observation and the truth. But, not to be too hasty in statements, it may be as well to mention, that, by reason of the feebleness of magnetic force in India, arising from proximity to the magnetic equator on the one hand, and high temperature on the other, one carefully-made set of dip observations under every advantage, cannot be expected to arrive nearer than within 8 or 10 minutes of the truth. On looking over the whole of the results, however, discordances are found to an amount far exceeding this,—one indeed which would render the observations altogether useless, were there no means left of accounting and making allowance for the same. I became aware of the discordances which affect our observations, when at work on their reduction at Trivandrum; at first I felt inclined to attribute the discrepancies to local causes and error, but a little reflection convinced me that I must give up such a supposition, since, from the care we had taken in every particular, the one was highly improbable and the other impossible; for we had been careful to observe in sheds or under trees, far removed from local disturbing causes, and had not omitted to lay aside our keys and the buckles from our stocks and braces, &c.; so that we must look to some other cause for an explanation of the discrepancies.

In the course of our travels, I had noticed at one place (*Carryshandy* I think), that, on applying the magnet to one end of the needle to ascertain the position of the poles, the edge a (fig. 1) attracted the needle and a' repelled it; but, on again applying the magnet to a, its pole had become changed to the same denomination as a'; and on immediately vibrating the needle, its indication had altered about 50 minutes. Having at Trivandrum met with a similar anomaly, I was led to enquire, whether the discrepancies which appeared in some of the observations could not be accounted for in this way: might not the magnet, in the act of reversing the poles, have pressed upon one edge, and have established a pole at a or a' instead of the end e? To resolve this difficulty, I availed myself

of a very bad observation (one in which I had purposely been careless), and one which proved very discordant, to discover, by thrusting the needle among some iron filings, where the poles were situated; when, my discordant observation was fully explained by the poles having chosen to take up a position at *a* and *b*, forming an angle of 11½ degrees with the ends *e* and *e'*.

I now, for the sake of variety, inclined the magnets a little, so as to establish the poles at *a'* and *b'*, and, as might be expected, a result differing 3½ degrees from that just made, immediately resulted: the former being as much in excess as the latter was in defect.

I now set to work systematically—thus—at Trivandrum August 30th—13th September 1837.—

Needle employed.	Observed dip.	Remarks.
	° ′ ″	
Needle No. 1 =	−3 17 30	Each result being the mean of 5 observations in one position of the needle only; made with the greatest possible care, that the poles should be settled at the ends *e*, *e'*.
—— =	3 20 0	
—— =	3 22 30	
—— =	3 22 30	
—— =	− 4 7 0	Each derived from 5 observations in the same position as above, by causing a slight degree of inclination in one of the magnets, whereby the poles were situated at *e* and *a*.
—— =	4 7 0	
—— =	− 4 56 0	From the mean of 5 observations in the same position as above, magnetized by inclining both magnets slightly, whereby the poles took up the position *b'* and *a*.
Needle No. 4 =	+ 0 22 30	Each result being derived from 5 observations in one position of the needle only, magnetized by causing a slight inclination of both magnets, or poles at *a'* and *b*.
——	+ 0 17 30	
—— =	− 0 37 30	Each result being derived from 5 observations in the same position as above, inclining one of the magnets only, or poles at *e* and *a'*.
—— =	0 37 30	
—— =	0 35 30	
—— =	1 17 30	Each result being determined from 5 observations in the same position as above, both magnets being drawn to the ends; or poles at *e* and *e'*.
—— =	1 17 30	

In a similar way the following were obtained—

	° ′ ″			
Needle No. 3—	3 55 23	Mean of 8 observations,	poles at *a* and *b'*	
——	3 20 0	——	——	—— *e* and *e'*
——	1 42 30	——	——	—— *a'* and *b*

	° ′ ″			
Needle No. 2—	4 7 10	Mean of 8 observations,	poles at	b' and a
——	2 22 56	——	——	—— a and b
——	2 22 43	——	——	—— e and e'
——	2 28 41	——	——	—— a' and b'

The above results, being derived from one position of the needle only, do not represent the *true* dip, but furnish, by means of differences, what we require: thus, taking the means—

Needle No. 1 shews—that if the poles, instead of being situated at e, e' should take up a position such as e and a, (which in practice has occasionally occurred) then, the reading would be erroneous to the amount $\pm$ 0°,49′,0″; and that, in an extreme case, when both poles are astray, then an error in the reading to nearly double of this amount (or $\pm$ 1°,35′,23″) results—or, we obtain on the whole.

The Poles being situated at

Needle.	e & e'	a & b	a' & b'	e & $\begin{cases} b \\ b' \end{cases}$ e' & $\begin{cases} a \\ a' \end{cases}$	a & b' a' & b
	error.	error.	error.	error.	error.
	° ′	° ′	° ′	° ′	°
No. 1	0 0			+0 46	+ 1 35
— 2	0 0	0 0	+ 0 6		1 44
— 3	0 0				1 37
— 4	0 0			+0 37	1 37
Mean.	0 0	0 0	+ 0 6	+0 42	+ 1 38

A greater degree of consistency would no doubt exist between these numbers, were the ends of the needles symmetrical, and of exactly the same size; then we should expect to find

		° ′
Poles e and e'	the error of observation =	0 0
a and b or a' and b'	—— —— =	0 0
e and b or e and b' / e' and a or e' and a'	— —— =	$\pm$ 0 49
a and b' or a' and b	—— —— =	$\pm$ 1 38

The greatest disagreement from these being in the case of needle No. 4, (poles at e and a'), I have, since writing the above, turned to

examine it, when the want of symmetry in one of its ends, fully justifies the accuracy of the $\pm$ 0°,37′ found above. The other needles are, however, singularly perfect; so that the mean values here found belong to needles Nos. 1, 2, and 3: and for No. 4 as far as concerns the poles a and b' and a' and b; but for the positions e and a' the correction $= -0°.37'$ and we may conclude, for —— —— e and b' —— —— $=$ + 1. 1 and for the remaining positions e' and b and e' and a —— $=$ $\pm$ 0.49

In the actual determination of the dip, however, it is necessary to invert the poles: so that putting p and $\frac{p}{2}$ for the corrections which apply to needles Nos. 1, 2, and 3; we may

in one position of the poles of the needle—read off ..... $\begin{cases} A \\ A \pm \frac{p}{2} \\ A \pm p \end{cases}$

and in the inverted position of the poles we might read off . $\begin{cases} B \\ B \pm \frac{p}{2} \\ B \pm p \end{cases}$

where $\frac{A + B}{2} = \delta$ the true dip, or, taking all the possible combinations of these six readings, the values for δ, resulting from either of the needles 1, 2, or 3, and for several cases of No. 4,

			° ′ ″
are	$\frac{A + B}{2}$	or	$\delta \pm$ 0. 0. 0
	$\frac{A + B}{2} \pm \frac{p}{4}$	or	$\delta \pm$ 0.24.30
	$\frac{A + B}{2} \pm \frac{p}{2}$	or	$\delta \pm$ 0.49. 0
	$\frac{A + B}{2} \pm \frac{3p}{4}$	or	$\delta \pm$ 1.13.30
	$\frac{A + B}{2} \pm p$	or	$\delta \pm$ 1.38. 0 :—

and since, in the remaining cases of needle No. 4, there are several values entering, which the observations afford no clue to identify, if they are—poles at e and a' or at e and b', it will in cases of doubt be as well to reject the observations of needle No. 4. With this view of the case, and recollecting that among several independant observations,—in the greater number of cases no correction whatever will be necessary—the poles will have identified themselves with the extreme ends of the needle,—we will now consult Table I, and endeavour to discover what proper compensations may be applied to the values there given, to obtain the true values of δ

TABLE I. DIP OBSERVATIONS, &c.

Date.	Place of Observation.	δ Needle I.	δ Needle II.	δ Needle III.	δ Needle IV.	Observed by	Site—Remarks, &c.
1838		° ′ ″	° ′ ″	° ′ ″	° ′ ″		
May 19	Ongole	+ 11.46.15	+ 11.43.26	+ 10.45.37	+ 11.43. 7	T.	On the bank of the *red* tank, (the village being on the south, and the traveller's bungalow distant 100 yards to the east) under the shade of a tree.
20	——	11.31.53	11.56.15	11 25.37	12.23.45	T.	
May 16	Ramahpatam	+11.15.37	+ 11.11.34	+ 10.45.37	+ 11.43. 7	T.	In Mr. Elliot's compound,—under the shade of a tree.
23	——	10.36.34	10.35 37	10.46.15	11.26.34	T.	
May 14	Alloor	+10.17.11	+ 10.20.19	+ 9.50.56	+ 10.21.53	T.	In a cadjan shed attached to the tasildar's cutcherry.
27	——	10.17.11	10.26.34	10.16.53	9.50.19	T.	
May 12	Nellore	+10.35.19	+ 9 45.57	+ 9.30.37	+ 9.43.26	T.	In *Singaryah's* garden, under the shade of the banyan tree.
29	——	9.46.15	9.33.26	10.31 53	9.24.23	T.	
May 9	Woojelly	+ 8.23.45	+ 9.11.53	+ 8.49.41	+ 8.43.26	T.	100 yards to the south of the traveller's bungalow, under the shade of a banyan tree.
June 1	——	8.50.37	8.52 30	8.53.26	8.14.41	T.	
May 7	Sooloorpet	+ 8. 6.53	+ 8.10.37	+ 7.27.11	+ 8. 5.56	T.	In the weaver's grove close to the traveller's bungalow.
June 3	——	8.11.34	8.16.34	8.11.15	7.29. 4	T.	
May 28	Poodaway	+ 7.18.26	+ 7.14. 4	+ 7.23.26	7.16.53	T.	Ellamas's grove under a banyan tree.
29	——	6.15.56	7.11.53	6.58.45	7.43.26	T.	do. do.
June 7	——	7.10.37	7. 8 45	9. 2.49	6. 0.37	T.	do. do.
1837							
April 26	Madras	+ *6.49.56	+* 6.46.52			D. B. & T. G. T.	In the observatory dwelling house.
26	——	*6.55. 4				D. B. & T. G. T.	Do.
July 17	——	6.49.49		+ 6.54.30		T. G. T.	In the observatory.
Oct. 16	——	6.40.56		6.59.22	+ 6.54. 4	T. G. T.	Do.
1838							
April 3	——	6. 7.30	6.30.19	7.34.41	6.50.37	T.	Do.
5	——	6.16. 4	6.53. 7	7.46.53	6.40.19	T.	Do.

Date.	Place of Observation.	δ Needle I.	δ Needle II.	δ Needle III.	δ Needle IV.	Observed by	Site—Remarks, &c.
1839		° ′ ″	° ′ ″	° ′ ″	° ′ ″		
Jan. 29	Madras		+* 6.55. 0			T. G. T.	
Feb. 11	———	+**6.51.34	** 6.53.26			T. G. T.	
1838							
July 24	Sadras	+ 5.39.15		+ 5.30. 0		T. G. T.	In the traveller's bungalow.
Oct 14	———	5.30.18	+ 5.28. 7	5.42.30	+ 5.38. 7	T. G T.	
July 25	Thaumpaukum	+ 4.43.42		+ 5.12. 7		T. G. T.	Under the shade of a tree.
Oct. 13	Allumparva	+ 4.50.37	+ 4.48.23	+ 4.52.12	+ 5. 4.22	T. G. T.	Under a cadjan shed.
July 26	Pondicherry	+ 4.31.41	+ 4.25.56	+ 4.43.33	+ 4.25.56	T. G. T.	The master attendant's office.
27	———	4.21.34		4.12.49		T. G. T.	do.
28	———	4.31.15		4. 0.22		T. G. T.	do.
Oct. 12	———	4.20.57	4.25.18	4.27.11	+ 4.30 0	T. G. T.	The verandah of the post master's house.
July 31	Porto Novo	+ 3.24.22		+ 3. 0.23		T. G. T.	In Mr. Pugh's house.
Aug. 1	———	3.16.15		3. 3.52		T. G. T.	do.
Oct. 11	———	3. 8.26	3.11.52	3. 8.45	+ 3. 0.37	T. G. T	do.
Aug. 2	Sheally	+ 2.19.22		+ 2. 0. 0		T. G. T.	In the verandah of the traveller's bungalow.
Oct. 10	———	2.33. 7	+ 2.31.34	2.30. 0	+ 2. 6.15	T. G. T.	
1837.							
Aug. 3	Tranquebar	+ 2. 4.10		+ 1.58. 7		T. G. T.	In the guard room.
7	———	1.56.52		1.55.46		T. G. T. & J. C.	On top of the house.
8	———	2. 6.52		2.11.11		T. G. T. & J. C.	In the guard room.
9	———	2.13.22		2 8.45		T. G. T. & J. C.	do.
Oct. 9	———	2.11.15	+ 2.19. 8	2 2.37	+ 1.48.26	T. G. T.	do.
Aug. 12	Negapatam	+ 2.32. 6		+ 1.22.54		T. G. T.	An open shed.
13	———	2 31.30		0.44.41		T. G. T. & J. C.	do.

* Observed with Captain D. Bethune's Instrument. ** Observed with Mr. Caldecott's new Instrument.

Date.	Place of Observation.	δ Needle I.	δ Needle II.	δ Needle III.	δ Needle IV.	Observed by	Site—Remarks, &c.
1837		° ′ ″	° ′ ″	° ′ ″	° ′ ″		
Oct. 2	Negapatam	+ 1.43,45	+ 1.23. 7	+ 0.21.33	+ 1.33.15	T. G. T.	Verandah of the hospital.
Aug. 13	Manargoody	+ 1, 4.41		+ 0.38. 5		T. G. T. & J. C.	Verandah of the missionary bungalow
14	Puttucottah	+ 0.52.37		+ 0.57.23		T. G. T. & J. C.	Verandah of the choultry.
15	Munamalegoody	+ 0. 7. 0		+ 0.15.17		T. G. T. & J. C.	do.
16	Kalehennary	+ 0. 4.15		+ 0 .8.30		T. G. T. & J. C.	do.
17	Ramnad	— 1.28,37		— 1.20.49		T. G. T. & J. C.	Verandah of the commanding officer's quarters.
Sept 30	Paumban	— 1.49. 3	— 1.24.22	— 1.34.43	— 1. 9.22	T. G. T.	Verandah of the Engineer's bungalow.
Aug. 20	Carryshandy	— 1.51.15		— 1.52.30		T. G. T. & J. C.	Verandah of the choultry.
21	Vadinatum	— 1.37.31		— 1.30.11		T. G. T. & J. C.	Open air near to the choultry—A hot land wind with much dust.
22	Powani	— 2.43.54		— 2.49.26		T. G. T. & J. C.	Mud hut belonging to the Missionaries. A hot and strong land wind—observation effected with difficulty.
Sept. 26	Tutocorin	— 2.27.30	— 2.45, 0	— 2.40.37	— 2.11.10	T. G. T.	In the verandah of Mr. Cory's house.
Aug. 23	Pallamcottah	— 1 50.26		— 2.48.45		T. G. T. & J. C.	In a cocoanut tope situated 20″ N. of the fort.
Sept. 22	——	2.48.26	— 2.48.45	2.40.19	— 2.46.34	T. G. T.	Verandah of a house in the middle of the fort.
Aug. 25	Nagracoil	— 3.54,26		— 3.51. 4		T. G. T. & J. C.	Verandah of the Missionary's house (Mr. Miller's).
Sept. 21	——	4. 4.22	— 4 14.23	3.28.26	— 3.38.42	T. G. T.	do. do. (Mr. Malt's)

Date.	Place of Observation.	δ Needle I.	δ Needle II.	δ Needle III.	δ Needle IV.	Observed by	Site—Remarks, &c.
		° ′ ″	° ′ ″	° ′ ″	° ′ ″		
Aug. 28	Trivandrum	— 3.10.26		— 3.17.23		T. G. T. & J. C.	Meteorological bungalow.
Sept. 5	———	3. 4. 4	— 3 23.34	3.17.30		T. G. T. & J. C.	do.
13	———	3.10.56	3.17.49	3.24.26	— 2.35 37	T. G. T. & J. C.	do.
Nov. 20	———	2.41.53	2.58 7			J. C.	do.
20	———	3.13.11	3, 7.55			J. C.	do.
1838							
Dec. 15	———	3.24. 4				J. C.	do.
1837							
Nov. 15	Quilon	— 2.28. 8				J. C.	Residency grounds—in a mango tope, at about 100 yards to the south of the house.
1838							
Dec. 15	———	* 2.15. 3					
1837							
Nov. 12	Allepee.	2.12.49	— 2.30.19			J. C.	In a thatched shed in Mr. Anderson's compound, south of the house.
Nov. 12	———	1.59.41	1.57.12			J. C.	In a thatched shed in Mr. Anderson's compound, south of the house.
						J. C.	do. do.
13	———	0.57.49				J. C.	do. do.
1[illegible]	———	1. 1.15					
1838							
Dec. 20	———	* 2 37. 0				J. C.	do do.
1837							
Nov. 8	Balghatty	+ 0.31.34	+ 0.17.30			J. C.	The Residency compound in a tent.
8	———	0.14. 4	0 41.53			J. C.	do. do.
8	———	0. 8. 5	0. 5.37			J. C.	do. do.
8	———	———	0. 4.22			J. C.	do. do.
1838							
Dec. 21	———	* 0.10. 6	* 0.21.18			J. C.	do. do.

* Observed with a new Dip apparatus by Mr. T. Jones.

Date.	Place of Observation.	δ Needle I.	δ Needle II.	δ Needle III.	δ Needle IV.	Observed by	Site—Remarks, &c.
		° ′ ″	° ′ ″	° ′ ″	° ′ ″		
1837							
Nov. 6	Chetwaye	+ 1. 3.26	+ 1.17.30			J. C.	The N. E. room of the public bungalow (thatched).
	——	1.16.15	1. 3.15			J. C.	
	——	1.17.30	1.17.30			J. C.	
„ 5	Penaney	+ 1. 3. 8	+ 1.19.41			J. C.	The S. W. corner of the public bungalow (thatched).
„ 4	Calicut	+ 1.36.15	1.51.53	+ 2.36.53	+ 2.42.30	J. C.	Under a tent pitched on the borders of the sea beach, among the cocoanut trees, 300 yards N. W. of the flag staff.
	——	1.13. 8	1.12.49			J. C.	

Consulting the above observations, with reference to the remarks at page 231 we may conclude as follows:—

Ongole.—The observations Nos. 1*, 2, 4, 5 and 7 appearing consistent, there is little fear of their not representing the true dip: No. 3 probably requires the second correction or + 0° 49′ 0″; No. 6 the 1st correction, and No. 8 being doubtful, had better be omitted.

(∴ δ = + 11° 36′ 40″)

Ramyapatam.—Here we have four results, Nos. 3, 5, 6 and 7, telling nearly the same tale, and in all probability the right one; in which case Nos. 1 and 2 require the minor correction—24′ 30″ and Nos. 4 and 8 the second correction or—0° 49′ 0″.

(∴ δ = + 10° 44 14″)

Alloor.—Here Nos. 1, 2, 4, 5, 6 and 7 are coincident, exhibiting a deficiency to the amount of the 1st correction + 0°, 24′ 30″ in Nos. 3 and 8.

(∴ δ = + 10° 18′ 46″)

Nellore.—Nos. 2, 3, 4, 5, 6 and 8 are coincident; exhibiting an excess in Nos. 1 and 7 to the amount of the 2d correction or—0° 49′ 0″; and No. 8 probably requires the first correction or + 0° 24′ 30″, but being doubtful we will omit it.

(∴ δ = + 9° 41′ 16″)

Woogelly.—Nos. 3, 4, 5, 6 and 7 are coincident, exhibiting a deficiency in No. 1, and an excess in No. 2 to the amount of the minor correction 0° 24′ 30″: No. 8 being doubtful is omitted.

(∴ δ + 8° 49′ 20″)

Sooloorpet.—Nos. 1, 2, 4, 5, 6 and 7 are coincident, exhibiting a deficiency in Nos. 3 and 8 to the amount of the second correction or + 0° 49′ 0″; but No. 8 had better be omitted.

(∴ δ = + 8° 11′ 17″)

Poodaway.—These observations are the most discordant of any that have been made; they exhibit in Nos. 14 and 15 nearly the two extreme cases which *can* happen; on looking over the several values, from the coincidence found in Nos. 1, 2, 3, 4, 6, 9 and 10, we naturally conclude that they re-

* These numbers refer to the order in which the values stand in the table.

present the true dip; in which case, Nos. 5 and 12 require the third correction; Nos. 7 and 8 the 1st; and Nos. 11 the 4th or largest correction.

($\therefore \delta = +7^\circ\ 16'\ 46''$)

Madras.—Nos. 1, 2, 3, 4, 5, 6, 7, 8, 12, 14, 16, 17, 18 and 19 probably exhibit the true values of the dip—in which case Nos. 9, 11 and 15 require the second correction, and Nos. 10 and 13 require the first or minor correction only.

($\therefore \delta = +6^\circ\ 50'\ 4''$)

Sadras.—The general mean will probably be pretty near the truth.
($\therefore \delta = +5^\circ\ 31'\ 23''$)

Thaumpaukum.—Nos. 1 or 2 require the minor correction to produce an agreement *inter se*, but since in either case we might possibly be in error, it will be as well to take the mean, and mark the result as *doubtful.*

($\therefore \delta = +4^\circ\ 57'\ 54''$) *doubtful.*

Allumparva.—Was visited on my return homeward, instead of Thaumpaukum, in consequence of its affording better shelter than the latter place: the observations all agree pretty well, although No. 4 probably requires the minor correction.

($\therefore \delta = +4^\circ\ 50'\ 16''$)

Pondicherry.—The first and third observations with needle No. 3 apparently require the minor correction.

($\therefore \delta = +4^\circ\ 27'\ 12''$)

Porto Novo.—The first observations apparently requires the minor correction.

($\therefore \delta = +3^\circ\ 6'\ 15''$)

Sheally.—The observations with Nos. 2 and 6 seem to require the minor correction.

($\therefore \delta = +2^\circ\ 28'\ 13''$)

Tranquebar.—No. 12, which we may as well omit, seems to require the minor correction.

($\therefore \delta = +2^\circ\ 5'\ 17''$)

Negapatam.—It is quite impossible at first sight to form any idea of the true dip from these observations. On consulting those made on 2d October, we may

adopt with equal propriety, the mean of Nos. 1 and 4 (1° 38′ 30″), or of Nos. 2 and 3 (1° 22′ 20) as the true dip. On consulting the previous observations, we find that they may be brought to agree with the first of these values, by allowing the second correction in Nos. 1, 3 and 4, and the first correction in No. 2; whereas to reconcile them with the second value found above, we must admit the *third* correction in Nos. 1 and 3: and the second in No. 4. Hitherto the minor correction only having been found sufficient to reconcile the observations made by myself, I think it little likely that *the third correction should apply twice* at the same station, particularly as the observations on the second day were made with more than ordinary care on account of the disagreement met with on the first day of observation: or, it would appear on the whole that the most probable value for the true dip will be found, by allowing the first correction in Nos. 2, 6 and 7; and the second correction in Nos. 1, 3 and 4.

($\therefore \delta = + 1° 42′ 10″$)

Manargoody.—One or the other of these observations probably represents the true dip, in which case the other observations requires the minor correction.

($\therefore \delta = + 0° 39′ 8″$ or $+ 1\ 3\ 38$)

Puttoocottah.—The mean of these is probably pretty near the truth.
($\therefore \delta = + 0° 55′ 0″$)

Munamalegoody.—The mean of these is probably pretty near the truth.
($\therefore \delta = + 0° 10\ 31″$)

Kalehenary.— Do. do. $\therefore \delta = + 0° 6′ 22″$.

Ramnad.— Do. do. $\therefore \delta = - 1° 24′ 42″$.

Paumban.—No. 4 appears to require the minor correction.
($\therefore \delta = - 1° 35′ 30″$)

Carryshandy.—Observations coincident— $\therefore \delta = -1^\circ\ 51'\ 52''$.

Vadinatum.— Do. do. $\therefore \delta = -1\ 33\ 51$.

Powani.— Do. do. $\therefore \delta = -2\ 46\ 10$.

Tutocorin—No. 4 appears to require the minor correction, but the amount being doubtful it had better be omitted.
($\therefore \delta = -2^\circ\ 37'\ 42''$)

Palamcottah.—The large quantity of dust floating in the air, and the hot land wind, rendered observing irksome and difficult on the 24th August, which may account for the magnetising of the needles having been less successfully accomplished than heretofore:—it would appear that No. 1 requires the second correction, and No. 2 the third; but they had better all three be omitted.
($\therefore \delta = -2^\circ\ 46'\ 1''$)

Nagracoil.—Nos. 4 and 5 appear each to require the minor correction.
($\therefore \delta = -3^\circ\ 53'\ 3''$)

Trivandrum.—The observation with needle No. 4 had better be omitted; Nos. 10 and 11 apparently require the minor correction.
($\therefore \delta = -3^\circ\ 15'\ 24''$)

Quilon.—The observations are coincident. $\therefore \delta = -2^\circ\ 21'\ 35''$.

Allepee.—These observations are so singularly discordant, that no sort of estimate can be made of the value of δ.
($\therefore \delta = -x$)

Balghatty.—No. 4 apparently requires the minor correction.
($\therefore \delta = +0^\circ\ 18'\ 46''$)

Chetwaye.—Observation coincident— $\therefore \delta + 1\ 12\ 34$.

Penaney.— do. do.— $\therefore \delta + 1\ 11\ 25$.

Calicut.—Observation coincident— $\therefore \delta + 2\ 42\ 43$

Tellicherry.—The observations made at this place are so singularly discordant, that they had better stand over for the present.

The above values of the dip, when laid down upon a map, exhibit an appearance something resembling a series of parallels of latitude,—save that the errors of observation (which somewhat disturb their uniformity), prevent our discovering if these lines *be* parallel to the equator, or if their inclination tends towards it on the eastern, or on the western side of the Peninsula. To arrive at a more correct knowledge of this matter, we will in the first place suppose them to be parallel, and proceed to find the latitudes of the magnetic equator, corresponding to the several longitudes, from the well known formula

$$tan\ \delta = 2\ tan\ \lambda$$

where δ represents the dip and λ magnetic the latitude of the place. It may be objected—that this formula obtains only on the old hypothesis, of there being two magnetic poles symmetrically situated in a diameter of the earth, and near to its centre,—an hypothesis which is not completely borne out by our present improved knowledge:—however valid this objection may be with reference to high latitudes; a slight consideration of the subject, renders it clear, that in the case of *our* observations (which twice cross the magnetic equator), a result very nearly approaching to the truth will be obtained by this formula: accordingly we get as follows—

Geographical situation of various places on the Coast of India, with the observed Dip, and corresponding deduced Latitude of the Magnetic Equator.

	Long.	Latitude	Obsd. Dip. δ,	Latitude of Mag. Eq.	Remarks.
	° ′ ″	° ′ ″	° ″	° ′ ″	
Ongole	80 5 E	15 30 N	+11 36 40	+ 9 38 3	
Ramapatam	80 6	15 3	10 44 14	9 38 40	
Alloor	80 7	14 41	10 18 46	9 29 5	
Nellore	70 2	14 28	9 41 16	9 35 17	
Woogelly	89 58	14 1	8 49 20	9 35 28	
Sooloorpet	80 3	13 41	8 11 17	9 34 5	
Poodway	80 11	13 21	7 16 46	9 42 14	
Madras	80 17 12·13	4,9	6 50 4	9 38 23	
Sadras	80 12	12 32	5 31 23	9 45 55	
Thaumpaukum	80 2	12 12	4 57 54	9 46 46	Doubtful.
Allumparva	80 2	12 14	4 50 16	9 48 36	
Pondicherry	79 54	11 54	4 27 12	9 40 12	
Porto Novo	79 48	11 29	3 6 15	9 55 48	
Shealy	79 50	11 16	2 28 13	10 1 51	
Tranquebar	79 55	11 1	2 5 17	9 58 21	
Negapatam	79 51	10 46	1 42 10	9 54 54	Doubtful.
Manargoody	79 32	10 40	0 39 8	10 20 26	The latter of these is no doubt correct.
			1 3 38	10 8 10	
Puttoocottah	79 23	10 27	0 55 0	9 59 30	
Munamelegoody	79 15	10 3	0 10 34	9 57 43	
Kalehennary	79 0	9 40	+ 0 6 22	9 36 49	It would appear that this value of δ, requires the 2d correction or δ, = — 0° 42′ 38″.
Ramnad	78 54	9 22	— 1 24 42	10 4 24	
Paumban	79 5	9 17	1 35 30	10 4 46	
Carryshandy	78 27	9 11	1 51 22	10 6 57	
Vadinatrum	78 10	8 57	1 33 51	9 43 56	This value of δ probably requires the second correction, or δ = — 2′22″51‴.
Powani	77 57	8 49	2 46 10	10 1 28	
Tutocorin	78 14	8 48	2 37 42	10 6 54	
Palamcottah	77 45	8 44	2 46 1	10 7 3	
Nagracoil	77 28	8 11	3 53 3	10 7 40	
Trivandrum	76 59	8 30 35	3 15 24	10 8 24	
Quilon	76 56	8 54 0	2 21 35	10 4 49	
Allepee	76 21	9 31 0	x		
Balghatty	76 17	9 58 30	+ 0 18 46	9 49 7	
Chetwaye	76 4	10 32 6	1 12 34	9 55 48	
Penaney	75 58	10 46 30	1 11 25	10 0 46	
Calicut	75 49	11 15 25	2 42 43	9 53 51	
Tellicherry		11 45 0			

Neglecting the observation at *Thaumpaukum*, and adopting the second value for *Manargoody*, we get as follows :—

	Latitude. ° ′	Longitude. ° ′ ″	Lat. of M. Equator. ° ′ ″
From 9 Stations in	12 32 N to 15 30 N	80 6 47	+ 9 37 28
—— 13 ——	2 14 N to 9 11 N	79 27 23	9 56 46
—— 11 ——	8 57 N to 8 11 N to 11 15 N	77 3 38	10 1 51

On comparing each of these with its several constituent values, we find that the mean error at a single station is 6′, 33″; from which we should conclude, that the latitude of the magnetic equator, derived from the first 9 stations, as far as error of observation goes, is probably not above 2 or 3 minutes in error: and the same may be said of the result from 13, and of that from 11 observations. Hence we are free to infer that the discordance which exists between these three values, as compared with the longitude, is without the limit of error of observations; and since no simple value of inclination of the isoclinal lines would reconcile both the longitudes and latitudes, we are left to conclude, either that the isoclinal lines (arising from local causes) are undulating, or that we have assumed an erroneous theory.

Having come to this conclusion, we will now proceed with the observations at these three groups of stations, to obtain values for the inclination of the isoclinal lines to the meridian (θ); and the rate of variation (r) corresponding to a variation (of one minute for instance) in the latitude. For this purpose, let λ and μ represent respectively the longitude and latitude of any principal station (O) to which we wish to refer a group of observations; and $\lambda_,$ and $\mu_,$ the same for any one of the other stations. Let P represent the pole of the earth; P O the meridian of the said principal station, and P Q the meridian of any one of the stations which we wish to refer to O. From Q let fall Q R perpendicular to P O; or, since R O and R Q will in no case exceed $1\frac{1}{2}$ or 2 degrees, we may, for simplicity sake, make R O a parallel of latitude; when

$$\text{R O} = \text{A} = \lambda - \lambda,$$
$$\text{and R Q} = \text{B} = (\mu - \mu_,) \cos \lambda,$$

Let O S represent an isoclined line, making the single O S P $= \theta$ with the meridian, and draw Q T $= p$ perpendicular to it; then we get

$$p = (\text{B}. \cos \theta + \text{A}. \sin \theta) \text{ nearly.}$$

Now, within the limited range of each group of stations, we may safely allow, that the dip varies as the distance—that r remains constant;—hence

$$\delta - \delta_, = r p$$

or $\delta - \delta_, = r \cos \theta . \text{B} + r \sin \theta . \text{A}$; where, substituting x, and y, for the terms $r . \sin \theta$ & $r . \cos \theta$, and restoring the values of A & B,

$$\delta - \delta_, = (\mu - \mu_,) \cos \lambda_, . x + (\lambda - \lambda) y.$$

The stations proper to be chosen for principal stations, are evidently those which are situated in the middle of the group, or such as we have already obtained; where

λ	μ	δ
° ′ ″	° ′ ″	° ′ ″
+ 14 2 20	80 6 47	+ 8 46 49
10 33 51	79 27 23	+ 4 11 4
9 24 11	77 3 38	— 1 15 18

whence we deduce the following, for the first group,

Place of observation.	λ_1	μ_1	A or $(\lambda-\lambda_1)$	B or $(\mu-\mu_1)\cos.\lambda_1$	D or $(\delta-\delta_1)$	w
	° ′	° ′	′	′	′	
Ongole	+15 30	+80 5	— 88	+ 2	— 169,9	4
Ramapatam	15 3	80 6	61	1	117,4	4
Alloor	14 41	80 7	39	0	92,0	4
Nellore	14 28	80 2	26	5	54,5	4
Woogelly ..	14 1	79 50	+ 1	9	2,5	4
Sooloorpet ...	13 41	80 3	21	4	+ 35,5	4
Podway	13 21	80 11	41	— 4	90,0	6
Madras	13 5	80 17	57	10	116,7	9
Sadras	12 32	80 12	90	5	195,4	3

Similarly we get for the second group.

Place of observation.	λ_1	μ_1	A or $\lambda-\lambda_1$	B or $(\mu-\mu_1)\cos.\lambda_1$	D or $(\delta-\delta_1)$	w
	° ′	° ′			′	
Allumparva.....	+12 14	+80 2	— 100	— 34	—216 2	3
Pondicherry	11 54	79 54	80	26	193 1	7
Porto Novo.....	11 29	79 48	55	20	112 1	4
Sheally	11 16	79 50	42	22	74 1	3
Tranquebar	11 1	79 55	27	27	51 2	6
Negapatam	10 46	79 51	12	23	28 1	3
Manargoody	10 40	79 32	6	5	+ 10 5	2
Puttoocottah	10 27	79 23	+ 7	+ 4	19 1	2
Munamelogoody...	10 3	79 15	31	12	63 5	2
Kalehennary	9 40	79 0	54	26	67 7	2
Ramnad	9 22	78 54	72	32	158 8	2
Paumban	9 17	79 5	77	22	169 6	3
Carryshandy	9 11	78 27	83	59	186 0	2

And further, for the third group.

Place of observation.	$\lambda_{,}$	$\mu_{,}$	A or $\lambda - \lambda_{,}$	B or $(\mu - \mu_{,})\cos.\ \lambda_{,}$	$(\delta - \delta_{,})$	w
	° ′	° ′			′	
Vadinatrum.....	+ 8 57	78 10	+ 27	— 66	+ 18 2	2
Powani	8 49	77 57	35	52	90 9	2
Tutocorin	8 48	78 14	36	69	82 4	4
Palamcottah	8 44	77 48	40	43	90 7	4
Nagracoil	8 11	77 28	73	24	157 8	4
Trivandrum . ..	8 30	76 59	54	+ 5	120 1	7
Quilon.....	8 54	76 56	30	8	66 3	2
Allepe..... ...	9 31	76 21	— 7	42	.....	....
Balghatty	9 58	76 17	34	46	— 94 1	6
Chetwave	10 32	76 4	68	59	147 9	4
Penaney	10 46	75 58	82	65	146 7	2
Calicut	11 15	75 49	111	74	238 0	5

We have found above, that

$$\delta - \delta_{,} = A\,x + B\,y\ ;\text{—put} = D$$

and it only remains, that, with the above values of A, B, $(\delta - \delta_{,}) = D$ and the weight *(w)* (determined from a consideration of the number and goodness of the observations constituting each result); we should now, by the method of minimum squares, determine the most probable values for x & y: to accomplish this, we must, after multiplying the above equation by w, again multiply it successively by the coefficients of the quantities sought; when we get equations of the form

$$A^2\,w\,x + A\,B\,w\,y = A\,D\,w$$

and

$$A\,B\,w\,x + B^2\,w\,y = B\,D\,w$$

from which, by the following equations of conditions, the most probable values of x and y will now be obtained:

3976 x	—	704 y	$= \pm$ 59804,8	—	704 x	+ 16 y	= —	1359,2
1484	—	244	= + 28645,6	—	244	+ 4	= —	469,6
6084	—	0	= + 14352,0	—	0	+ 0	=	0,0
2704	—	520	= + 5668,0	—	520	+ 100	= —	1090,0
4	+	36	= — 10,0	+	36	+ 324	= +	90,0
1764	+	336	= + 2982,0	+	336	+ 64	= +	568,0
10836	—	984	= + 22140,0	—	984	+ 96	= —	2160,0
29241	—	5130	= + 59867,1	—	5130	+ 900	= —	10503,0
24300	—	1350	= + 52758,0	—	1350	+ 75	= —	2344,8

taking the sum we get

$120043\,x - 8560\,y = 246207{,}5 \qquad -8560\,x + 1579\,y = -17268{,}6$

and for the second series

$+30000\,x$	$+10200\,y$	$= +64860{,}0$	$+10200\,x$	$+3468\,y$	$= 22052{,}4$
44800	+ 14560	$= +108136{,}0$	14560	+ 4732	$\equiv +35114{,}2$
12100	+ 4400	$= +21662{,}0$	4400	+ 1600	$= +8968{,}0$
5292	+ 2772	$= +9336{,}6$	2772	+ 1452	$= +4890{,}6$
4374	+ 4374	$= +8294{,}4$	4374	+ 4374	$= +8294{,}4$
432	+ 828	$= +1011{,}6$	828	+ 1587	$= +1938{,}9$
72	+ 60	$= -126{,}0$	60	+ 50	$= -105{,}0$
98	+ 56	$= +267{,}4$	56	+ 32	$= +152{,}8$
1922	+ 744	$= +3937{,}0$	744	+ 288	$= +1521{,}0$
5832	+ 2808	$= +7311{,}6$	2808	+ 1352	$= +3520{,}4$
10368	+ 4608	$= +22867{,}2$	4608	+ 2048	$= +10163{,}2$
17787	+ 5082	$= +39177{,}6$	5082	+ 1452	$= +11193{,}6$
13778	+ 9794	$= +30876{,}0$	9794	+ 6962	$= +21948{,}0$.

taking the sum we get

$146855\,x + 60286\,y = 320611{,}4 \qquad 60286\,x + 29397\,y = 129685{,}5$

and for the third series

$1458\,x$	$-3564\,y$	$= +982{,}8$	$-3564\,x$	$+8712\,y$	$= -2402{,}4$
2450	− 3640	$= +6363{,}0$	− 3640	+ 5408	$= -9153{,}6$
5184	− 9936	$= +11865{,}6$	− 9936	+ 19044	$= -22742{,}4$
6400	− 6880	$= +14512{,}0$	− 6880	+ 7396	$= -15600{,}4$
21316	− 7008	$= +46077{,}6$	− 7008	+ 2304	$= -15148{,}8$
20412	+ 1890	$= +45397{,}8$	+ 1890	+ 175	$= +4203{,}5$
1800	+ 480	$= +3978{,}0$	+ 480	+ 128	$= +1060{,}8$
6936	− 9384	$= +19196{,}4$	− 9384	+ 12696	$= -25971{,}6$
18196	−16048	$= +40228{,}8$	−16048	+ 13924	$= -34904{,}4$
13448	−10660	$= +24058{,}8$	−10660	+ 8450	$= -19071{,}0$
61605	−41070	$= +132090{,}0$	−41070	+ 27380	$= -88060{,}0$

taking the sum we get

$159505\,x - 105820\,y = 344750{,}8 \qquad -105820\,x + 105617\,y = -228090{,}3$

Resolving these three pairs of equations, we get

x	y
$+2{,}07218$	$+0{,}29708$
$2{,}35365$	$-0{,}41532$
$2{,}17310$	$+0{,}01770$

and since $x = r \sin.\,\theta$ and $y = r \cos.\,\theta$; we get

$$\frac{x}{y} = \tan.\,\theta$$ or in numbers.

	θ	r
	° ′	′
+	81 50	2,0934 for one geographical mile.
	100 1	2,3900 —— —— ——
	89 32	2,1731 —— —— ——

Shewing that a flexure takes place in the direction of the isoclinal lines, as represented in fig. 3—much at variance with the supposed uniformity of their curvature,—and with reference to r, a determined variation from the theory (tan. $\delta = 2$ tan. λ) in which r cannot exceed 2:—If we now refer to page 243 for the mean values of δ and λ: we can, from the above values of r and θ, compute more correct values than we have yet obtained of the latitude of the magnetic equator; thus

μ	Lat. of Mag. Equator.
° ′ ″	° ′ ″
80 6 47	+ 9 53 4
79 27 23	10 3 35
77 3 38	9 58 53

These values are no doubt very near the truth; the only doubt which can exist, is, whether we ought not to have rejected the observations at Kalehannary and Vadinatrum? If we had done so, the above 2d and 3d values would each be increased about two minutes.

Intensity Observations.

I have already mentioned that the intensity needles, employed for a great portion of this work, were constructed by myself, immediately before quitting Madras,—when I had observed with them for about 30 or 40 days only. During this time, no perceptible alteration in the magnetic intensity* of either of them having taken place, I determined to trust to their invariability†—or rather to give the results, if on my return to Madras it appeared that the needles had not varied;—and the needles constructed by Mr. Caldecott, had not been in use for a day previously to my quitting Trivandrum. Under these circumstances, it will naturally be expected that our intensity observations are of little worth; particularly since the observations have been made over a tract of country, where from theory we know that an almost invariable intensity must prevail;

* The needles of this construction employed in England for measuring magnetic intensity, have generally been found to part with their intensity, during the first two years after being magnetized.

† The two needles to which this remark belongs, remained suspended in their boxes during this time: had they been handled even, experience since shews that a difference would probably have been obtained.

and that, to trace the law of its variation under these circumstances, observations of far more than ordinary accuracy should be employed. I had however other motives in view in making these observations than that of discovering from them the *law* of magnetic intensity. My object was, *not* to discover the law, but—assuming the law according to theory—how far it was transgressed by incidental or local causes: for, with regard to the latter, our track along the Coromandel coast, surrounded by extensive sandy plains, would form a fair field for exhibiting the effect of local disturbances, when contrasted with the vast granitic formations and elevations to be met with in and near to Travancore and along the Western coast generally.

With thus much by way of explanation, I will now lay before the reader the whole of the observations, even those which I shall eventually propose to reject, in order, that no more, or less importance may be attached to them, than they are fairly entitled to. I will here mention one trifling circumstance with regard to Mr. Caldecott's needles; namely, that, with a view to try if their intensities might not be rendered at once invariable, before leaving Trivandrum I submitted each of them to rather rough usage by hard friction. The effect of this was, that a diminution of intensity ensued at once—to the amount of about 20 seconds in performing 100 vibrations. How far this might be carried, is a matter of interest for which I may not pause here, save to remark, that, as far as my experience goes, a needle may by this means at once be brought to a fixed intensity; of which more presently. It only remains for me to add, that the same observers and the same stations as those mentioned in the dip observations, apply to these.

Corrections to be applied to the Intensity Observations.

The corrections to be applied to the observed time of one of these needles, performing 100 vibrations, are three in number.

1st.—On account of R the rate of the chronometer; which renders necessary the correction

$$\text{rate} = \text{I} - \left(\text{I} \times \frac{86400}{86400 + \text{R}}\right)$$

2d.—*On account of arc.* To reduce the time of vibration performed in a circular arc commencing from A°, and terminating at $a°$, to that which would have been noted had the vibrations been performed in an infinitely small circular, or a cycloidal arc, the correction is

$$\text{corr. for } arc = + \text{ I} \times \frac{\text{sin. (A} + a\text{). sin. (A} - a\text{)}}{32\ \text{M (log. sin. A} - \text{log. sin. } a\text{)}}$$

where M = the logarithmic modulus = 2,302585; and A and a, throughout—have always been 20° and 6½° respectively; or correction for arc = + (I ×,0022).

3d.—*On account of temperature*—It being found that a magnetized needle exhibits a greater degree of intensity in cold than in warm weather, it is necessary to render the observations comparable—that they should either all be made at the same temperature, or that, if the temperature vary, a correction proportionate thereto should be employed: for this purpose I have lately made several observations with the three needles employed by myself, at temperatures between 70° and 80°; by observing in a cool room of uniform temperature, and afterwards in one with a low roof with a higher temperature, when the following rates of alteration were observed:

No. observations.	Needle No. 1		Needle No. 2		Needle No. 3	
	Faht. therm.	Time of 100 vib.	Faht. therm.	Time of 100 vib.	Faht. therm.	Time of 100 vib.
	°	s	°	s	°	s
from 3	t'+ 8,0	$I_{,}$ + 0.37	t' + 14.5	$I_{,}$ + 0,90	t'+ 8.0	$I_{,,,}$ + 0,65
——	t'+11,0	$I_{,}$ + ,70	t' + 10 8	$I_{,,}$ + 0,60	t'+ 8.8	$I_{,,,}$ + 0,27
——	t' +11,4	$I_{,}$ + ,57	t' + 12.3	$I_{,,}$ + 0,70	t + 9.1	$I_{,,,}$ + 0,44

where I, $I_{,,}$ $I_{,,,}$ represent the time of performing 100 vibrations at the lower temperature (t')—If I represent the time of performing 100 vibrations at the standard temperature t; and I, that of performing the same at any other temperature t' then the correction

$$I - I = a\, I\, (t - t')$$

$$\text{or} \quad a = \frac{I - I_{,}}{I\,(t - t')}$$

In which I, $I_{,,}$ $I_{,,,}$ were 282, 312, and 277 respectively; whence

a = ,00018 for needle No. 1.

= ,00019 —— No. 2.

= ,00019 —— No. 3.

This near and unusual agreement *inter se*, arising no doubt from my not having employed artificial heat (as has been usual in observations of this nature), has induced me to suppose that the remaining two needles require the same correction, which consequently has been applied in the reductions (Table III). This premised, we may now proceed to the

Discussion of the Intensity Observations.

In the examination of the intensity observations, it will be found convenient and necessary, to divide them into three several classes, and to discuss the observations with each needle—cylinder rather—in each class separately; thus—

Class 1st.—*Observations made from Madras to Trivandrum and back again.*

— 2d.—*Observations made from Tellicherry to Trivandrum.*

— 3d.—*Observations made from Madras to Ongole and back again.*

CLASS I.

If we now attentively examine Table II, in which this arrangement has been made for the first class of the cylinder T. G. T. No. 1, we perceive that the numbers in the column "difference," decrease pretty uniformly, in something like a geometrical progression, corresponding to an arithmetical advance of the time,—until at *Nagracoil*, we find that for nearly a month, no alteration had taken place in its intensity. If we examine the observations with cylinder T. G. T. No. 2, we find that precisely the same circumstance occurs; and on examining T. G. T. No. 3, it appears, that—with the exception of a difference of 10,00 seconds caused by the cylinder having been let fall,—during nine weeks its intensity remained unchanged. If then it be admitted for cylinders Nos. 1 and 2, that they had arrived at a fixed state of intensity on the 25th August; and that No. 3 had done so on the 2d August, it only remains, that we should cancel the observations made previously to these dates, and adopt those made subsequent thereto. One circumstance, however, must be noticed with regard to cylinders Nos. 1 and 2, namely—that the observations at eight stations made in the course of our *onward* march, (between Negapatam and Palamcottah), have purposely been omitted; the cylinders when at these places not having arrived at a fixed state of intensity, the observations must necessarily be given up. With regard to the two cylinders constructed by Mr. Caldecott, I have already mentioned that I had submitted them to rather rough usage; by which their intensities had at once been reduced to the amount of several seconds for performing 100 vibrations; my intention was to bring them at once to a fixed state of intensity, for I can state with considerable confidence, that *when a needle is magnetized to saturation, its loss of magnetic intensity is due alone to the necessary violence employed in its use.* I have employed a cylinder which was magnetized to saturation for a month—not touching it—without its having parted with any portion of its magnetism; but on applying the armature, and then again vibrating it, a change of several seconds has immediately resulted. In confirmation of these views, it will be noticed that on the return of cylinders J. C. 1 and 2 to Trivandrum, after an absence of ten weeks, in which they had travelled over 1200 miles,

No. 1 had varied its intensity + 0.40 ^{s} in performing
2 —— —— —— — 0.87 100 vibrations.

TABLE II.

CLASS Ist—Cylinder T. G. T. No. 1.

Date.		Place.	Obs. time of 100 vibrs.	Rate of Chronometer	Thermometer.	Correction for			Time of 100 vibrs. at 60° Temperature	Difference.
						Arc.	Rate.	Temp.		
1837			s	m s	°	s	s	s	s	s
July	18	Madras	259,16	+ 0 8,0	85,6	—,572	— ,024	— ,275	259,14	— 14,84
October	16	„	274,23	— 0 21,5	85,5	,604	+ ,070	,286	273,98	
July	24	Sadras	262,50	— 0 1',0	87,4	,579	+ ,033	,368	262,62	9,98
October	14	„	272,87	— 0 21,5	85,0	,601	+ ,068	,259	272,60	
October	13	Allumparva	274,53	— 0 2',5	89,0	,604	+ ,068	,468	274,46	
July	27	Pondicherry	266,56	— 0 11,0	87,7	,587	+ ,032	,388	266,39	7,65
October	12	„	274,13	— 0 21,5	88,5	,604	+ ,068	,113	274,04	
July	31	Porto Novo	268,30	— 0 12,0	89,5	,591	+ ,039	,484	268,23	5,52
October	11	„	273,80	— 0 21,5	89,1	,604	+ ,068	,486	273 75	
August	2	Sheally	269,53	— 0 12,0	86,0	,593	+ ,039	,3 6	269,28	5,12
October	10	„	274,87	— 0 21,5	83,2	,605	+ ,068	,166	274,50	
August	7	Tranquebar	270,97	+ 3 49,0	92,8	,596	— ,689	,656	270 36	
	10	„	270,20	— 0 12,0	87,6	,595	+ ,039	,389	270,03	4,00
October	7	„	274,20	— 0 21,5	91,5	,604	+ ,068	,540	274,20	
August	11	Negapatam	270,70	+ 3 49,0	92,1	,596	— ,715	,632	270,02	3,45
October	3	„	273,97	— 0 21,5	80,2	,603	+ ,068	,010	273,47	

CLASS Ist.—Cylinder T. G. T. No. 1 *continued.*

Date.		Place.	Obs. time of 100 vibrs.	Rate of Chronometer	Thermometer.	Correction for Arc.	Correction for Rate.	Correction for Temp.	Time of 100 vibrs. at 80° Temperature	Difference.
1837			*s*	*s m*	°	*s*	*s*	*s*	*s*	*s*
August	24	Pallamcottah	267.50	+ 3 49.0	95,5	—,589	— ,709	+,775	266,98	* 8,55
September	22	„	275,67	— 0 21,5	87,6	,607	+ ,068	,400	275,53	or 3,20 perhaps.
August	25	Nagracoil	275,10	+ 3 48,0	86,7	,606	— ,724	,353	274.12	0,29
September	21	„	274,63	— 0 21,5	86,2	,605	+ ,064	,321	274,41	
August	28	Trivandrum	275,57	+ 3 46,5	84.7	,607	— ,709	,245	274.50	— 0,51
September	16	„	274,20	— 0 20,5	86,4	,605	+ ,064	,332	273,99	
September	26	Teutocorin	274,77	— 0 20,0	85,8	,605	+ ,068	,303	274,54	
September	30	Paumban	274,47	— 0 20,0	87,6	,605	+ ,068	,395	274,33	

* The observation on the 24th August is from the mean of two sets; thus—
In the outer verandah: time of 100 vibrations 267,60*s*:—removed to a distance of 30 or 40 yards into a cocoanut tope the time of 100 vibrs. = 267*s*,41.
Notwithstanding this agreement, I think we must have counted 98 vibrations only instead of 100, which is a mistake very easily committed.
The other observation (that on 22d September), was made under the verandah of a house in the Fort, near to the commanding officer's quarters, and three-fourths of a mile from the above.

CLASS Ist—Cylinder T. G. T. No. 2.

Date.		Place.	Obs. time of 100 vibrs.	Rate of Chronometer	Thermometer.	Correction for Arc.	Correction for Rate.	Correction for Temp.	Time of 100 vibrs. at 80° Temperature	Difference.
1837			s	m s	°	s	s	s	s	s
July	18	Madras	271,42	+ 0 8.0	85,5	—,599	— ,035	+ ,281	271,14	20,27
October	16	„	291,70	— 0 21,5	85,0	,641	+ ,072	,277	291,41	
July	24	Sadras	273 53	— 0 11,0	87.5	,603	+ ,035	,392	273.35	17,30
October	14	„	291,00	— 0 21,5	84,0	,641	+ ,072	,221	290,65	
do	13	Allumparva	292,03	— 0 21,5	88,8	,644	+ ,072	,484	291,94	
July	27	Pondicherry	282,26	— 0 11,0	87,4	,623	+ ,036	.396	282,07	9,66
October	12	„	291,83	— 0 21,5	88,6	,644	+ ,072	,475	291,73	
July	31	Porto Novo	281,50	— 0 12,0	88,6	,621	+ ,039	,460	281,38	10,35
October	11	„	291,66	— 0 21,5	90,6	,642	+ ,072	,586	291,68	
August	2	Sheally	285,65	— 0 12,0	86,4	,629	+ ,039	,347	285,41	6,33
October	10	„	292,10	— 0 21,5	83,8	,644	+ ,072	,211	291,74	
August	7	Tranquebar	284,93	+ 3 49,0	92,4	,628	— ,758	,667	284,13	
„	10	„	281,53	— 0 12,0	87,3	,627	+ ,039	,394	284,34	8,23
October	7	„	292,87	— 0 21,5	91,2	,644	+ ,072	,160	292,46	
August	11	Negapatam	285,33	+ 3 49.0	92,5	,629	— ,759	,672	284,61	6,97
October	3	„	292,13	— 0 21,5	80,4	,643	+ ,072	,022	291,58	

CLASS Ist--Cylinder T. G. T. No. 2 *continued.*

Date.	Place.	Obs. time of 100 vibrs.	Rate of Chronometer	Thermometer.	Correction for Arc.	Correction for Rate.	Correction for Temp.	Time of 100 vibrs. at 80° Temperature	Difference.
1837		s	m s	°	s	s	s	s	s
August 24	Pallamcottah	*286,73	+ 3 49,0	90,7	—,633	— ,760	+,576	285.91	8,96
September 22	„	295,03	— 0 21,5	87,6	,65	+ ,073	,423	294,87	
August 25	Nagracoil	293.60	+ 3 48.0	86,7	,647	— ,774	,372	292.55	0,80
September 21	„	294,57	— 0 20,5	86,4	,646	+ ,070	,356	293,35	
August 28	Trivandrum	295.47	+ 3 46,5	84,7	,651	— ,774	,264	294,31	—0,74
September 16	„	293,80	— 0 20,5	86,3	,647	+ ,070	,351	293,57	
September 26	Teutocorin	293,97	— 0 20,0	85,6	,646	+ ,068	,312	293,70	
September 30	Paumban	292,07	— 0 20,0	85,8	,643	+ ,067	,322	291,82	

* After making this observation I let the needle fall from my hand to the ground.

CLASS 1ST.—Cylinder T. G. T. No. 3.

Date.		Place.	Obs. time of 100 vibrs.	Rate of Chronometer	Thermometer.	Correction for Arc.	Correction for Rate.	Correction for Temp.	Time of 100 vibrs. at 80. Temperature	Difference.
1837			s	m s	°	s	°	s	s	s
July	18	Madras.....	245,82	+ 0 8,0	86,0	−,542	− ,022	+ ,241	245,54	20,54
October	16	„	266,30	− 0 21,5	86,0	,582	+ ,066	,301	266,08	
July	24	Sadras	247,80	− 0 11,0	86,3	,546	+ ,032	,297	247,59	18,02
October	14	„	265,83	− 0 21,5	85,7	,583	+ ,066	,284	265,60	
October	13	Allumparva	266,67	− 0 21,5	83,7	,584	+ ,066	,445	266,60	
July	27	Pondicherry	250,49	− 0 11,0	87,8	,551	+ ,032	,370	250,34	15,87
October	12	„	266,27	− 0 21,5	89,0	,584	+ ,066	,455	266,21	
July	31	Porto Novo	253,75	− 0 12,0	88,8	,557	+ ,035	,424	253,65	13,78
October	11	„	267,27	− 0 21,5	93,0	,564	+ ,067	,656	267,43	
August	2	Sheally....	256,80	− 0 12,0	87,3	,563	+ ,036	,356	256,63	9,78
October	10	„	266,70	− 0 21,5	84,4	,583	+ ,067	,221	266,41	
August	7	Tranquebar....	257,00	+ 3 49,0	91,7	,560	− ,678	,566	256,43	11,80
„	10	„	255,53	− 0 12,0	87,1	,559	+ ,036	,345	255,35	
October	7	„	267,60	− 0 21,5	92,0	,585	+ ,067	,611	267,69	
August	11	Negapatam....	257,77	+ 3 49,0	93,0	,563	− ,684	,637	257,16	11,35
October	3	„	269,03	− 0 21,5	80,0	,584	+ ,066	,000	268,51	

CLASS 1st.—Cylinder T. G. T. No. 3.

Date.		Place.	Obs time of 100 vibrs.	Rate of Chronometer	Thermometer.	Correction for Arc.	Correction for Rate.	Correction for Temp.	Time of 100 vibrs. at 80. Temperature	Difference.
1837			s	m s		s	s	s	s	
August	13	Manargoody	260,43	+ 3 49,0	88.8	—,569	— ,670	+ ,434	259 63	
,,	14	Puttoocottah	260,83	+ 3 49,0	88.0	,569	— ,670	,395	259 99	
,,	15	Munamelegoody	259.90	+ 3 49,0	85.8	,568	— ,668	,282	25[illegible] 93	
,,	16	Kalchennary	259,90	+ 3 49,0	87.6	,568	— ,668	,371	259,01	
,,	18	Rannad	260,43	+ 3 49,0	88.8	,569	— ,6 9	,434	259,61	
September	30	Paumban	267,63	— 0 20,0	84.4	,584	+ ,064	,222	267,33	
August	20	Carryshandy	260,57	+ 3 49,0	93,8	,569	— ,689	,686	260,00	
,,	21	Vadinatrum	260,67	+ 3 49,0	96,0	,569	— ,689	,793	260,20	
,,	22	Powani	260 53	+ 3 49,0	89,8	,569	— ,689	,486	259,76	
September	26	Teutocorin	266,93	— 0 20,0	85,8	,582	— ,064	,294	266,71	
August	24	Pallamcottah	256,13	+ 3 49,0	94,6	,561	— ,682	,713	255,60	13,87
September	22		269,60	— 0 21,5	87,7	,590	+ ,066	,395	269,47	
August	25	Nagracoil	25[illegible],47	+ 3 48,0	86,6	,567	— ,681	,323	257,55	12,36
September	21		269,07	— 0 20,5	87,2	,589	+ ,065	,368	269,91	
August	28	Trivandrum	* 257,47	+ 3 46,5	84,7	,569	— ,681	,232	258,45	10,62
September	13		269,27	— 0 20,5	86,3	,589	+ ,065	,322	269,07	

* Immediately after marking this observation the cylinder accidentally dropped from my hand upon the ground, when it appeared, that an alteration in the time of making 100 vibrations to the amount of 10,00 seconds had taken place.

CLASS Ist. Cylinder J. C. No. 1.

Date.		Place.	Obs. time of 100 vibrs.	Rate of Chronometer	Thermometer.	Correction for Arc.	Correction for Rate.	Correction for Temp.	Time of 100 vibrs. at 80. Temperature	Difference.
1837			s	m s	°	′	s	s	s	s
September	16	Trivandrum	204.67	— 0 1,0	86,6	— 452	0,000	,256	204,47	—0,40
November	22	,,	204 37	0,0	84,0	,452	0,000	,156	204,07	
September	21	Nagracoil	203·37	— 20,5	86,5	,448	+ ,050	,251	203,22	
,,	22	Pallamcottah	204.33	— 21.5	87,7	,451	.050	,297	204,23	
,,	26	Teutocorin	202.93	— 21.5	85.0	,447	,050	,193	202,73	
,,	30	Paumban	202.40	— 21,5	88,4	,445	,050	,321	202.33	
October	3	Negapatam	202.13	— 21.5	82 7	,445	,050	104	201 84	
,,	7	Tranquebar	202.33	— 2 .5	92.0	,445	,050	,460	202 40	
,,	10	Sheally	202.37	— 21.5	86,6	,445	,050	,252	202,23	
,,	11	Porto Novo	201.83	— 21,5	92 6	,445	,050	,482	201,92	
,,	12	Pondicherry	202.10	— 21,5	89 6	,445	,050	,364	202,07	
,,	13	Allumparva	203.13	— 21,5	90 0	,448	,050	,386	203,12	
,,	14	Sadras	200.83	— 21,5	86,0	,442	,050	2..9	200,67	
,,	16	Madras	202.12	— 21,5	86,2	,445	,050	,240	201,97	

CLASS Ist. Cylinder J. C. No. 2.

1837										
September	20	Trivandrum	278,17	— 0 1,0	86.6	—,613	0,000	+ 0.348	277.91	+ 0,87
November	12	,,	279,18	0.0	83,9	,615	,000	,208	278.78	
September	21	Nagracoil	277,30	— 20,5	86,0	,611	+ ,066	,316	277.07	
,,	22	Pallamcottah	278,23	— 21.5	88,4	,613	,069	,445	278,13	
,,	26	Teutocorin	276,00	— 21.5	85.0	,608	,069	,262	275.72	
,,	30	Paumban	278,43	— 21.5	88,4	,613	,069	,445	277,33	
October	3	Negapatam	278.67	— 21,5	92,6	,613	,069	,136	278,26	
,,	7	Tranquebar	278,60	— 21,5	9 ,8	,613	,069	,627	278.68	
,,	10	Sheally	279,70	— 21.5	56	,616	,069	,297	279,39	
,,	11	Porto Novo	278,73	— 21,5	93,0	,613	,069	,690	278,84	
,,	12	Pondicherry	279.00	— 21,5	89,6	,614	,069	,509	278,96	
,,	13	Allumparva	279,50	— 21,5	90,0	,615	,069	,533	279.49	
,,	14	Sadras	277,30	— 21,5	86 0	,611	.069	,315	277,09	
,,	16	Madras	277,85	— 21,5	86,2	,612	.069	,325	277,64	

A few days after my arrival at Madras, having completed the observations of Class I., I despatched the cylinders in a banghy parcel for *Cochin*, where they were met by Mr. Caldecott, for the purpose of making the observations which follow. In comparing the times of performing 100 vibrations at Trivandrum now observed, with those obtained when I left there, it appears that the Cylinder T. G. T. No 1, had diminished its intensity* by about 6 seconds, and No. 2 had diminished 1,2 seconds† in performing 100 vibrations; a circumstance which could only be expected, on considering the rough usage to which, in all probability, parcels are subjected by the banghy runners; such however is not the case with the other cylinder (No. 3), nor with J. C. Nos. 1 and 2; these last no doubt owe their invariableness to the rough usage to which I had previously subjected them—having performed at once what otherwise would have been performed by degrees.—In addition to the two cylinders J. C. No. 1 and No. 2, Mr. Caldecott had now constructed a third; which appears to have arrived at a fixed state of intensity; since, during 27 days (in which observations of this class were being made) its intensity diminished only 0, 19*s*. for 100 vibrations: this cylinder differed from the other two, in its length only; a circumstance which arose from its extreme brittleness, by which one end (about $\frac{1}{4}$ an inch) broke off, in polishing, after it had been tempered.

* It is somewhat curious, although quite accidental no doubt, that

			s	
No. 1	has lost	altogether	20,68	in performing 100 vibrations.
2	—	—	20,37	
3	—	—	20,54	

† This decrease of intensity in No. 2 is I think rather chargeable to other causes.

CLASS 2B.—Cylinder J. C. No. 1.

Date.		Place.	Obs. time of 100 vibrs.	Rate of Chronometer	Faht. Thermometer.	Correction for Arc.	Correction for Rate	Correction for Temp.	Time of 100 vibrs. at 80. Temperature	Difference.
1837			s	m s	°	s	s	s	s	
September	16	Trivandrum	204,67	- 0,1,0	86,6	,452	0,00	+ ,258	204,48	
November	22	"	204,37	0,0,0	84,0	,452	,00	+ ,156	204,07	
December	5	"	203,97	0,0,0	79,1	,450	,00	— ,036	203,48	
November	15	Quilon	205,47	0,0,0	83,0	,453	,00	+ ,117	205,14	
"	13	Allepee	205,37	0,0,0	79,7	,453	,00	— ,012	204,91	
"	9	Balghatty	203,71	0,0,0	80,3	,449	,00	+ ,012	203,28	
"	6	Chetwaye	204,36	0,0,0	82,7	,450	,00	+ ,105	204,02	
"	5	Penaney	201,96	0,0,0	82,5	,445	,00	+ ,096	201,62	
"	4	Calicut	202,80	0,0,0	84,7	,446	,00	+ ,181	202,54	
"	1	Tellicherry	203,49	0,0,0	82,2	,448	,00	+ ,083	203,13	

CLASS 2D.—Cylinder J. C. No. 2.

1837										
September	20	Trivandrum	278,17	— 0,1,0	86,6	,613	0,00	+ ,349	277.91	
November	22	"	279,18	0,0,0	83,9	,615	,00	,408	278.78	
December	5	"	279,28	0,0,0	79,5	,616	,00	— ,026	278.64	
November	15	Quilon	280,99	0,0,0	83,1	,620	,00	+ ,165	280.54	
"	13	Allepee	280,79	0,0,0	76,0	,619	,00	— ,214	279.96	
"	9	Balghatty	278,85	0,0,0	80,3	,614	,00	+ ,016	278.26	
"	6	Chetwaye	279,55	0,0,0	82,3	,616	,00	+ ,122	279.06	
"	5	Penaney	278,81	0,0,0	82,6	,614	,00	+ 138	278.34	
"	4	Calicut	279,28	0,0,0	84,9	,616	,00	+ ,261	278.93	
"	1	Tellicherry	279,91	0,6,0	84,7	,617	,00	+ ,250	279.55	

CLASS III.

Immediately after making the above observations, which were performed altogether by Mr. Caldecott, he despatched the cylinders to Madras, for the purpose of enabling me to make the observations to the north of this place; the carriage of them was necessarily effected as before by the banghy runners; save that Mr. Caldecott had taken the precaution to place the cylinders in grooves cut in a little box, made on purpose for their reception; and the whole was tightly secured by cotton. Notwithstanding this precaution, on the arrival of the box at Madras, the cylinders were all found huddled together in one corner of the box, the insufficient quantity of cotton which remained, allowing them to play about in any manner they pleased; it was in fact but too evident that the box had been opened to ascertain its contents, and had not been packed again with anything like care. Thus circumstanced, the needles, which had necessarily lost a considerable degree of intensity, were now employed during two months by my assistant *Tannyachellum*, by way of learning; when, finding that during this time they bore rough handling without losing any portion of their intensity, on the 21st April I despatched them by *Tannyachellum* to Ongole, when the following observations were made :—

CLASS IIIb.—Cylinder T. G. T., No. 1.

Date.	Place.	Obs. time of 100 vibrs.	Rate of Chronometer	Thermometer.	Correction for Arc.	Correction for Rate.	Correction for Temp.	Time of 100 vibrs. at 80 Temperature	Mean.
1838		s	m s	°	s	s	s	s	s
April 20	Madras	283,00	— 0,18.5	86,0	— ,623	+ ,060	+ ,060	282,50	282,37
June 16	,,	282,30	— 0,18,5	89,5	,622	,060	+ ,509	282,25	
1839									
January 17	,,	282 78	— 0, 0,5	79,0	,623	,000	— ,053	282,10	
1838									
April 29	Poodaway	283,33	— 0,18,5	95,0	,624	+ ,060	+ ,807	283.57	284,03
June 7	,,	284,43	— 18,5	91,7	,626	,060	,632	284,50	
May 7	Sooloorpet	283,40	— 18,5	104,0	,624	,060	1,184	284.02	284,85
June 3	,,	285,67	— 18,5	100,5	,629	,060	0,572	285,67	
May 9	Woogilly	283,43	— 18,5	99,5	,624	,060	,512	283.38	283,87
June 1	,,	284,55	— 18,5	97,0	,626	,060	,379	284.36	
May 12	Nellore	283,53	— 18,5	102,5	,624	,060	,672	283,64	284,57
do. 29	,,	285,67	— 18,5	87,5	,629	,060	,406	285,51	
do. 14	Alloor	284,20	— 18.5	106,7	,625	,060	1,441	285.08	285,53
do. 27	,,	285,60	— 18,5	97,5	,628	,060	0,955	285,99	
do. 16	Ramapatam	284,53	— 18,5	108,5	,626	,060	1,542	285.51	285,51
do. 23	,,	285,50	— 18,5	90,7	,628	,060	0,578	285,51	
do. 19	Ongole	282,93	— 18,5	96.7	,623	,060	,899	283 27	283,88
do. 20	,,	284,17	— 18,5	96,0	,625	,060	,866	284,49	

CLASS IIID.—Cylinder T. G. T., No. 2.

Date.	Place.	Obs. time of 100 vibrs.	Rate of Chronometer	Thermometer.	Correction for			Time of 100 vibrs. at 80 Temperature	Mean.
					Arc.	Rate.	Temp.		
1838		s	m s	°	s	s	s	s	s
April 20	Madras	312,93	— 0,18,5	85.2	— ,688	+ ,067	+ ,312	312.62	312,31
June 16	„	312,05	— 0,18,5	90,0	— ,686	,067	,580	312,01	
1839									
January 17	„	311,47	— 0, 0,5	85,0	,685	,067	,282	311,13	
1838									
April 29	Poodaway	312,40	— 0,18,5	93.5	,687	,067	,786	312,57	312,86
June 7	„	313,07	18,5	91,7	,688	,067	,697	313,15	
May 7	Sooloorpet	314.57	18,5	102,0	,692	,067	1,375	315,32	315,18
June 3	„	314,10	18,5	105,0	,690	,067	1,562	315,04	
May 9	Woogilly	311,87	18,5	104,0	,686	,067	1,378	312,63	313,49
June 1	„	313,93	18,5	97,0	,690	,067	1,039	314,35	
May 12	Nellore	313.00	18,5	102.5	,688	,067	1,316	313,71	313,37
do. 29	„	313,17	18,5	88,0	,688	,067	0,478	313,03	
do. 14	Alloor	313.70	18,5	106,0	,689	,067	1,578	314,66	314,80
do. 27	„	314,50	18,5	97,0	,691	,067	1,057	314,93	
do. 16	Ramapatam	313,60	18,5	106.5	,689	,067	1,598	314,58	314,35
do. 23	„	314 20	18,5	90,7	,690	,067	0,655	314,13	
do. 19	Ongole	314,10	18,5	97.0	,690	,067	1,045	314 52	313,97
do. 20	„	313,10	18,5	96,0	,688	,067	0,950	313,43	

CLASS IIIb.—Cylinder T. G. T. No. 3.

Date.	Place.	Obs. time of 100 vibrs.	Rate of Chronometer	Thermometer.	Correction for Arc.	Correction for Rate.	Correction for Temp.	Time of 100 vibrs. at 80 Temperature	Mean.
1838		s	m s		s	s	s	s	s
April 20	Madras	277,10	— 0,18,5	85,0	— ,610	+ ,058	+ ,263	276,81	276,96
June 17	,,	277,13	— 0,18,5	90,5	,611	,058	,554	277,13	
1839									
January 17	,,	277,70	— 0 0,5	85,1	,612	,058	,268	277,41	
1838									
April 29	Poodaway	277,77	— 18,5	95,0	,612	,058	,792	278,01	278,36
June 7	,,	278,67	18,5	91,5	,614	,058	,609	278,72	
May 7	Sooloorpet	277,40	18,5	102,0	,611	,058	1,162	278,01	279,13
June 3	,,	279,40	18,5	106,7	,616	,058	1,418	280,26	
May 9	Woogilly	277,05	18,5	102,0	,610	,058	1,157	277,65	278,50
June 1	,,	279,00	18,5	97,0	,615	,058	,901	279,31	
May 12	Nellore	278,31	18,5	102,5	,612	,058	1,190	278,95	278,66
do. 29	,,	278,50	18,5	88,0	,614	,058	,424	278,37	
do. 14	Alloor	279,95	18,5	106,0	,617	,058	1,383	280,77	279,95
do. 27	,,	278,80	18,5	96,5	,615	,058	,872	279,12	
do. 16	Ramapatam	278,10	18,5	105,5	,612	,058	1,320	278,87	279,03
do. 23	,,	279,20	18,5	90,5	,615	,058	,557	279,20	
do. 19	Ongole	278,21	18,5	97,5	,612	,058	,923	278,68	279,54
do. 20	,,	280,15	18,5	97,0	,617	,058	,905	280,50	

To deduce from these values of the times occupied by each cylinder to perform 100 vibrations, the relative horizontal magnetic intensities at the several places; let T represent the time of any needle performing 100 horizontal vibrations at *Madras*; and T′, the time occupied by the same needle, to perform 100 vibrations at any other place, and let h, and h' represent the horizontal intensities at those places: then we get

$$\frac{h}{h'} = \left(\frac{T'}{T}\right)^2.$$

Applying this formula to the *Madras* and *Trivandrum* observations, and putting $h = 1$ we have

	T.G.T. 1.	T.G.T. 2.	T.G.T. 3.	J. C. 1.	J. C. 2.
MADRAS.....	273°,98	291°,41	266,08	201,97	277,64
TRIVANDRUM....	274,50	294.31	———	204.47	277,91
	273,99	293,57	269,07	204,07	278,78
h' = ...	0,998032	0,982860	0,977899	0,977608	0,994905

Mean value of h' = ,98626

Assuming h' as just found, if we now compare the observations made between *Vadinatrum* and *Tellicherry* with those made at *Trivandrum*; and (recollecting that $h = 1$,) compare the observations at the remaining stations with those made at *Madras*, we get altogether as follows:—

TABLE IV.

A table of the observed horizontal Magnetic force relative to Madras assumed = 1.

Place.			T. G. T. 1	T. G. T. 2	T. G. T. 3	J. C. 1.	J. C. 2	J. C. 3	Mean.
Ongole	....	.....	0,9894	0,9894	0,9816	.....	.....	.....	0,9868
Ramapatam	....	.....	,9781	,9870	,9852	.....	.....	.....	,9834
Alloor	....	....	,9780	,9842	,9790	.....	.....	.....	,9804
Nellore	.....	.....	,9816	,9933	,9878	.....	.....	.....	,9886
Woogilly	....	.....	,9895	,9925	,9890	.....	.....	.....	,9903
Sooloorpet	....	...	,9827	,9819	,9845	.....	.....	.....	,9830
Poodaway	.....	....	,9883	,9965	,9900	.....	.....	.....	,9913
Madras	....	....	1,0000	1,0000	1,0000	1,0000	1,0000	1,0000	1,0000
Sa iras	....	....	1,0101	,0052	1,0036	1,0130	,0010	.....	1,0072
Allumparva	....	....	0,9965	,9964	,9961	,9887	,9868	.....	0,9929
Pondicherry	....	....	0,9996	,9978	,9990	,9990	,9906	.....	,9972
Porto Novo	....	....	1,0017	,9931	,9899	1,0005	,9911	.....	,9962
Sheally	....	....	0,9962	,9977	,9893	0,9974	,9875	.....	,9936
Tranquebar	....	....	0,9984	,9928	,9887	0,9958	,9926	.....	,9937
Negapatam	....	....	1,0037	,9988	,9797	1,0012	,9956	.....	,9958
Manargoody	....	....	.....	.....	,9773	.....	.....	.....	,9773

TABLE IV—*continued.*

A table of the observed horizontal Magnetic force relative to Madras assumed = 1.

Place.	T.G.T.1	T.G.T.2	T.G.T.3	J.C.1.	J. C. 2	J. C. 3	Mean.
Puttoocottah	.....	.....	,9746	.....	.....	.....	,9746
Munamelegoody	.....	.....	,9826	.....	.....	.....	,9826
Kalehennary	.....	.....	,9820	.....	.....	.....	,9820
Ramnad	.....	.....	,9775	.....	.....	.....	,9775
Paumban	,9857	,9972	,9952	,9964	1,0023	.....	,9953
Carryshandy	.....	.....	,9745	.....	.....	.....	,9745
Vadinatrum	.....	.....	,9730	.....	.....	.....	,9730
Powani	.....	.....	,9763	.....	.....	.....	,9763
Teutocorin	,9842	,9854	1,0038	1,0021	1,0020	.....	,9955
Pallamcottah	,9888	,9776	,9970	,9866	,9847	.....	,9869
Nagracoil	,9862	,9877	,9866	,9965	,9923	.....	,9898
Trivandrum	,9771	,9863	,9863	0,9863	,9863	,9863	,9863
Quilon	,9774	,9854	,9685	,9824	,9739	,9695	,9762
Allepee	,9780	,9840	,9687	,9801	,9780	,9729	,9769
Balghatty	,9926	,9993	,9844	,9959	,9899	,9956	.9929
Chetwaye	,9856	,9963	,9840	,9887	,9843	,9892	,9880
Penaney	,9956	,9967	,9839	1,0123	,9894	,9960	,9956
Calicut	,9958	,9935	,9890	1,0032	,9852	,9987	,9942
Tellicherry	,9934	,9875	,9831	0,9971	,9808	,9955	,9896

These results appear, on the whole, as accordant as results from intensity observations generally come; for, independent of the known corrections and unavoidable errors which occur to observations of this nature, there are without doubt others of whose disposition we are ignorant; a fact, that will be rendered sufficiently obvious by consulting the foregoing observations, in which the greatest error of observation from *known causes*, I estimate can never amount to 4-tenths of a second of time; under these circumstances it will be turning the above results to the best account, if we now deduce the intensity of the magnetic equator; for, thus employed, we may fairly hope to get rid of errors of every kind. To arrive at the most accurate result, we must here have recourse to theory; and although the theory that the tangent of the dip is equal to twice the tangent of the magnetic latitude (*tan.* $\delta = 2$ *tan.* λ) is derived from principles which appear, all circumstances considered, to be not strictly true; still, for the small space over which we have occasion to employ it, and that only in a differential sense, its accuracy is fully equal, and indeed superior, to our wants. If to the above formula we add, that, $h = A \cos. \lambda$, where A represents the *total* magnetic force; we arrive, after a little reduction, at the expression

$$h = 2 A \sqrt{\frac{1}{3 + \sec.^2 \delta}} ;$$

from which we will now compute the

Total intensity of the Magnetic force at the Magnetic Equator, horizontal force at Madras = 1.

Place.	Observed values of A.	Mean value.	Difference.
Ongole	0,9920	0,9921	— ,0001
Ramapatam	,9879	.....	— ,0042
Alloor	,9845	.....	— ,0076
Nellore	,9922	.....	+ ,0001
Woojilly	,9933	.....	+ ,0012
Sooloorpet	,9856	.....	— ,0065
Poodaway	,9933	.....	+ ,0012
Madras	1,0019	.....	+ ,0098
Sadras	,0082	.....	+ ,0161
Allumparva	0,9938	.....	+ ,0017
Pondicherry	,9980	.....	+ ,0059
Porto Novo	,9966	.....	+ ,0045
Sheally	,9939	.....	+ ,0018
Tranquebar	,9939	.....	+ ,0018

Place.	Observed values of A.	Mean value.	Difference.
Negapatam.....	,9959	,09921	+ ,0038
Manargoody.....	,9 74		
Puttoocottah.....	,9747		
Munamelegoody.....	,9826		
Kalhennary,.....	,9821		
Ramnad.....	,9775		
Paumban.....	,9953	.....	+ ,0032
Carryshandy.... ...	,9748		
Vadinatrum.....	,9730		
Powani.....	,9763		
Teutocorin.....	,9958	.....	+ ,0037
Palamcottah	,9872	.....	— ,0049
Nagracoil.....	,9898	... .	— ,0023
Trivandrum....	,9867	.....	— ,0054
Quilon.....	,9765	.....	— ,0156
Allepee.....	,9771	.....	— ,0150
Balghatty	,9929	.....	+ ,0008
Chetwaye	,9882	.....	— ,0039
Penaney..	,9958	.....	+ ,0037
Calicut.....	,9946	.....	+ ,0025
Tellicherry.....	.9901	.....	— ,0020

If to each of the above values we were to give a weight proportionate to the number of cylinders employed, we should obtain a mean value possessing the least probable error of observation; but, since in this case the errors due to local causes would not be fairly dealt by, it becomes a question—if a more correct mean value would not be attained, by taking the mean without reference to the number of observations employed; to pursue a middle course, however, we may safely give

to 1 observation a weight 1
— 3 or 4 —— —— 2
and — 5 or 6 —— —— 3

(when, assuming the horizontal intensity at Madras = 1.)

The total magnetic force at the magnetic equator = ,9906

or, rejecting the observations at eight stations made *only* with cylinder T. G. T. No. 3, we get the horizontal intensity of the magnetic equator = ,9921 :—On comparing this with the several constituent values, we obtain the column "difference;" exhibiting the amount of error of observation, mixed up with the effect of local disturbances; the largest of these (that at Sadras), might possibly be accounted for by

the granitic formations there met with (the Sadras hills), but *if so*, Palamcottah and Nagracoil (at which places similar but larger causes for disturbance exist) ought to shew the same; whereas they exhibit a very small, but opposite, tendency. Or it would appear on the whole, *that the distribution of magnetic intensity in Southern India is but little interfered with by local causes*, and, with reference to Madras, that the location chosen for making the observations exhibits an intensity in excess, to the amount of 1,0098 to 1.

Assuming this, we will now compare the magnetic intensity of Madras, and of the magnetic equator with that of London; for which purpose we have the following observations made with the two intensity cylinders belonging to Captain D. Bethune, already adverted to at the commencement of this paper. The observations in London were, I presume, made by Captain Bethune, whereas those at Madras in 1837 were made by Capt. B. and myself conjointly, and those in 1839 by myself alone.

Mean time occupied by Cylinders No. 3 × and No. 3 in making 10 *vibrations, at the temperature of* 60°.

	at Madras.		in London.	
	No. 3 ×	No. 3	No. 3 ×	No. 3
Date.			*s*	*s*
In the year 1835			442.76	461.96
1837.				
April 30 }	*s* 300.30	*s* 309.74		
May 3 }				
1839.				
Jan. 29	303.26	310.83		

A mere glance at these numbers, shews that one, if not both of the cylinders, had diminished its intensity at the time of making the first observations at Madras; and that after twenty-one months (when the second observations were made) they had still further diminished their intensities No. 3 ×, by 2.96*s* and No. 3, by 1.09*s*; hence it would appear probable that in 1835, when the *London* observations were made, these cylinders, with their then stronger intensities, at *Madras* would have performed 100 vibrations in something like 294*s* and 307*s* respectively: as the numbers now stand (recollecting that $\frac{h}{h'}=\left(\frac{T'}{T}\right)^2$; and putting $h=1$ for the horizontal intensity of London)

we get from cylinder No. 3 ×; $k = 2.174$
and ——— No. 3 $k' = 2.225$—

whereas, from the somewhat-probable numbers we have just assumed,

cylinder No. 3 × gives $k_{,} = 2.268$
No. 3 — $k = 2.264$

The latter numbers, if admitted, now remain to be diminished in the proportion of 1.0098 to 1.0000 for the local influence at Madras; when, with reference to the formula at page 269, we get

	Horizontal Intensity.	Total Intensity.
in London.	1	1
Magnetic Equator Longitude 79° E.	2.259	,8065

In conclusion, I cannot but feel regret that I have devoted so much space to the discussion of observations, which in the end have furnished results of but comparatively little importance; but, viewing these observations as a part only of a series, which will probably ere long be extended to the most northern limits of India, and perhaps some parts of Persia, it becomes a question, whether, on the whole, they are not just what could be desired.

MADRAS OBSERVATORY,
9th March, 1839.

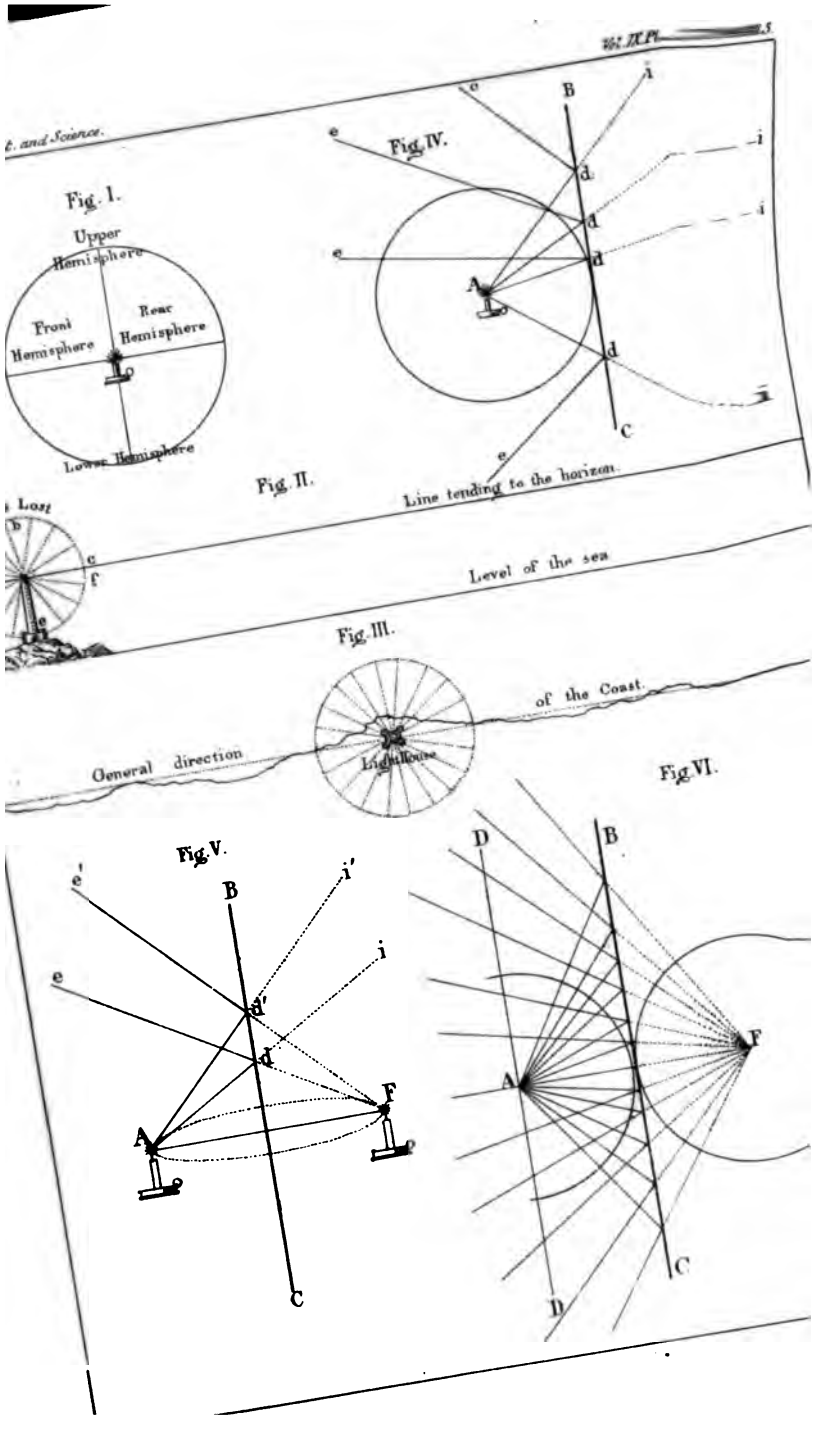


Fig. I.
Upper Hemisphere
Front Hemisphere
Rear Hemisphere
Lower Hemisphere
Fig. II.
Fig. IV.
Line tending to the horizon.
Level of the sea
Fig. III.
Lighthouse
of the Coast.
General direction
Fig. V.
Fig. VI.

III.—*An Investigation of the Nature and Optical efficiency of the combination of Mirrors used to augment the illuminating power of the Madras Light.—By Captain* J. T. Smith, *Engineers, F. R. S.*

To the Editor of the Madras Journal of Literature and Science.

Sir,

On looking through some old papers, I have met with, and have the pleasure to send you the accompanying essay, which was written in the year 1833, with a view to publication, but which from accidental causes was then laid aside. As the subject has more of a local than general interest, and as the evils which are herein pointed out are likely to be soon remedied, I should not now have ventured to request you to give it insertion in your pages, were it not possible that some benefit might result from an exhibition of the defects of a contrivance, which has hitherto been but little studied, and has been supposed by some to possess considerable merit for its simplicity; at a time when the increasing intercourse between the different parts of India, and the urgent demand for the better illumination of our coasts, renders the adoption of a correct theory, and more efficient means, every day more and more desirable.

The analysis which forms the chief object of this paper, owes its origin to an enquiry in which I was engaged at the time I have mentioned, some scattered memoranda of which were collected and arranged in the way in which they now stand; and, in order to introduce the subject to the perusal of the general reader, I have thought it necessary to premise a few general observations on the distribution of light, and the nature and objects of Light-house illumination, together with a few remarks upon the leading principles by which the latter is governed; a distinct understanding of them being almost indispensable to a clear explanation of the mode of investigation which has been adopted.

Madras, *December 8th* , 1838.

Preliminary Observations.—Every luminous point whatever throws out rays in all directions, and is equally visible at the same *distance* in every possible situation. This may be illustrated, by supposing it placed in the centre of a hollow sphere, every portion of the surface of which would receive an equal number of its rays, and be equally illuminated by it.

I shall have occasion hereafter to speak of the upper half of this sphere as the upper hemisphere of rays (Fig. 1 Pl. 3), and the lower half as

the lower hemisphere. In the same manner, of two other similar divisions of it, formed by a plane perpendicular to the former, (which is supposed to be horizontal) as the front and rear hemispheres, as regards the situation of the light in reference to a reflector or any particular object. The rays proceeding *directly* from a luminous body to the eye, and thus visible, may be termed the original or *direct* light, in contradistinction to that visible after *reflection* from any bright surface.

Under most of the circumstances in which light is usually required, as for instance, in illuminating apartments &c. the whole of the rays of direct light, corresponding to every part of the above sphere, are of equal value, those proceeding in an upward direction serving to illuminate the ceiling and upper parts of the room, and those proceeding in a direction *from* the eye, being reflected from other objects and rendering *them* visible; the intention being in this case, to afford as much light as possible to the various objects placed in different situations round the luminous body, and not particularly to throw a large quantity towards the eye; as it is not the *light*, but the *objects*, which it is most desirable should be seen.

In a Light-house, however, the case is just the reverse, for there are here *no* objects whatever to be illuminated, the great point to be attained being to throw as much light as possible to the observer. Now as it is evident that in respect to a luminous body placed in a Light-house the eye can never be situated in any part of the *upper* half of the sphere of rays above alluded to, since the line connecting the light and the horizon would be barely even horizontal, it follows that the whole of those rays must be entirely lost. If the Light-house from being insulated be required to illuminate the circumference of the horizon all round, nearly all the remaining, or lower half of the sphere of rays, will be effective, as those which fall below the horizon line will be visible from points nearer to the light, and consequently forming an angle of depression with it; and the only rays of the lower hemisphere lost will be those intercepted by the brick work of the building itself. This will I hope be clearly understood by a reference to FIG. 2 which represents a vertical section of a Light-house situated as above supposed, and in which the unserviceable rays, or those lost in consequence of their emanating in directions *above* the level of the horizon, are comprised within the semicircle *a b c* (which is the *section* of the upper hemisphere before spoken of) while the serviceable rays, or those which are visible from points at different distances from the building, are included within the lower semicircle *d e f*.

In many instances, however, illumination may be required to extend

to only half of the whole circumference of the horizon, which is frequently the case when the situation of the Light-house is on the edge of a straight line of coast, (as at Madras) and it is required merely to be visible from the sea. Under these circumstances, it is evident, that only a half of the before mentioned hemisphere of *serviceable* rays are available for the purpose required, since all that emanate towards the opposite hemisphere fall in rear of the line of coast, and are consequently entirely useless, as exhibited in figure (No. 3). In other words, in such a situation, out of the whole sphere of rays proceeding from the luminous object, one half is lost owing to their being projected in directions *above* the horizon, and one half *of the remaining half* by falling in rear of the line of coast.

In other cases, when the situation is such as to require a greater or less portion of the circumference of the horizon to be illuminated, as for instance, if the Light-house be placed upon a promontory, or within a channel or harbour, the ratio of the serviceable rays to the whole illuminating power of the lower hemisphere will be in proportion to the extent of that part of the circumference whence they are required to be seen, to the whole periphery of the circle. When this ratio is one half, or 180° the proportion of the rays from which benefit is derived is as before stated, one half of the inferior hemisphere, shown in Fig. 2, or ¼ of the whole of the rays proceeding from the luminous body, no advantage whatever being derived from the remaining three-fourths.

The great loss of light here shown to occur in situations similar to that of the Madras Light-house, has led amongst other contrivances, to the invention of metallic and glass mirrors for the purpose of reflecting as many as possible of these truant rays, by diverting them from their natural directions into others in which they would be visible.

These mirrors may be either plane or curved.

It is my intention in this paper merely to consider the properties of plane mirrors, with a view of estimating the assistance they afford when arranged in the manner in which they are at present applied in the Madras Light-house, my object in selecting that work being principally to put an end to all doubts as to the possibility of great improvement in it, and at the same time, if possible, to lead the way to the rejection and removal of a clumsy contrivance, by demonstrating the extreme inefficiency of the arrangement, and tracing it to its proper causes.

Previous, however, to entering upon this investigation, it is necessary to prepare the way for it by a brief attention to a few of the fundamental laws of optics upon which it is founded, and which I hope I shall be ex-

cused for taking notice of in this place, as although devoid of novelty and interest to the scientific reader, they are nevertheless indispensable to a proper understanding of what follows, by those who may have devoted less of their time and attention to the subject.

When the rays of light proceeding from a luminous point are reflected from a plane, they proceed *after* reflection in lines which will slope as much *from* the plane as they before sloped *towards* it.—Namely, if A *d*, A *d'* (FIG. 5) be any rays of light proceeding from a point A and striking a plane B C, they will *after* reflection slope *from* the plane at angles B *d e*, B *d' e'*—equal to the angles A *d* C, A *d'* C at which they before sloped *towards* it. Hence it may be easily deduced that the obliquity of the rays *d e*. *d' e'*—from the *front* of the plane is exactly the same as that of the lines *d i*, *d' i'*, in which they would have proceeded to the *rear* of it if not intercepted. The effect of the reflection being exactly the same as of the light at A were turned half round an imaginary axis B C to a new position at F, so that the rays proceeded to the front instead of the rear of plane as shown in the figure.

It must also be remarked, that the divergence of the rays with respect to one another remains unaltered, the angle *e f e'* being in every case unchanged, and continuing equal to the angle *i a i'*, the effect being merely to *reverse* the whole of the rays composing the hemisphere of light next the plane, without in the least interfering with their relative inclinations.

If we now suppose a plane polished surface to be placed immediately in rear of the imaginary sphere of light before spoken of, it will be easy to understand from what has just been explained, that its effect would be to turn the whole* of the rays comprised in the rear hemisphere, and cause them to proceed in directions exactly similar to those pursued by the rays emanating from the front one. In applying this to the aid of Light-house illumination, therefore, such a contrivance, would, in cases when only half of the circumference of the horizon is required to be illuminated, *double* the useful light, by in fact converting one complete sphere of luminous rays into *two front*, instead of one front, and one rear hemisphere.

What has been hitherto said has referred only to a single luminous *point* infinitely small, but as the same is equally true regarding every point constituting a body of light of any size, it follows that in every situation from which it has been shown that the rays from a single point

* This of course supposes the plane to be unlimited in extent, as the rays nearest the diameter AD would not meet it, except at an infinite distance. In practice, therefore, the *whole* of the rays cannot be returned by a plane mirror, for the same is true also when taken in a *lateral* direction, and the number lost will depend upon the size of the plane and its distance from the radiant point.

Fig. VII.

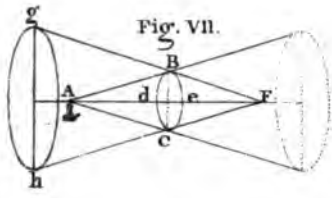


Fig. VIII.

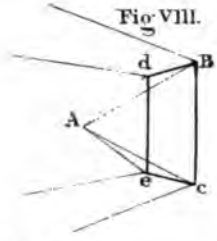


Fig. IX.

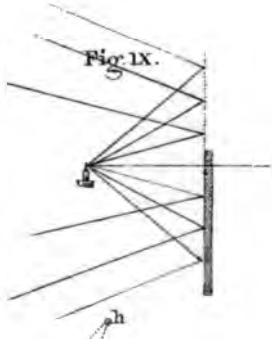


Fig. X.
Reflectors.

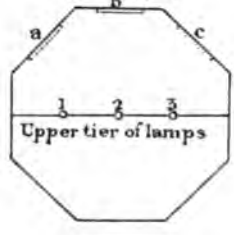


Fig. XII.

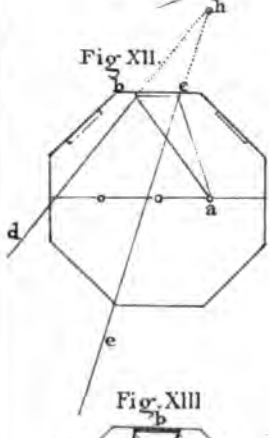


Fig. XI.

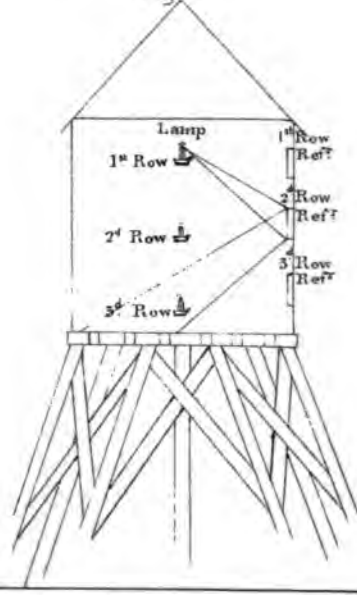
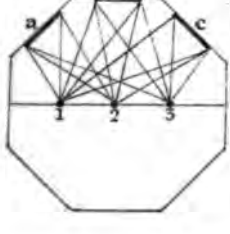


Fig. XIII



would be visible, in the same situations the rays from the other points would also be seen, constituting *images* of the flame or luminous body, of whatever kind.

In this manner an image of a candle will be seen by reflection from a circular looking glass or mirror, in all those situations embraced by a cone of rays proceeding from it in the directions pointed out by the above law—namely, if A (Fig. 7 Pl. 4) be the light, and B C a circular plane mirror, a reflected image of A will be visible from any point within the frustum of the cone B C *g h*, formed by the reflection of the rays impinging on the circular area B *d* C *e*.

If the mirror be *square* then a reflected image of the light will be visible in any part of the *pyramid* of rays, formed in the same way, as shown in Fig. 8.

From what has been said in the former part of this paper, taken in connection with these circumstances, it will be easily seen, that in order to produce the utmost beneficial effect, no part of a plane mirror, if placed vertically, ought to be above the uppermost part of the light to which it is adapted, as in that case, the rays which would be reflected from that part of it, would be those belonging to the *upper* hemisphere, which I have already shown to be useless (vide Fig. 9). I am not aware whether this circumstance has been attended to in the disposition of the reflectors in the Madras Light-house, having never examined the apparatus, but I shall suppose such to be the case, and that they are disposed to the greatest advantage they are capable of, as even were it not so, it is a defect which could be very easily remedied, and it is my object to show, not that a bad use has been made of efficient means, but that the contrivance itself, under the best arrangement, is of much less value and assistance than has generally been supposed.

I shall now proceed to a description of the lantern of this Light-house, and to dissect the operation of, and calculate the value, of the assistance rendered by the reflectors contained in it. In doing this, I shall as I before stated, suppose every mirror to be placed in the most advantageous position (with regard to height), viz., so that the image reflected from the *upper* portion of it is visible on the edge of the horizon, and that the lower portions in turn, successively, afford light to the points nearer to the building itself.

The shape of the lantern is an octagon, three sides of which, towards the land, are opaque, and the remaining five sides glazed. On the three first opaque sides are placed the reflectors, in three rows, one above the other; they are squares of one foot each side, of looking-glass, and occupy the centre of each of the sides of the polygon as shown in the plan Fig. 13.

The lamps, which are 12 in number, are also arranged in three tiers, corresponding to those in which the mirrors are placed, but the number in each row is not the same, that of the top row being 3, in the second 4, and in the third 5.

From the accompanying section (FIG. 11) it is evident, that no assistance whatever is derived by any lamp, from any of the mirrors except those in the *same tier* with itself, an inspection of the figure showing at once, that the image reflected from a mirror situated in the row *beneath* the lamp, would be merely visible at the very foot of the Light-house, even if it did not fall within the limits of the building itself; and I have before said enough to explain, that no benefit whatever would be derived by any aid from a mirror in the tier *above* it, all the rays of which would strike the roof of the lantern, or be lost in the air. It is unnecessary therefore to pay any attention to the operation of the reflectors, with reference to any of the lamps except those belonging to the same tier, and I shall therefore proceed to enquire into the aid afforded by those in each row to every lamp belonging to it, in turn; and admitting the very favourable assumption before alluded to, that the images when visible at any point on the horizon, will also be visible at every point in a direct line between it and the Light-house, shall now measure the extent of the circumference in a *lateral* direction through which this effect will take place.

In order to calculate this, it is merely necessary to consider, that the reflected image of any one of the lamps, will, as before explained, be visible in each mirror merely within the limits embraced by the pyramid of rays reflected from its surface, and also, that any attention to the *vertical* divergence, or angle formed between the *upper* and *lower* sides of this pyramid, is rendered entirely unnecessary, by assuming that it produces the greatest possible effect it is capable of, in rendering the image visible to the very foot of the Light-house. It will therefore only remain to ascertain the *lateral* extent of these rays from each mirror, to obtain the number of the degrees of the horizon illuminated by the *reflected* light of the lamp from which they proceed, and within which its image will be visible; and by repeating this with each lamp and each mirror, ascertain the effect produced by the whole combined. Now, it has been before observed, that the divergence of the rays before and after reflection remains the same, and that the sides of a cone or pyramid of reflected light, have exactly the same mutual inclination, and comprehend the same angle after quitting the plane, which they subtended before reaching it. For instance, that if *a* be the lamp, (FIG. 12) and *a b*, *a c* the limits of a pyramid of rays striking the surface of the

mirror *b c* and reflected from it in the directions *b d*, *c e*, that the angle *d h e* comprehended between the sides of the *reflected* pyramid *a b c e*, will be equal to the angle *b a c*.

In order, therefore, to ascertain the lateral extent embraced by each pyramid of reflected rays, it would answer the purpose just as well, if instead of projecting and taking the measurements of these rays themselves, we were to substitute for them the angles which each lamp forms with the two edges of each mirror, viz. if the angle *b a c*, shown in the annexed plan, be substituted for its equal *d h e*. As this is a much less troublesome operation, and as it renders the figure less complicated, I have accordingly done so; and the following are the measurements of these angles, for the three rows, taken separately, as shown in the accompanying plan, Fig. 13.

Table, showing the breadth of the angular spaces illuminated by the reflection of the light of each lamp from the different mirrors.

No. I Tier.

Of three lamps and 3 reflectors.

Lamp.	Reflector.	Angle.	Total.	
1	*a*	22		
,,		14½		
,,	*c*	12½	49	
2	*a*	19		
,,	*b*	19		
,,	*c*	19	57	
3	*a*	12½		
,,	*b*	14½		
,,	*c*	22	49	155°

In each table the *numbers* refer to the different *lamps* belonging to the tier, which are numbered from left to right as shown in the plan. The letters *a*, *b*, *c*, refer to the three reflectors, which are taken in the same order. "No. 1, *a*" consequently, refers to the rays proceeding from the *left hand* lamp, and reflected from the mirror nearest it on the same side.

From the above measurements it appears, that a reflected image of the centre lamp will be visible throughout 57 degrees of the circumference of the horizon, and of the other two in 49 degrees each.

Therefore, if the effects be *equally* distributed over the whole illuminated space, there would be visible from the *upper* row of lamps and

mirrors only *one* reflected image in every part except 25 degrees, which is evident, since the sum of all the above angular spaces containing *one* reflected image, is only equal to 155°, or 25° short of the complete semicircle.

In the same way the angles of the second and third rows have been obtained, as follows:—

No. 2, Tier. *Of* 4 *Lamps and* 3 *Reflectors.*				No. 3, Tier. *Of* 5 *Lamps and* 3 *Reflectors.*			
Lamp.	Reflector.	Angle.	Total.	Lamp.	Reflector.	Angle.	Total.
No. 1	*a*	20½		No. 1	*a*	21	
„	*b*	14		„	*b*	13½	
„	*c*	13½	48°	„	*c*	12	46½
2	*a*	21½		2	*a*	23	
„	*b*	18		„	*b*	17	
„	*c*	16½	56°	„	*c*	15½	55½
3	*a*	16½		3	*a*	19	
„	*b*	18		„	*b*	19	
„	*c*	21½	56°	„	*c*	19	57
4	*a*	13½		4	*a*	15½	
„	*b*	14		„	*b*	17	
„	*c*	20½	48°	„	*c*	23	55½
				5	*a*	12	
	Total of No. 2,		208°	„	*b*	13½	
				„	*c*	21	46½
					Total of No. 3 =		261°

The values of the different angles here laid down, have been ascertained geometrically from plans on a large scale, and as the measurements have been made with considerable care, they may be considered if not exactly accurate, as sufficiently near the mark for practical purposes. From the results thus obtained it appears, that the sum of all the angular portions of the horizon in which reflected images will be visible is 624°, whence, if the effects of the different mirrors were carefully equalised, by distributing the illuminated portions over the whole circumference, there would be reflected images of *three* lamps visible in *every* part of the horizon, and of *four* in 84 degrees of it: in this latter portion therefore, the effect of the 12 lamps would be increased to *sixteen*, and in the remaining part of the semi-circumference to *fifteen*, provided that the brilliance of a reflected image were equal to that of the lamp itself. But this is far from being the case. In the Philosophical Transactions, vol. XC. is an account of some experiments made by Sir W. Herschel on this subject, and it is there stated, that "after many experiments with plain mirrors, the result was, that out of 100.000 incident rays 67.262 only were returned." Now if this be true when the

Fig. XIV.

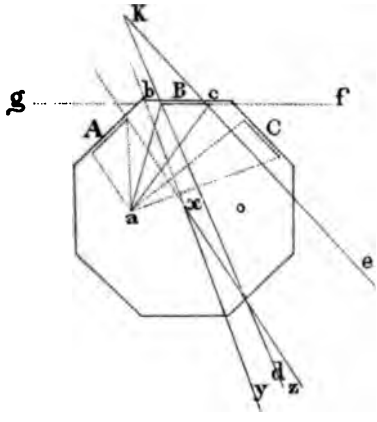


Fig. XV.

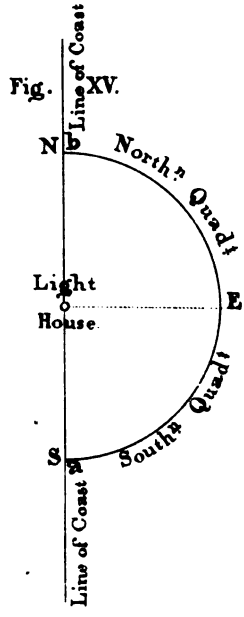
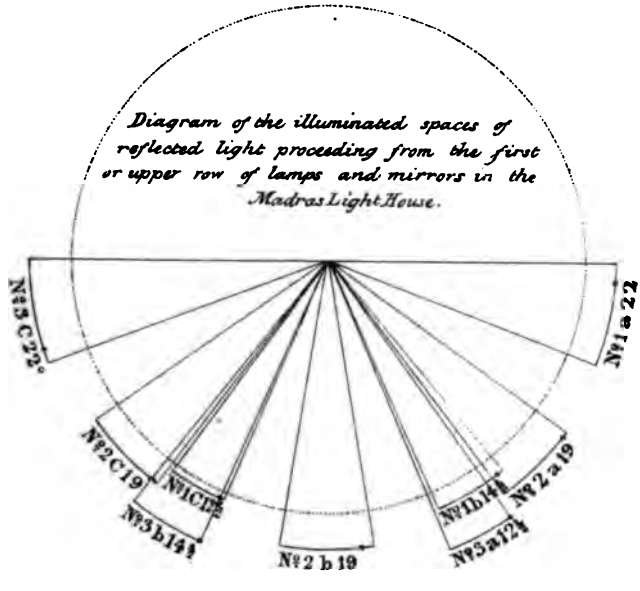


Fig. XVI.



material composing the mirror was speculum metal of highly brilliant lustre, and polished in the most exquisite manner, it would not be assigning too little to mirrors of looking-glass of the common description, to assume that they would only return 50 out of 100.000, or one half of the incident rays. In this case, what would be the value of the nine reflectors? In the most favourable situation it would appear that they would increase the brilliance of the 12 lamps so as to render them equal to *fourteen*, and in less favourable ones, that their assistance is not much superior to the addition of a *single* extra lamp.

I am aware, however, that this estimate has been made to rest upon an assumption, which may not, upon examination, be found to correspond with the actual circumstances of the case. It is indeed highly probable from the nature of the apparatus, that the duly regulated distribution, necessary to produce an exact equality of light may not be attainable, and that great irregularity in this respect may be found to exist. Admitting such however to be the case, the above would still be a correct measure of the *average* effect produced throughout the whole extent of the horizon, and a fair statement of the benefit derived from the apparatus, as it is evident, that if, owing to such inequality, it should be found that the effect produced in any particular point of the circumference were much in excess of what is above assigned, such a circumstance could only be occasioned, by a corresponding defect in some other quarter, which would fall short in an equal degree.

In order, however, to prevent this point remaining a subject of doubt, I have thought it worth while to lay down on paper, in the accompanying plans (FIGS. 16, 17 and 18), the whole of the diverging rays, in the situations in which they are actually reflected, making the angles of incidence and reflection equal, in accordance with the law in optics before alluded to, so as to exhibit in one view the whole of the spaces in which the reflected images of every lamp, from the surface of each reflector are to be found.* The manner in which this has been done is represented in FIG. 14, where the positions of the rays *c e* and *b d*, have been ascertained

* It will be observed that in the 17th and 18th figures one angular space on each side is made to overlap, and in part to fall in rear of the line *g f* of FIG. 14, parallel to the surface of the central mirror, and it is evident that not only these, but also a small portion of the rays in front of them, towards A and C could not be visible, owing to their being intercepted by the opaque sides A and C. I have thought it better however to leave them in FIGURES 17, 18, and 19, in the places to which they would be *directed* by reflection, in order that each group of rays might be duly accounted for, but they have afterwards been deducted in summing up the effects and arranging them in a tabular form.

by marking off the angles *f b d* and *f c e* equal to their corresponding angles of incidence *a b g* and *a c g*.

The same having been done regarding the other two reflectors A and C, a similar operation was performed, and a similar set of angles obtained from the second or middle lamp, and afterwards from the third, until the whole set belonging to the first tier of lamps and reflectors was complete.

As the figure would have been very much confused from the intersection of so many diverging lines from different points, owing to the difficulty of referring them to their respective centres, and comparing their relative directions, I have in the diagrams representing the spaces illuminated by the three different tiers (FIGURES 16, 17, and 18), referred the whole to a common centre, an arrangement which greatly facilitates their comparison with one another, as it exhibits them combined under one view, at the same time that it does not in the least affect the truth of the representation, as the distances of the real points of divergence from the central point of the light room to which they are referred, is so small when compared with the distance of the circumference of the horizon on which the angular spaces are measured, that the effect produced by the change in position which such an arrangement requires, is in reality entirely imperceptible.

In order to render the operation here alluded to, still more easily understood, I have represented the manner of effecting it in the figure last given. The point to which all the cones of rays are referred is there represented by *x*— *b d* and *c e*, are the resulting lines of direction of the two rays *a b*, *a c* proceeding from the lamp *a* and reflected from the mirror B. The angle which they subtend with one another, and the general direction of the cone of rays, is at once obtained by producing them till they meet in K, and the angle which is substituted for it at the point *x* is found by drawing *x y* and *x z* parallel to *k d* and *k e*. In the three figures Nos. 16, 17 and 18, these angles have been laid down separately for each row of reflectors and lamps, as it has before been shown, that no reflected light is visible, from the lamps of one row and mirrors of another. In order to distinguish the different sectors of rays from one another, they have all been marked, both with the number of the lamp whence the light originates, and the particular reflector from which it is thrown, in the same manner as in the tables before given. For greater convenience in summing up the results also, the number of degrees comprehended by each group of rays is also marked upon the plan, and in FIG. 19, the whole of the preceding results are brought together at once, by combining the three FIGURES 16, 17 and 18, into one. In considering the

Fig. XVII.

Diagram of the illuminated spaces of reflected light proceeding from the 2d, or middle row of lamps and mirrors in the Madras Light House.

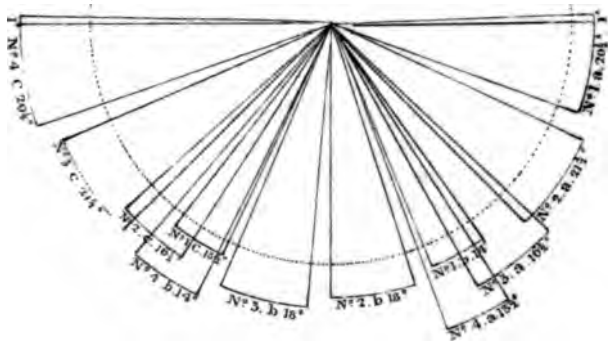
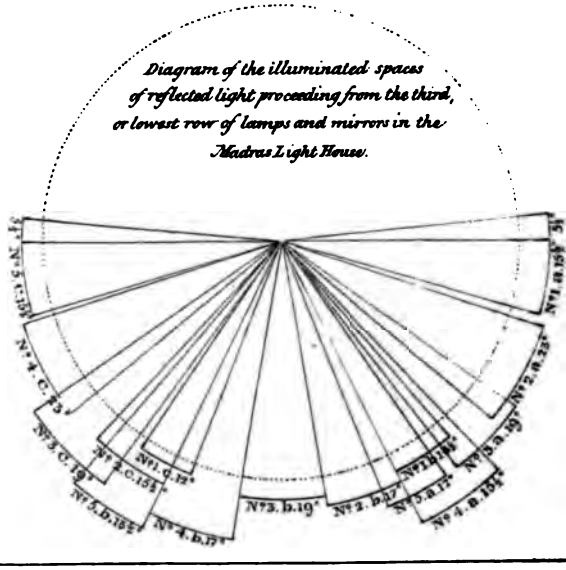


Fig. XVIII.

Diagram of the illuminated spaces of reflected light proceeding from the third, or lowest row of lamps and mirrors in the Madras Light House.



result thus obtained, it should be carefully borne in mind, that each of the sectors laid down in the three figures, represents the angular portion of the horizon throughout which the reflected image of some *one* of the lamps is rendered visible, by means of *one* of the reflectors, and consequently, that when two or more of these angular spaces occupy the same part of the horizon, or overlap one another, two or more images will be seen, and so on.

The object of the arrangement adopted in the 19th figure, is, by exhibiting the whole of the reflected rays in one view, to point out, both where irregularity in the distribution of the light exists, and also the exact quantum of advantage derived from the reflectors in every separate portion of the horizon, as the number of reflected images visible in any particular point of it will of course be shown by the number of angular spaces of rays, within whose confines it may happen to be situated. With regard to the first point it will at once be seen from the figure, that very great inequality in the diffusion of the light prevails, the whole of the diverging beams appearing to be huddled together near two points equidistant from the centre of the semi-circumference*, while that part itself, and the portions near the diameter *a b* (in Fig. 15) are in comparison very scantily supplied.

As there is some difficulty, owing to the number of lines indispensable to the figure, in distinguishing the angular spaces from one another, and ascertaining the number which lie over any particular part, I have in Fig. 20 given another representation of the same semi-circumference, in which the differently illuminated parts are marked off, and distinguished from one another according to the number of reflected images visible within them, and, as the number of degrees of each of these spaces is marked on it, as well as the number of images visible throughout it; this figure contains within itself, a condensed view of the whole of the results exhibited in the other four diagrams.

I have also given a tabular form to the contents of the last diagram No. 20, in order to a limit of a mean being found, and a comparison made, with the estimate of the *average* effect formerly taken. This has been obtained by multiplying the number of images visible in any part of the horizon, by the breadth of the space, expressed in degrees, throughout which that number is seen, and adding the whole of the products together, and dividing by the number of degrees contained in the entire semicircle; by this process, and after rejecting the first 5½ degrees in each quadrant represented in Fig. 19, in consequence of their falling

* Measuring about 30° on each side, from the point E (of Fig. 15).

outside of the semi-circle, the sum of all the products is found to be 601¼, which divided by 180° gives 3.34 as representative of the *mean* value expressing the number of reflected images throughout the whole circumference, a result which corresponds, pretty nearly, with that formerly obtained which represented *less* than four and *more* than three images, and in nearly the same proportion, viz.

$$3 \text{ and } \frac{84}{180\text{ths}} \text{ or } 3\ \frac{21}{45\text{ths}} = 3.4 \text{ —}$$

In the following table the different spaces have been marked down in the order in which they occur,on tracing the circumference from South to North, or from *a* to *b* in the annexed diagram No. 15.

TABLE

Of the breadths of the various portions of the horizon differently illuminated by the reflected light, with the number of images visible in each.

	Southern Quadrant.			Northern Quadrant.			
	Breadth of the spaces illuminated.		Number of images seen in them.	Breadth of the spaces illuminated.		Number of images seen in them.	
a	Degrees..	16	3	Degrees...	2¼	2	*E*
		1½	2		7¼	3	
		3½	3		10¾	2	
		1	2		1¼	1	
		3¼	1		0¼	3	
		10¼	2		0¾	4	
		4	4		3¼	6	
		4	3		3	7	
		3	4		4	8	
		1½ ...	3		1	7	
		2¼	4		0½	6	
		2¾	5		0¼	5	
		1¼ ...	4		1¾	4	
		0¾	5		2¾	5	
		0¾	6		2¼	4	
		1	7		1¼	3	
		4	8		3	4	
		3	7		4	3	
		3½	6		4	4	
		0¾	4		10½	2	
		0¼	3		3¼	1	
		1¼	1		1	2	
		10¾	2		3¼	3	
		7¼	3		1½	2	
E		2¼ ...	2		16	3	*b*

Fig. XIX.

Diagram of the illuminated spaces of reflected light proceeding from all three rows combined of lamps and mirrors in the Madras Ligh. House.

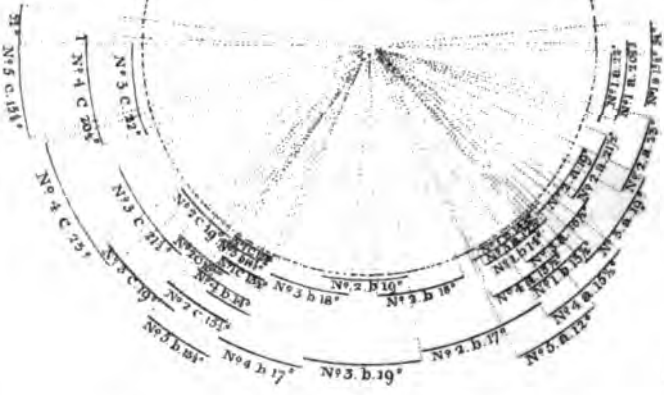
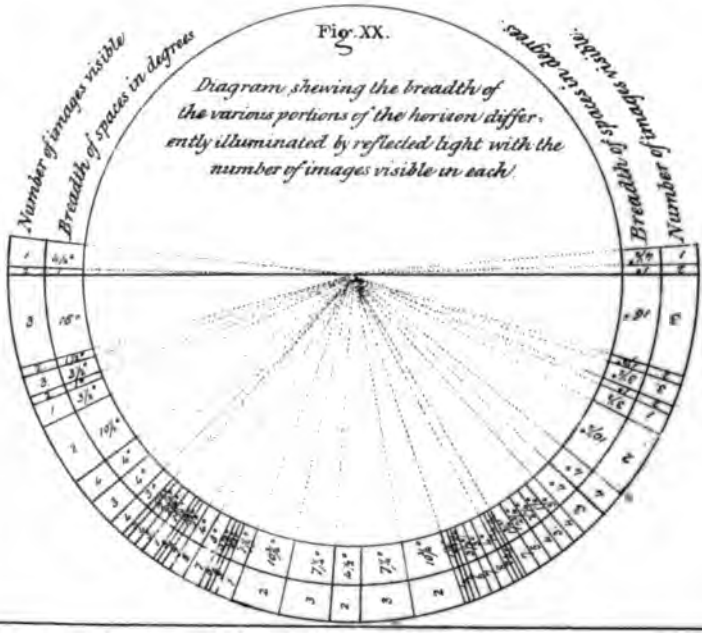


Fig. XX.

Diagram shewing the breadth of the various portions of the horizon differently illuminated by reflected light with the number of images visible in each.



By arranging the contents of this same table in another form, by adding together the spaces in which the effects produced an equal, it will appear that there are

9½	degrees in which only one image is visible.....	1
52	..... in which	2
64½	..... „	3
23½	....	4
6½	..... „	5
8	..... „	6
8	..... „	7
8	..... „	8.

Or to condense it still more, that out of the whole semi-circumference of 180 degrees, the portion in which 1.2.3 and 4 images of a *single* light only are visible, amounts to 140°, or 7-9ths; the remaining 2-9ths being illuminated by 5.6.7 and 8. When it is recollected that, as before shown, the brightness of these images is only one *half* as vivid as that of the *direct* unassisted light, and when it is also considered, that the total value of this *direct* light is represented by 12 of these doubly powerful images, visible throughout the *whole* circumference of the horizon, it will no longer be a matter of surprise that the light in its present condition, although stated in the Almanac to be visible (by which I understand *possible* to be seen) at a distance of 27 miles from the mast-head of a large ship, is in matter of fact with difficulty discerned at 15 or even 10.

It might have been expected, that the very great difference above shown to exist in the value of the assistance afforded by the reflecting apparatus, as seen from different points, would have occasioned a material inequality in the brightness of the beam generally, as viewed from a distance in different directions; which, had it prevailed to any extent, could not fail to have attracted attention; and there is no doubt that such would have obtained, if the whole effect produced by reflection, bore any thing like a large proportion to the whole illuminating power. But it has been before shown, that in the situations where it is most powerful, and even within the very small limits in which 8 reflected images are seen, the actual increase of the refulgent power exclusively due to reflection has no more effect than would be derived from the addition of 4 extra lamps; or that the share of effect due to the assistance of the reflectors, is even then, only *one-fourth* of the whole brightness of the visible beam. It is therefore hardly to be expected, that a gradual increase or diminution of power which at its maximum does not exceed 1-4th, and whose *average*

barely exceeds 1-8th, should be capable of producing any very sensible alteration; which, even if it did take place, to a much greater extent than is here shown to be possible, would be entirely lost in the fitful and uncertain glimmering, which characterises the whole beam at great distances.

It has been my object, however, in what I have above written to demonstrate, not so much that the light must of necessity be defective, as that if it should happen to be so, abundant reasons might be shown to exist for anticipating such a circumstance, from causes which it has been my endeavour to point out. I leave the fact of its *being* so or not, to be established by the testimony of those who may be able to speak from experience, and will at present merely add, that if the opinion which I at the commencement of this paper ventured to express, regarding the extreme inefficiency of the contrivance as it exists at present, be granted to be correct, it would not be unreasonable to anticipate, that a considerable improvement in it might be effected, if the importance of the light were considered sufficiently great, to warrant the expence of its being remodelled upon a more scientific plan, and which I feel satisfied might be done without any very alarming outlay. It was my intention to have appended to this some observations on the spherical and parabolic mirrors used in England for this purpose, in the hopes of attracting to the subject the attention of others more competent to examine it than myself; but I have already been carried to a length so far beyond what I originally intended, and the subject is one of so little interest to the general reader, that I cannot expect to be granted the indulgence of further occupying the pages of your valuable work, to the exclusion of more important matter, and I must therefore content myself with the hope, that should communications of this kind be suited to the character and objects of the "*Madras Journal of Literature and Science*," I may at some future period, have it in my power to make up for the deficiency.

I remain, &c.

J. T. S.

Madras, November 1833.

IV.—*On the Crystalline Structure of the Trap Dykes in the Sienite of Amboor: with an Enquiry into the Causes to which this Peculiarity of certain Igneous Rocks is due.*—*By* Richard Baird Smith, *Lieutenant, Madras Engineers.*

The phenomena exhibited by the internal structure of certain rocks, which a large class of facts clearly prove to have been, more or less, acted on by subterranean heat, have lately had the attention of observers specially directed to them; and a wish has been expressed by an eminent geologist,* that, since the study of these peculiarities has, as yet, received but little attention, it would be therefore desirable, that information should be collected relative to them, for the purpose of enabling us to enquire into the causes of their production. Having lately been enabled to examine the geology of the route from Madras to Bangalore, I was especially interested in the results of an examination of the trap dykes, in the sienite around the village of Amboor; and since in these the phenomena, above alluded to, were strikingly exhibited, I have ventured to throw together a few remarks deduced from these observations. Since the field is one of comparative novelty, perhaps interest may be excited, and the attention of those qualified to explore it, be directed more particularly towards collecting the information relative to it, so much desired.

The underlaying rock of the plain on which the village of Amboor is situated, is the sienite so universally met with throughout the range of the ghauts. This sienite outcrops at various points in the plain, and occasionally by its disintegration, gives rise to boulder-like masses, which are found scattered around in great abundance. Mingled with these, are weathered, and apparently water-worn, fragments of other rocks, as of granite, gneiss, &c. varieties of trap, compact, and vesicular felspar, quartz, and porphyries. The non-appearance of the parent rocks, from which these fragments have been derived, in the neighbourhood, or actually *in situ*, proves that some transporting agent has been acting upon them. This perhaps may have been the nullah which intersects the plain, and seems to take its rise among the distant hills, where, doubtless, the rocks above mentioned are largely to be met with, since all belong to the primary series. These may have formed the bed of the stream, and, thus being subject to continued abrasion, they would readily yield to any increased force the current might acquire, from the

* Mr. De la Beche—"How to Observe."

fall of rain, or other similar causes, masses would be detached, and borne along to distances according to their size and weight. They seemed all nearly of the same size, and of equal specific gravity, hence we may infer, a transporting power of equal intensity had acted on all, and hence, also, an additional argument might be derived for their being true boulders. On finding, however, that in one part of its course, the nullah was confined by an artificial bund, mainly composed of masses similar to those strewed over the plain, the possibility, that the latter might have been derived from the former, suggested itself, and naturally tended to throw doubts on the first idea, that the masses had been brought, by the force of the stream, from the distant hills; evidence is however, wanting to enable the inquirer to form any decided opinion, and, therefore, it is best to rest satisfied with a simple statement of facts, without attempting to draw conclusions, for which these cannot be deemed sufficient warrant.

The road to Palliconda intersects the range of hills which forms the enclosure to the plain of Amboor, at a distance of about half a mile from the latter place. At this point, the road winds along between two hills forming portions of the main range. To the left hand of one of these, my attention was particularly directed*, and on examina-

* At Palliconda, I examined with much interest the geological features of a large hill in its vicinity which I subsequently found had been described by Dr. Benza. On comparing my notes with his description I found there was no essential difference between them, save in one or two trifling instances, arising from the different degrees of attention with which we had examined different localities. I will annex therefore in this note only a rapid sketch of the results of my observations, referring those desirous of seeing the subject treated in greater detail to the paper above alluded to. The plain at the base of the hill is sandy, and strewed over it, there are masses of a sienite, which, as is proved by the natural sections exposed at various points in the beds of the neighbouring nullahs, forms the underlaying rock of the whole. Traversing this there are dykes of trap and porphyry, with veins of quartz and felspar. The two latter are sometimes found together—the quartz massive and the felspar crystalline, forming together a compound coming under the class porphyry. Since it is a general principle, recognised in naming different members of this class, to distinguish these by affixing the name of the matrix in which the crystals are imbedded to that of the general class, I have adopted the name of quartz porphyry for the above. It may be remarked in passing that it is of the greater importance to adhere to some general principles in the nomenclature of geology, as few sciences have suffered more from these having been lost sight of. The progress of our studies is most seriously impeded by the different arbitrary systems authors have employed, and the necessity for a table of synonyms is absolute when we wish to compare different works, each of which perhaps describes the same rock under names so different as to render their identification quite impossible. Investigating a portion of this quartz porphyry, I found a simple mineral to which I could not assign a name, never having seen it before. The characteristics of this are as follow—lustre highly metallic, inclining to adamantine—colour dark grey, nearly black—hardness between 7 and 8—fracture splintery—structure laminated—specific gravity not numerically determined, but high—crystalline

tion, I found it to be wholly composed of sienite, intersected by various trap dykes of different dimensions. These dykes maintained, throughout their whole extent, one uniform and parallel direction, being all at right angles to the line of the road intersecting the main range, and consequently parallel to the main range itself.

The trap, of which these dykes are composed, consists of a matrix of dark coloured granular hornblende, throughout which small grains of mica are interspersed.

On examining the trap at its lines of junction with the including sienite, decided marks of alteration are observable in the former, though not in the latter—the hornblende becoming of a much lighter colour, while the grains of mica become larger, and most distinctly developed. Traversing the dykes, and *invariably* at right angles to the cooling surfaces of the sienite, I found small cracks or fissures—a similar remark to this, has been made on the comparatively recent ejections from certain volcanoes, and more especially on those of mount Vesuvius, of which Mr. Lyell remarks—"There is a tendency in all Vesuvian dykes to divide into horizontal prisms, a phenomenon, in accordance with the

form—a flat rhomboidal prism, having an obtuse angle=about 130°and an acute angle-about 50°; the want of a goniometer put it out of my power to do more than approximate to the side of the angles of the rhomboid-cleavage, regular and single in a plane at right angles to the axis of the crystal. Exposed to the action of undiluted muriatic acid it deepened the colour of this to a dark and beautiful orange hue—to nitric acid it communicated a greenish tinge, while in sulphuric acid no action whatever took place. From the two first effects I was led to suspect the mineral to be one of the crystallized salts of iron, and under this impression I added to each of the acid solutions, ammonia and oxalic acid, expecting precipitation to follow. In this however I was disappointed; no such effect being produced. The mineral strikingly resembles in external appearance the specular iron ore, but in comparison I found they differed in crystalline form, the latter being octahedral while the former as was before stated is rhomboidal.

On examining the main body of the hill I found it composed of sienite, intersected by numerous trap and porphyritic dykes—one of the latter I found capping the sienite, so as to seem at first sight to be an overlaying rock, but on further examination its true nature is easily detected and its limits observed. Much variety is observable in the composition of the dykes and veins. Sometimes the quartz of the porphyries disappears altogether, when we have pure felspar left. Sometimes hornblende predominates, and sometimes nothing but quartz is seen. The felspar was often of a pinkish hue, and generally so much decomposed on the surface as when pressed in the hand to crumble into dust—sometimes it became dendritic, the tree-like forms being due to small vesicular cavities, presenting a very beautiful appearance. In the vicinities of the nullahs abundance of water-worn masses of basalt, greenstone, claystone, &c. are met with, though as might be anticipated they are more sparingly distributed at a distance from these. For further particulars, see Dr. Benza's paper on the Geology of the route from Madras to the Hills, in No. XII of this Journal.

formation of vertical prisms in horizontal beds of lava, for in both cases, the divisions which give rise to the prismatic structure are at right angles to the cooling surfaces." Now in the trap of Amboor, I was especially interested by finding, that, independent of these fissures at right angles to the cooling surfaces, there were also distinct planes of cleavage, or as miners call them "joints," which when combined with the fissures, render the trap divisible into these very prismatic forms, spoken of by Mr. Lyell. I found it impossible to break the trap otherwise than into regular, and prismatic fragments; and this regularity of internal structure clearly proves, that crystallizing forces must have been in operation throughout the whole, to produce such striking results. The cleavage planes invariably exhibited an ochreous hue, as if a portion of the oxide of iron, which, in a greater or less proportion, ever forms a constituent of hornblende, had been decomposed, and determined towards these planes, by an action analogous to that, by which certain bodies are determined towards the different poles of a galvanic battery.

Additional interest is attached to the phenomena above described, when we learn they are members of a class which has been largely recognised throughout the natural world. The following remarks by Professor Sedgwick, will prove their existence throughout large districts of England and Wales. In both of these countries, the slate formation is of great extent, and speaking of certain parts of it, he had examined with much care, Professor Sedgwick remarks—"Besides the planes of cleavage, formerly spoken of, we often find in large slate quarries, one or more sets of cross joints, which, when combined with cleavage, divide the rock into rhomboidal solids. These solids are not capable of indefinite subdivision into similar solids, except in one direction, namely that of true cleavage, and in this way, we may, even in hand specimens, distinguish the true cleavage planes, from the joints." This, I found, was a matter of great ease in the trap of Amboor, for, independantly of the ochreous hue before mentioned, as characteristic of the cleavage planes, the joints or fissures being free from this, it was vain to attempt to fracture a mass, save in the direction of the sides of the prisms, while when the effort was made in this manner, division was easily accomplished. Speaking of the joints, Professor Sedgwick continues—"These last are fissures, placed at definite distances from each other, the masses of rock between them having, generally speaking, no tendency to cleave in a direction parallel to them." This remark is also applicable to the trap of Amboor, the direction of cleavage never being parallel, but invariably perpendicular, to that of the fissures. These last may be attributed to the mechanical action, produced on the rock, either during con-

traction, while the fused mass originally ejected from the interior of the earth in a fluid, or semifluid, was passing into a solid state, the tension thus caused, producing more or less regular sets of cracks, or fissures. It is impossible, however, to attribute to a like origin the phenomena of cleavage planes, they being distinctive of crystalline forces, and affording proofs, that the ultimate particles of the rock have been subjected to chemical action, whereby this peculiar arrangement has been effected.

In instituting the following enquiry into the causes to which these phenomena are due, the first step will be to collect as many analogous ones as possible, and thus to form a series of classes, whose relations to each other may be observed, and a clue thus obtained, by which the common cause operating on all, may be at length discovered as the leading member of this class, and the head under which the others are to be ranged may be placed.

(1). The phenomena of dykes, observed under different circumstances, both in the volcanic rocks of the present, and in those of past eras. By a fair and close induction from observed facts, geologists universally agree, that these rocks were originally ejected in a fluid, or viscous state, and have gradually assumed their present hard, and compact nature, as they parted with the temperature they then possessed.

(2). The slates of Cumberland and Wales, described by Prof. Sedgwick, the analogy between the peculiarities of whose structure, and those of the trap dykes, has already been noticed, belong to a class of rocks, to which Mr. Lyell has applied the term " metamorphic; " such rocks, this eminent geologist considers, to have a sedimentary origin, being originally deposited from water, but subsequent to their deposition, he conceives them to have been modified and acted on by internal heat. Whether that heat was sufficient to reduce them to the fluid state, so that polar forces might act with greater freedom, is, as will afterwards be proved, a question of little, or no importance, as bearing on the present enquiry. It is sufficient for this, that heat should have been in action at all, its intensity being of comparatively little consequence.

(3). Intimately connected with the two preceding classes, are the phenomena exhibited by altered rocks, or those in the immediate vicinity of decidedly volcanic products. These rocks are sometimes in actual contact with the originally fused masses, as when they form the walls of a dyke, and then at the planes of junction on both sides and to some distance beyond them, phenomena analogous to the preceding are

most commonly met with—Chalk in the vicinity of basalt, is known to become beautifully crystalline; the crystallization being most perfect, in the immediate neighbourhood of the altering rock, while it becomes gradually less and less distinct as we recede from this. Numberless instances similar, and even more striking, than the above might be adduced, the facts however are so familiar to every geologist, that I do not consider it necessary to advance more; in all, however, this is observed, that crystals only appear in those localities, affected by the dyke. The sienite, including the trap dykes of Amboor, exhibited no signs of alteration; but this is by no means an uncommon circumstance, and it finds a ready explanation, when we bear in mind, that the original temperature of injected rocks may vary considerably, and also that the conducting powers of different rocks, on which their susceptibility of alteration materially depends, are also very variable; from these two causes, it may frequently happen, that certain rocks exhibit no signs of alteration, under circumstances apparently similar to those of others, in which these signs are strikingly apparent.*

The three preceding classes belong peculiarly to the province of the geologist, all being taken from his particular science. Now in this, it most frequently happens, that effects only remain to us, the causes to which these are due having ceased to act; it therefore becomes necessary to advance with caution, in our enquiry as to what these causes may have been, and rigidly to examine and verify each step we take. Hence, then, it is very natural for us to enquire, if there is a possibility of producing effects analogous to those observed in the natural world, while we can watch also the cause in operation to produce them. This remark leads us to the consideration of a fourth class, by which some additional light is thrown on the enquiry.

(4). In this class, I purpose including the results of the researches of several eminent chemists, on the production of crystals, similar to those occurring in nature, through the agency of heat, of greater or less intensity. Among these, Mitscherlich of Berlin has been the most successful, and to him we are indebted for a large proportion of the new and interesting information these researches have furnished. Having by careful analysis, made himself acquainted with the proportions, existing between the component parts of different minerals, he formed a mixture, in which these were retained, and after exposing this to the

* On examining the sienite of Waniamboddy in which trap dykes are also abundantly met with, I was equally unsuccessful in my search after signs of alteration. Benza however mentions having met with them occasionally. In Antrim, Isle of Anglesea, &c. these alterations are remarkable.

action of a furnace till fusion took place, when it was removed, and allowed to cool, he thus obtained, synthetically, those very minerals, in a state quite analogous to that in which they had been found in the natural world. Having in this manner combined the elements of mica,* he succeeded in forming beautiful, and distinct crystals from them, in this case, finding it essential, that the fused mass should cool very slowly. This remark is very interesting as connected with the formation of sienite, granite, &c. in which mica occurs so abundantly. Similarly, having combined the elements of augite†, he succeeded in obtaining it in a crystalline form, more rapid cooling being requisite for it than for mica. This also is quite consistent with the observations of mineralogists, who remark that augite is always found associated with such rocks, as have experienced a rapid decrease of temperature. So material is the influence exerted by rapid cooling, on the nature of certain minerals, and especially on augite, that it is often the only cause of their differing from certain others. Thus in reference to augite, its composition, and many of its external characters, are precisely similar to those of hornblende, so much so, that Professor Rose of Berlin has proposed, to consider them as one and the same mineral.

Since hornblende enters so largely into the composition of all trap rocks, and especially abounds in the trap of Amboor, the following remarks, relative to the cause of the difference between it and augite, are very interesting :—"It is well known," says Allen, from whose useful work on mineralogy I quote "that augite and hornblende seldom occur together: and that when they do, it is in trachytic rocks and lavas of later date, in which the one forms crystals in the cavities, the latter, a portion of the mass. The frequency of augitic forms, and the non-occurrence of hornblende, among crystalline slags—the results of Mitscherlich and Bertheor's experiments in producing augite artificially, whereas they never succeeded in forming hornblende, and lastly, the general occurrence of hornblende, associated with quartz, felspar, &c., and such rocks as have experienced a slow decrease of temperature, while augite is always associated with others as olivine which are known to have cooled rapidly—all concurred, in leading Rose to conclude, that the crystalline form presented by each of these substances, depended entirely on the more or less rapid cooling to which they had been exposed. Upon fusing in consequence, a mass of hornblende in a porcelain furnace, he found that it did not in cooling, assume its previous shape, but invariably took that of augite." Such being the

* Buckland's Bridgewater Treatise.

† do. do. do.

case, Rose concluded they ought to be looked upon as the same, and included in one class; of the propriety of which step, the preceding remarks seem to leave but little doubt. These experiments are most interesting, when viewed as furnishing us with a standard of comparison, by which we may form some idea, of the different times required for the production of different minerals in nature. The rate of cooling may also be estimated, from the peculiar forms assumed by the minerals produced, as for instance, in the sienite, so frequently mentioned in this paper, the ingredients of which, the quartz, felspar, and hornblende, are all known to require slow cooling for their production; and, therefore, we conclude the sienite to have passed very gradually, from its highest point of temperature, down to its present state—similarly, with reference to the trap dykes under consideration, in which hornblende and mica prevail, substances also requiring slow and gradual cooling for their production. The earliest experiments on record, by which the connection between the crystalline structure, and the application of heat was exhibited, are those of Sir James Hall, in 1798; in 1804, Mr. Walt pursued the same subject in greater detail, while in our own day, Wollastone, Millen, and Haidenger, have been occupied in the same train of research. I do not intend to enter farther on this point, since enough has been adduced to prove the analogy subsisting between these operations of men in their laboratories, and those due to the action of the general laws by which God governs the material world, and which are included in the three first classes.

Now, the general and connecting link of the whole series of phenomena above described, is their dependance on the application of temperature, but, it will readily be observed, it is not so much on the absolute degree of this, to which the substances exhibiting them have been subjected, that the phenomena depend, as upon the fact, that the original temperature has undergone variations of greater, or less, extent. Had the original heat applied, remained the same, only the effects due to this would have been exhibited: as, for instance, if the heat had continued at the points of fusion, or of viscidity, the bodies, of course, would ever have remained in a fluid or viscous state: but, the gradual diminution of the temperature has given rise to new, and striking phenomena, dependant on it for their development, and following it invariably, as effects follow their cause. Assuming then for the present, that, as a natural law, including a certain series of phenomena, provided disturbing causes are not in operation, "signs of crystallization will follow on a body, kept in a fluid or partially fluid state by the action of heat, again becoming solid," it is natural for us to enquire if the law can be extended further, and be rendered more general in its expression, and application. And

first to show that neither fluidity, nor viscidity, are necessary for crystallization, I proceed to the consideration of certain facts included in class—

(5). In the collection of a friend, I had an opportunity of examining a fragment of sandstone, which had originally formed part of the floor of a baker's oven. On breaking up the floor for the purpose of repairing it, the whole of the lower portion of the sandstone was found most regularly, and beautifully crystallized, in prismatic columns of 6 or 8 sides, being the very forms so frequently assumed by basalt, and certain other rocks of igneous origin, and exhibited, on a gigantic scale, at the Isle of Staffa and the Giant's Causeway. The sandstone was I think about 2 or 2½ inches thick, while the columns extended from a thin layer at the upper surface, of about ⅓ of an inch in thickness, down throughout the remaining thickness of the mass. Looking at the exposed surface which formed the floor of the oven, no signs of the column beneath could be detected, and only when a fracture was made were they discovered. The sandstone was taken from a quarry, the rock of which was a member of the coal series: its texture was close, and granular, and its general appearance proved, that though the heat to which it had been subjected, was sufficient to produce crystallization, it had not in the slightest degree, caused it to fuse. In farther illustration of this point, it may be stated, that Professor Mitscherlich found, on exposing prismatic crystals of sulphate of nickel,* in a close vessel, to no stronger heat than that of the sun, that, though externally unchanged, yet, on being broken up, were wholly composed of octahedrons; while the same cause, changed, in a few seconds, prismatic crystals of zinc, also, into octahedrons. Crystals of sulphate of magnesia and of sulphate of zinc when boiled in alcohol gradually lose their transparency, and on being opened are found to be composed, internally, of numberless minute crystals, totally different in form from the originals. Most striking, indeed, are the views such facts give us of the state of the matter by which we are surrounded; all seems in relative motion, and substances which to our senses seem as hard as adamant may, and indeed, judging from the preceding facts, actually are in a state of continued and increasing motion—who can say, but that the interior even of the diamond, excited by no greater cause than the warmth of the hand that wears it, would, were its particles and the effects produced upon them equally appreciable by our senses, exhibit a scene of as much turmoil, and change, as that produced by a

* Mrs. Somerville's Connection of the Sciences.

furnace, on the metal-filled cauldrons of an iron foundary, or on the water in the boilers of a steam-engine.

The further we advance, in our knowledge of the wonders of creation, the more reason do we find to adore the infinite power of that great, and glorious Being, to whom all is due: a power, of which we may form some slight idea, from the toil and labour required on our parts, to investigate those laws by which it works, when applied to the government of the natural world. Little cause is there for intellectual pride, when we reflect that the profoundest investigations, and the most refined systems of analysis adopted by mathematicians, the most extensive observations of the natural philosopher, reaching almost literally from pole to pole, or the most laborious researches of the chemist, all and each, are only, as it were, so many lines by which we are enabled to sound the depths of the power and wisdom of that God, who, by the simple expression of his will, called all those laws, as well as the matter on which they operate, into existence. The progress of discovery proves to us how little we *have* known of those depths; and gives to the following remarks of one, who, perhaps, if any human being could be entitled to glory in his intellect, to him the right would be conceded, a beauty and force, which make it one of the most striking on record.—"I deem myself," says Sir Isac Newton, to whom I refer, "to be like a little child playing on the sea shore—the waves every now and then washing to my feet a smoother or a prettier pebble, while the great ocean of truth is unexplored before me."—I now return to the consideration of the classes which still remain.

(6) Since my attention was directed to collecting facts for this enquiry, I have been much interested by observing the regular forms, into which the fine mud, forming the bottoms of tanks and pools, divides itself, after the evaporation of the surface water. Whenever the surface of the mud is exposed to the heat of the sun, the outlines of the figures begin to develope themselves, and as the evaporation of the water combined with the mud proceeds, these outlines gradually become more and more distinct, till at length complete separation takes place, and the whole mass becomes divided into columnar prisms, of various sizes, and bounded by different regular figures—sometimes the bases are triangular, sometimes quadrangular, but the most generally prevalent forms are pentagons and hexagons. Both the sides and angles of the different prisms vary in these dimensions, as indeed might be expected when we consider how much the affinity of crystallization must be limited by the nature of the mud, and also by local circumstances, some portion being more freely exposed to the action o

the sun's heat than others, and the state of division in which the particles are, being also variable.

In the ditch of the fort at Bangalore, I found the general depth of the prisms to be about 4 or 5 inches; in one place however this was increased to as much as 8. Sometimes the lines bounding the figures are slightly curved, but these are exceptions to the general rule. In spite of the irregularity which modifying causes have produced on these forms, it is impossible to conceive they are due to simple mechanical contraction alone, and I cannot convey the view I am induced to take of their origin better, than in the language employed by Professor Sedgwick, relative to the analogous phenomena of the Welsh and Cumbrian slates. "We may safely affirm" says this eminent geologist "that no contraction of dimensions, no retreat of parts in passing from a fluid to a solid state, can explain such phenomena as these. They appear to me only resolvable, on the supposition, that crystalline or polar forces acted on the whole mass simultaneously, in given directions, and with a definite power." Similar appearances to the above are to be observed in the hard sun-dried soil so abundant in the neighbourhood of the cantonment of Bangalore; also traces are to be noticed in chunam which has dried rapidly, on being exposed much to the heat of the sun, combined with the occasional presence of moisture. There are certain peculiarities connected with this class, which, however, must be deferred, till the general enquiry is more advanced—and therefore I proceed to the consideration of the last of our series.

(7) This class will include certain phenomena which have been exhibited by ice during a thaw, and which are strikingly analogous to the preceding classes, thus extending the law of the connection of crystalline form with variation of temperature, to an extent which scarcely could have been anticipated. The phenomena referred to, are described by Col. Jackson in the Journal of the Geographical Society: Mr. Lyell, to whose work I am indebted for the account of them, quotes it to show, that the phenomena are analogous to those of certain igneous rocks, but he offers no explanation, and indeed says "this tendency to a jointed structure is by no means understood: but it appears, from recent observations, that ice sometimes presents a similar arrangement of parts. Scoresby,* indeed, had long ago, when speaking of the icebergs of Spitzbergen, stated "that they are full of rents, extending perpendicularly downwards, and dividing them into innumerable columns." Colonel Jackson has lately investigated the subject with more attention, and has found that the ice

* Arctic Voyages.

on the Neva at St. Petersburgh, at the beginning of a thaw, when two feet in thickness,is traversed by rows of minute air bubbles extending in straight lines, sometimes a little inflected, from the upper surface of the ice,towards the lower; at from two to five inches of which they terminate." Other blocks presented these bubbles united, so as to form cylindrical canals a little thicker than a horse hair.—Observing still further, he says, "I found blocks, in which the process was more advanced, and two, three or more clefts struck off, in different directions, from the vertical veins, so that a section perpendicular to the veins would represent in miniature the star-formed cracks of timber. Finally, in some pieces these cracks united from top to bottom of the veins, separating the whole mass into vertical prisms, having a greater or less number of sides. In this state a slight shock was sufficient to detach them: and the block, with its scattered fragments, was in all respects, the exact miniature resemblance in crystal, of a Giant's Causeway. The surface was like a tesselated pavement, and the columns rose close, adhering, and parallel, from the compact mass, of a few inches, at the lower surface—more or less time is required for the process, which I have seen in all its different stages." This, as well as the preceding class, confirm a remark previously made, namely that the phenomena in question depended essentially on variation of temperature, and it matters not whether this variation is caused, by the bodies losing, or gaining heat, as may readily be observed by comparing the circumstance of the different classes with each other. In the last case, the phenomena are first observed when a thaw commences, and their development keeps pace with the progress of this, so that their connection with the variation of temperature, during the passage of the solid ice into water, is thus evidently seen. In the former classes the variation was consequent on the passage of fluids into solids, and was therefore dependant on the obstruction of heat—in this it is exactly *vice versâ*.

Having, in the preceding seven classes, included all the phenomena analogous to those of the trap dykes of Amboor, with which I am acquainted, it now becomes necessary to consider with more care, and in greater detail, the mutual connection that subsists between them all—so that, if it be possible, we may by this means be led to some more definite ideas of the cause to which they are due, than we can now have.

Varied as the circumstances of the different cases have been, attention has occasionally been directed to that one point, in which all, without exception, have been found to agree. Now, it is a rule in enquiries of a

nature like the present, if we find that "in our group of facts there is any one circumstance in which they all without exception agree, that circumstance *may* be the cause in question, or at least a collateral effect of the same cause, if there be but *one* such point of agreement, this possibility becomes a certainty, and if on the other hand, there are more than one, they may be concurrent causes*."

Looking then to the group here assembled, we find that their subjection to a variation of temperature is the single point, in which they all agree; this, therefore, according to the above rule, given by Sir John Herschel, must be, either the cause itself, or intimately connected with the cause. We now proceed to examine this point, and in order that the results may be more clearly exhibited, one instance will be taken, and the various circumstances connected with it examined and discussed. Selecting, then, for this purpose, the trap dykes—we know, from generally acknowledged geological theories, that the trap of which they are formed, was originally ejected from the interior of the earth, at a temperature so high as to be kept by it in a state of fluidity similar to that of the lava currents of existing volcanoes. Let us therefore suppose we have before us a formation of this kind, an intensely heated and fused mass, included between two walls formed by the fissured rock. From the action of that law, by which bodies tend to an equalization of temperature, the moment contact was made between the heated trap and its including rock, an abstraction of caloric from the former by the latter would take place, and as the heat travels slowly from particle to particle of the including rock, to distances dependant on its conducting power, a continual demand is made on the trap, so that we may conceive two currents to be established flowing from each side of the dyke through the adjoining rock forming its walls. Now it is a singular fact, and one by which this enquiry is most materially advanced, that, under circumstances precisely similar to those under which the trap is here described as being, a combination is formed, by which large quantities of electricity are developed, and this development seems to be an effect of the variation of temperature. Hence, then, the idea that the cause we are in search of is this variation, becomes merged into the more definite one—that electricity in the active and operative agent, to which we are to attribute the phenomena whose production we are investigating. In electricity we have all the essential requisites for a cause by which natural phenomena may be explained, we know of its existence, of its be-

* Sir J. Herschel's Discourse on Natural Philosophy.

ing what Newton calls a "vera causa,"* we have examples of the effects it produces as an agent in natural operations; we may therefore safely reason about its efficiency in this case, and if we are supported by strong analogies derived from its "modus operandi" in other instances, we may be allowed to infer its being the active agent in this, since, to use the words of one† well qualified to judge, "we are not to deny the existence of a cause, in favour of which we have the unanimous agreement of strong analogies, though in the particular case it may not be apparent how the cause produces its effects."

These remarks naturally lead us to the more detailed examination of the cause, to which, from a discussion of the assembled group of phenomena and the application of special rules to these, we have been led—and first, we may establish the fact of its existence under circumstances like those of trap dykes, to which we still adhere as the representative of the others. The discovery that electricity might be excited by the partial application of heat to a circuit, into which no fluid entered as an elementary part, was made as early as 1822, by Professor Sæbeech of Berlin.‡ He employed a single bar of antimony, and having wound round the two extremities of this several coils of brass wire forming the poles, he applied the heat of a spirit lamp to one end of the bar—immediately a current of electricity was established, of intensity sufficient to affect most sensibly the needle of a galvanometer, placed under the circuit. This discovery of what has been called thermo-electricity (from the cause of its development) excited much interest, and the subject was pursued with great zeal, so that the thermo-electric relations of numerous substances were determined—all that seemed essential to the exhibition of these, was, that one part of the circuit should have a higher temperature than the other—the immediate consequence of which was, the determination of an electric current in a direction from the hot part towards the cold. There is no necessity for the substances employed being metallic, for M. Nobili§, a Florentine philosopher, has lately produced electric currents, by the contact of two pieces of moist clay, one

* Professor Whewell in his "History of the Inductive Sciences" questions the right of electricity to be considered a "vera causa," on the ground of its not being a physical reality, but due to the vibrations of an etherial medium. I use the expression without any special reference to the nature of electricity, of which we know so little but simply as a means of conveying the desired expression as to the propriety of reasoning concerning its operations in the natural world.

† Sir J. Herschel.

‡ Dr. Roget's Treatise on Electro-Magnetism.

§ Mrs. Somerville's Connection of the Sciences.

of which was hotter than the other. I cannot pass by this curious experiment, without attracting attention to the interesting bearing it has upon the phenomena of the clay and mud, previously described under class 6. The circumstances of each are exactly similar, for, it will be remembered, the phenomena I described followed the evaporation of the water mixed with the clay, and it is most natural to suppose, that the sun's heat would not operate on every part with the same degree of intensity; hence then we have the exact arrangement of Nobili's experiment viz. moist clay, of variable temperature, in contact throughout. We may therefore conclude, that electric currents would traverse it. Further on this point, it is known, that evaporation is itself one of our most fruitful sources of electricity, and if the water evaporated holds any substance, either earthy or saline, in solution, the quantity of this is proportionally greater; the currents circulating through the clay would thus be increased in quantity, though their intensity would be small; but, as will be afterwards proved, this is the state best adapted for producing those effects attributed to them in this paper.

To prove further that it is a matter of indifference whether the circuit gains or loses heat, provided only that variation takes place, I may give a hasty sketch of some observations made on this subject* by Oeisted, the celebrated discoverer of electro-magnetism. He made a hexagon, the alternate sides of which were antimony and bismuth, the two metals whose junction gives rise to the strongest currents. First he heated one of the soldered angles, and immediately the galvanometer needle was deflected, when two alternate angles being heated the deflection became greater; and greater still, when the spirit lamp was applied to three. Changing his plan, he reduced the temperature of one angle by means of ice (doing which was vertically raising the opposite) and, as might be anticipated, the needle was again most sensibly affected. On applying temperature to these alternate angles, and ice to the intermediate ones, Oeisted obtained the greatest effect from the currents—thus shewing that the intensity depended on the difference between the respective temperatures of the elements of the circuit. Mr. Becquerel arrived at a similar result, finding that the intensity increased with the heat, though a limit seemed ultimately to be put to the law, varying in different substances. To shew that the electricity derived from the above sources is identical both with that from the machine, and the galvanic pile, I may mention, that one Italian philosopher has succeeded in decomposing

* Dr. Roget's Treatise on Electricity.—Society Useful Knowledge.

water and several solutions by its means, while another has produced from it a clear and distinct spark.

Sufficient has now, I trust, been said, to establish satisfactorily the development of electricity under circumstances analogous to those of trap dykes. In the latter there is every essential for such an effect, the original high temperature of the injected trap, the consequent abstraction of its heat by the including rock, in which the temperature was much lower, are in themselves the elements of thermo-electric currents, and a remark due in common with many others of a like nature, to Dr. Faraday, "that when a solid which is not a metal becomes fluid it almost entirely loses its power of conducting heat, while it acquires a capacity for conducting electricity in a high degree," proves to us how favourable their original state was, for being traversed by currents thus excited. Indeed from views which have thus gradually, and step by step, developed themselves during the progress of this enquiry, I cannot but look on trap dykes as being essentially electrical machines, developing continued currents of electric energy during the time that their temperature remains above that of the including rocks—these currents, following the law of intensity formerly announced, being proportional to the difference of temperature between the elements of the circuit. Viewed in this light, trap dykes contain within themselves both the agent, and the substance acted upon, the electricity developed during the process of refrigeration being the one, the constituents of the mass the other. The preceding form another of those many links by which heat and electricity are connected, and though confessedly this bond yet remains enwrapped in mystery, the time seems not far distant when greater light will be thrown upon it, as analogies are becoming stronger and stronger, and materials for the discovery, we might almost say, of their identity are rapidly accumulating. It would be quite foreign to our subject to digress on this point, I would therefore now offer a few remarks on the efficiency of the cause to produce the effects I have attributed to it, and enquire into the connection subsisting between electricity and the phenomena of crystallization; our enquiry must here be exclusively analogical, for it is only thus we are permitted to conduct investigations like the present, where effects remain after the cause to which they are due has ceased to operate.

Electricity, as known in the natural world, may be considered as of five kinds, to which the names, common, voltaic, magnetic, thermo and animal electricities have respectively been given; now one of the triumphs of modern science has been to establish, beyond a doubt, the identity of these varieties, by clear and distinct proofs. Similar effects have been produced by all; composition and decomposition, deflection

of the needle, and the obtaining of sparks, are the chief links of that chain which binds them to one common source. The last to which this has been extended is the animal electricity, or that derived from those animals, as the torpedo, to which God has given the power of administering shocks, as their weapons of defence. Professor Linari of Sienna has obtained both the direct and the induced spark from the torpedo, and Dr. Davy has decomposed water by its means. "It has been further proved, that the apparent differences are due to the peculiar state in which the electricity respectively exists, with relation both to its quantity and its intensity." Now, according to Dr. Roget, these states are three in number, first the state of highest tension, or that in which electricity derived from the common machine exists, when it accumulates till its force is sufficient to enable it to make its way through the air, which is nearly a perfect non-conductor. Second, in a similar degree of tension as when derived from the galvanic battery, where the path is more open to it, and therefore it does not accumulate so much as in the common battery. The metallic parts of the galvanic battery are good conductors, but the fluid ones are not so easily traversed, the quantity circulating is therefore greater, though its intensity is smaller than in the preceding case. Third, in the smallest of all degrees of tension, as in thermo-electric currents, throughout the whole of which no impediment to the free passage of the electricity is met with, the circulation taking place, as it were, from particle to particle, without any non-conducting medium being interposed as in the two first cases. The peculiarity therefore of thermo-electric currents is, that while their intensity is next to nothing, the quantity is comparatively very great. Now it will be considered as a striking fact in connection with this enquiry, when it is known, that batteries whose principles of action are the closest possible to those of thermo-electric circuits, have been extensively used as the means of producing crystillization in a very great number of bodies. Those singular experiments due to Mr. Crosse, and which, from the sensation they excited, are still doubtless fresh in the memories of all, were performed under the circumstances above referred to. Feeble currents, derived from batteries excited by no stronger agent than pure water, but continued for a long time, were the means in operation by which crystals of quartz, arragonite, carbonate of lead, lime and copper, &c. were produced. These experiments I partially repeated some time after their announcement with most satisfactory results. I employed more powerful batteries, and obtained crystals more rapidly, but these are never so perfect as when formed by long continued action. Mr. Becquerel, who has with much success pursued this new path, found that years

were required for the production of some crystals. I believe this philosopher has been the means of forming a Company at Paris, for the purpose of obtaining certain precious stones by the above means, in which I am told by a gentleman who saw them, they have so completely succeeded, that the rubies of the Company could not be distinguished from those of the jeweller. Now I cannot but consider it as strikingly confirmative of the view I am inclined to take of the cause to which the crystalline structure of the trap dykes, &c. is due, that the electric action in them is so precisely similar to that in the above cases. It is even more favourable in the dyke, for the circulation of the currents is more free, especially at first; of course as solidification progresses this is diminished, but this process goes on very slowly, as is proved by lava currents retaining their heat for such immense lengths of time, when the upper surface becomes solid, so as to oppose the further abstraction of heat.

It is further interesting to learn that already have electric currents been detected in metalliferous veins, as by Mr. Fox in those of the Cornwall mines; and though the electricity generated seems more due to chemical actions between different materials in the vein, than to any variations of temperature, still we know the identity of the two kinds, and therefore if one produces a certain series of effects, it is natural to conclude the other would do so likewise. Of Mr. Fox's experiments by which he was led to the above discovery, Professor Wheatstone remarks "the value of these interesting researches consists, in the exact analogy they bear to what actually takes place in mineral veins;" and the result proved how true this remark was. The details of these experiments are now before me, but I do not consider it necessary to enter into further detail on this point, as I trust analogies sufficiently powerful and numerous, have now been brought forward to demonstrate the efficiency of thermo-electricity to produce the phenomena as observed in the structure of trap, and also in other rocks placed under analogous circumstances.

This principle of explanation will readily be applied to all the classes forming the ground work of this enquiry, which here might fairly be brought to a conclusion, since of the peculiar manner in which electricity acts in producing crystallization, little or nothing is known. That it does do so we have seen, and beyond this all is comparative uncertainty; it is therefore with most unaffected diffidence that I venture to offer a few remarks grounded on what is known on this subject, as I can scarcely deem my enquiry complete till such an addition has been made to it. I feel my incompetency to do any thing like proper justice to this question, yet as some interesting information, though small in quantity,

has been collected, I will conclude this paper with a few observations deduced from it.

Crystallization being an arrangement of the ultimate particles or atoms of the crystallized body, according to certain definite laws, it is thence evident that these atoms are of determinate bulk, and that matter cannot in consequence be regarded as infinitely divisible, but must ultimately arrive at a limit. What this limit is we know not, but when it is attained, the atoms have also determinate figures, as well as bulk; for it is known, that certain crystals can only be built up complete by the continued addition of those elements whose form is fixed. Magnitude and form necessarily imply density, and it is known that the particles of a body, however dense that may be, are not in actual contact, but are separated from each other by indefinitely small spaces. Now, considering electricity as a fluid of the highest state of elasticity, M. Mosotti of Corfu conceives, that these minute spaces are filled with the electric fluid, so that each particle is confined within an atmosphere composed of it. Further, and as consistent with the general phenomena of electricity, he conceives that the atoms of the fluid repel each other; the molecules of the matter also repel each other; while there is a mutual attraction between the particles of the fluid and of the matter. Few indeed could follow the refined and elaborate analysis by which M. Mosotti has succeeded in adjusting these forces, but we can all understand and follow the conclusions at which he has arrived. He has proved that *within* certain limits the particles of bodies repel each other, the force of repulsion diminishing rapidly as the distance increases—*beyond* a certain limit the force becomes attractive, and hence there must be some point at which equilibrium between these two forces exists, and there is then no tendency either to repulsion or attraction; if therefore we attempt compression, the repulsive force resists, if we attempt disruption, the attractive force or the force of cohesion then comes into play. The limit at which the negative force becomes positive varies according to temperature, and to the nature of the molecules, and determines whether the body is to be solid, fluid or aeriform. Beyond the neutral point, the attractive force increases till it attains a maximum, and then diminishes, till as soon as the particles are separated by sensible distances it varies directly as the mass, and inversely as the squares of the distances—the well known law of universal gravitation.

Such are the results of M. Mosotti's profound investigations:—applying them, therefore, to the case before us, viz. crystallization, it is evident, that the form of the ultimate particles would materially influence the direction of the attractive and repulsive forces, and hence arises our con-

ception of the polarity of matter, an instance of which in a great scale, is given in the case of the magnetic needle, the polarity of which is now considered due to its electrical condition. Now the phenomena of crystallization entitle us to infer, that there is something like a definite polarity in every particle, by which it is compelled to turn in a given direction, and to group itself with other particles in definite forms—the polarity in the "glaring instance" is due to electricity—may we not reasonably, from the above remarks, infer the same cause, to produce a like effect, in an instance, less under the immediate cognizance of our senses.

By reference to some observations I made about a year ago,* I find a remarkable illustration of the above opinions, noted as having occurred during the crystallization of fused sulphur. On the vessel, in which the sulphur was melted, being removed from the furnace, and allowed to cool, the upper surface of the mass became covered with thin needle shaped crystals, about one-eighth of an inch in length, and about the thickness of hairs. To these crystals, it seemed as if a power of spontaneous motion had been communicated, since they flew about in all directions, first from one side of the vessel to the other, then back again, then across, and indeed they kept unceasingly on the move. On close examination, I found all the phenomena of polarity exhibited by these small bodies toward each other, and on watching two, I observed them gradually approaching each other, till they almost seemed in contact, then, suddenly, both started back from each other to some distance. Turning round they approached each other again, apparently with those sides turned towards each other, which admitted of the attractive force coming into play, for they would rush together, and form what then seemed to be but one crystal. This process was going on throughout the whole, and this alternate advancing and retreating was the cause of the incessant motion. The forms of the acicular crystals were quite different from those resulting from their continued aggregation, the one being long and thin, the other, bright prisms of nearly equal length and breadth, and from one-quarter to half an inch in thickness. This remark is quite agreeable to the researches of crystallographers, who have found that such thin crystals following certain rules of superposition and ranged in a certain order, produce others of entirely different forms.

I will not enter further upon this point, but I trust the few remarks I have made will not be altogether devoid of interest, shewing as they do, the connection subsisting between the electrical condition of the parti-

* These were made in the laboratory of Mr. K. T. Kemp, to whom I believe the credit of having first remarked the singular phenomena is due.

cles, of a body, and the arrangement of these particles in their definite forms, a point of so important a bearing on the nature of this enquiry.

At a future time, I trust to be able to add one more link to the chain of reasoning, by which the preceding results have been arrived at, by giving the details of a series of experiments on the effects of electrical currents passed through bodies in a state of fusion, from which I anticipate additional confirmation to the foregoing view of the cause to which the crystalline structure of trap, basalt, and other rocks of igneous origin is due, as well as that of certain sedimentary deposits, acted on, and altered, by heat of variable intensities.

Perhaps it may now be advisable to cast a retrospective glance at the ground over which we have passed, and to exhibit, by a short recapitulation, the steps of our enquiry, so as to enable the memory to retain the leading points the better, by divesting them of the intervening details. The object to be attained was to determine, as far as we could, the cause of the crystalline structure of trap and other igneous rocks. To this end analogous phenomena were classified, and discussed, their general bearing in regard to each other exhibited, and the bond of union, the point in which they are all agreed, was, in obedience to the laws of induction, considered as either the cause itself, or intimately connected with the cause of the phenomena in question. A law, based on the facts reviewed, was there expressed, at first limited in its application, but subsequently extended, by the discussion of other phenomena, till, commencing with masses in a state of intense heat, it gradually descended till it was found to apply to frozen water. The law of the connection of crystalline forms with variation of temperature, as exhibited in the 7 classes, was then more minutely examined, and, by its extended discussion, variation of temperature was found to be a fruitful source of one of the most active secondary agents in the natural world, viz. electricity. The peculiar case of trap dykes was chosen to illustrate the action of this power, into which the original one was now resolved. Its development, its efficiency, and its mode of action, were successively examined in detail, and analogies were brought to bear on these different points. The field of inquiry is yet far from being exhausted, the dependance of crystalline form on chemical composition as exhibited in the laws of isomorphism, the resolution of chemical action into the preponderance of different electrical forces, as lately proved by Dr. Faraday, the connection subsisting between heat, light and electricity, are all paths open to and inviting research, full of interest, and promising most rich and fruitful returns.

In conclusion, it may be permitted me to remark, that, in seeking to extend the domain of a power already so universal in its agency, so extraordinary in its nature, it is impossible to refrain from oft times having the heart raised to that God whose handy-work we are investigating, and to whose name I would desire to ascribe that tribute of praise, too often, I regret to say, withheld by many who devote their talents and time to laying open the secret laws by which He governs the world in which we dwell. It gives us no mean idea of his power to mark, how, with one instrument, such varied, such numberless effects are produced. Nor is this idea diminished, when we examine the nature of the instrument itself, and find it so worthy of an Almighty hand. Traversing space with a duration less than the millionth part of a second; passing through solid bodies more rapidly than light travels through the regions of the planets;* at one time rending rocks asunder, at another the obedient slave of man; contributing both to his wants, and his pleasures; residing in the magnet, it guides the sailor on his pathless way, labouring in the caverns of the earth, it is daily producing more abundant supplies of the various metals so necessary to man's social comfort and earthly happiness; nay, some would even lead us to suppose, that it is the great link by which world is bound to world, that the great principle of gravitation is to be merged into the still greater one of electrical action. Be this as it may, electricity is, even supposing it false, an instrument sufficiently wonderful to lead us to admire and to glorify Him by whom it was created, and by whom it is now directed in all its vast and varied operations.

* Such are some of the striking results to which Professor Wheatstone's researches on electricity have conducted him. I am indebted to Turner's Elements of Chemistry for a short account of these. Mr. Wheatstone has found—

(1) That the velocity of electricity along a copper wire exceeds that of light through planetary space.

(2) The light of electricity of high tension has a less duration, in passing as a spark, than the millionth part of a second.

In a letter to Dr. Buckland, Mr. W. says, in reference to the economical applications of this power, "it requires not the tongue of a prophet to foretel that the voltaic pile will hereafter create as great a revolution in our chemical manufactories as the steam engine has already effected in the mechanical arts."—Bridgewater Treatises.—*Notes.*

V.—*Notice of River Dunes on the banks of the Hogri and Pennaur.*—*By* Lieutenant Newbold, a. d. c. *to* Major General Wilson, c. b.

Passing through Honoor, a village about 20¼ miles S. by E. from Bellary on the Bangalore road, I observed small ranges of sand hills, covering the black cotton soil to a considerable extent, that had very much the appearance of the dunes on the Malabar Coast. Not recollecting the vicinity of the Hogri river, I was at a loss to account for their appearance in this locality; but, on ascending one of the highest, I perceived the wide sandy bed of the river at a considerable distance to the west. This, and the clouds of sand blown in my face, were now sufficiently indicative of the cause of the elevation of these ambulatory hills. The direction of the ridge on which I stood was nearly north and south: it ascends from the west, *i. e.* from the river, in a broad sweep of drifted sand, covering the intervening land for nearly a mile, and terminating in a rather abrupt and steep descent, which falls to the east. This line is by no means regular; as the arenaceous phalanx advances most in those parts, where there is least obstruction from vegetation. One of these advanced dunes I observed, in the act of crossing the dry bed of a nullah. Many of them are prevented making progress by the embraces of the long fibrous plants that have grown up, and are interwoven with their substance: the *kaki beyru*, and *jihar chettoo* are the plants usually seen in this situation. Small fresh-water shells, principally univalves, have been carried along with, and imbedded in the sand: the wind has left ripple-like marks on its surface, and it only requires consolidation to transform the sand of yesterday into a rocky fossiliferous ridge.

On arrival at Honoor, the following information was given me by the head-man, and some of the oldest inhabitants of the place. The sand hills advance in an easterly direction, every year, during the months of June, July and August, when the western winds blow strongest. On an average they progress two, or two and a half yards annually. About eight years ago, when the rain was scant, and the wind unusually high, one of these dunes advanced on, and buried land under cultivation to the extent of more than eight chains, which has not since been reclaimed. During the famine about seven years ago, the dunes threatened to overwhelm Honoor, and the sand actually rose in the streets to the height

of five feet. In order to prevent the recurrence of such a disaster, the villagers allow the intervening *babul*, and other trees to grow, which they were formerly in the habit of cutting down. The present distance between the nearest sand-hill and the village does not exceed more than 400 yards. In the memory of the oldest native of the spot, the sand was confined to the immediate vicinity of the river banks: he attributes its advance to the cutting down of the jungle, and the comparatively dry seasons that have since prevailed.

The village of Bodurti, in the Conigul district, about three koss hence, was totally overwhelmed about 10 or 12 years ago. I visited the site of this village, and found it, with the exception of a foot or two of the old walls rising above the sand, completely buried under a large dune. The expelled inhabitants have built another village, not far from the site of its predecessor, whose name it now bears. I have met with sand dunes on the banks of the Pennaur in the Cuddapah district, and have ridden over the remains of an old village and pagoda, in the vicinity of Jummulmudgoo, now completely covered by the sand. They occur also on the Malabar Coast, and contribute greatly to the formation of those singular lakes of sea and fresh-water, termed back waters. These sand hills resemble the dunes extending from the mouth of the Garonne to the district of Bayonne, described by De la Beche, blown up by the westerly winds, and preventing the drainage of the country, and forming marshes in their rear. It would be worth while to examine the deposit now forming in the Malabar back-waters. In those of the Garonne are often found alternations of marine, fresh-water and terrestrial deposits.

VI.—*Extract of a Letter from Captain* J. A. Smith, *Civil Engineer 1st Division, dated 3d April* 1839, *on the Table land of Cumbaucum Droog.*

(Communicated by the Madras Government.)

I have visited and examined the table land in the vicinity of the Pulicat lake, described by Lieutenant-Colonel Montcith in the Madras Journal of Literature and Science, No. 12.

The hill on which this table land is situated is part of a ridge connected with the eastern range of ghauts, and is known by the name of Cumbaucum Droog, the inhabited spot adjoining to it being a village in the Calastrie Rajah's territory, called Tallaripett, distant about 10 miles from the Pulicat lake, the nearest points of which are at Tudda and Bolingarpollium, both situate on the high northern road.

From Tallaripett the distance is about three miles, the road winding through a thick jungle to the foot of the hill. The ascent is irregular and in some parts steep, but although there is no formed road there is little difficulty in reaching the table land, which may be done on foot, or even on horseback. The length of the ascent is about four miles.

On completing the ascent, a comparatively level surface, of fully two square miles in area, is met with, the general appearance of which is that of a flat basin surrounded by bluff ridges in every direction, and intersected by ravines. The soil appears to be good and is said to have been productive and fertile, there are traces of cultivation, and the ruins of a pucka building were pointed out to me.

On my first visit to this spot on the 8th ultimo, a series of barometrical observations was made for the purpose of ascertaining the height of the table land above the level of the sea, the result of which gave an altitude of about 1650 feet; that of the nearest adjoining peak to the eastward of it, being nearly 1900 feet.

On a subsequent visit on the 28th of the same month, a fresh series of observations gave the altitude of the table land nearly 1700 feet, and that of the highest of the surrounding peaks, viz. of one distant about three miles to the south-east of the ruins before mentioned, about 2300 above the level of the sea. On the first visit the thermometer in the shade of a tree stood at 80° to 81°, at 10½ and 11 A. M., a strong southerly wind prevailing at the time, and the sensation to the feelings being cool and

agreeable. On the 28th a dry hot wind was felt at intervals, and the heat was very oppressive; the thermometer standing at 98° and 99° at noon in a tent, and the air being parched and scorching. The water, however, procured from the reservoir in the bed of the torrent, which passes down a ravine intersecting the table land, and which being supplied from internal springs may be considered to represent the average temperature of the spot, was found, even in the latter visit (the 28th), to possess a temperature of only 64°: so that the occurrence of the extreme hot weather then experienced is the more remarkable, and may be perhaps an unusual circumstance.

The supply of water appeared to be abundant, and it was of a limpid clear appearance. It is also considered of good quality by the natives in the neighbourhood, but various streams which I tasted had all a bitter taste, which was accounted for by the natives from the circumstance of the water-courses being choked with leaves and vegetable matter, and it is not improbable that that objection would be obviated by clearing them out, or by deriving the supply required from wells.

The fact that this elevated region is not exempt from the occasional influence of the hottest winds, may perhaps be considered likely to defeat its usefulness as a sanatarium for invalids; and to take away considerably from the beneficial effects which its bracing atmosphere might at other seasons offer.

V.—*Fifth Report of Progress made in the Examination of the* MACKENZIE MSS., *with an Abstract Account of the Works examined.—By the Rev.* WILLIAM TAYLOR, *Member of the Madras Literary Society, &c.*

A.—TAMIL.

a. Palm-leaf Manuscripts.

1. *Cási-Cándam*, or the section of the *Scánda purâna* which relates to Benares.

No. 9—Countermark 51.

This is a large manuscript, though forming only a part of the *Scanda purana*. It is written in the kind of Tamil verse termed *Viruttam*, a difficult kind of measure. Its translation into this metre is ascribed popularly to *Adi-vira Pandiyan*, which is the case with several other works, too numerous to be probable; except possibly as regards patronage of the different authors. But the ascertained fact, that the College at Madura was founded with a special view to the transfusion of Sanscrit works into Tamil, and for the spread of the *Hindu* religion in the extreme south, may account for many dedications or ascriptions of works to one king. There is a reference in this poem to the passage of the *Vindhya* mountains by *Agastya*, extravagantly hyperbolized, but the greater portion relates to the river, and *tirt'has* or pools, to shrines, and to the legends of individual devotees at Benares. The *Cándam* or book is divided into one hundred *Adhyáyas*, or subdivisions. A specification of the contents of these *adhyáyas*, with a brief occasional explanation may suffice as regards this document.

1. *Nareda's* inspection of the *Vindhya* mountain. *Nareda* taunted the *Vindhya* mountain with being inferior to *Maha-meru* in size, and also inasmuch as the sun turns round *Meru* in its course. The *Vindhya* mountain, feeling itself insulted, elevated its summit even to the skies.

2. The celestials visit to *Brahmas'* world. As the *Vindhya* mountain had obscured the light of the sun, the celestials went and complained against it to *Brahma*, who referred them to *Agastya*.

3. The visit of the celestials to the hermitage of *Agastya*. They made known to him the haughtiness of the *Vindhya* mountain.

4. The praise of matronly chastity. The celestials describe the wife of *Agastya*, as a pattern of matronly virtues

5. The visit of *Agas'ya* to the *Vindhya* mountain. *Agastya* went near to it, when it bowed down, and paid homage at his feet. *Agas'ya* said "I am going to *Pothaiya*, and until I return remain always thus", a command which could not be broken.

6. Account of the *Tirt'has*. The virtues of the river Ganges are stated, and those of many other rivers, and reservoirs connected therewith, of superior efficacy in the removal of crimes.

7. The praise of towns adjacent to Benares. These places have their excellencies declared.

8. The account of *Siva-janma* and *Yama*. The former was a royal devotee, at whose death *Yama* took his soul.

9. The visit to the solar orb. *Yama* took the said persons soul, and shewed it that world.

10. The visit to the world of the celestials. *Yama* shewed this world to the soul of *Siva-janma*.

11. The visit to *Agni-loca*. *Yama* shewed to the disembodied soul the worlds of fire.

12. The visit to the quarter of *Nairiti*, guardian of the south-west.

13. The visit to the quarters of *vayavu*, and *Cavéra*, regents of the north-west and north-east quarters.

14. The visit to the world of *Isvara*, and *Chandra*.

15. The visit to the worlds of *Táraga*, and *Budha*, or the starry sphere, and the planet Mercury.

16. The visit to *Sucra-loca*, or the planet *Venus*.

17. The visit to Mars, Jupiter, and Saturn.

18. The visit to the regions of the seven *Rishis*, or the north polar celestial sphere, especially *ursa-major*.

19. The visit to the *Dhruva-mandalum*, or north polar-star; the said visit, like the preceding ones, being performed by the soul of *Siva Janma* under the guidance of *Yama*.

20. Eulogy of *Dhruva*.

21. Apotheosis, or beatification of *Dhruva*.

22. Visit to *Maha-loca* and the four other superior worlds.

23. The coronation of *Vishnu*, as seen by *Siva-janma*.

24. *Siva-janma's* beatification. As this king had, during his life, been a great benefactor, and had abounded in liberality, so after his death

Yama took him on the long celestial pilgrimage* above intimated; at the close of which he obtained full beatification.

25. The visit of *Agastya to Subrahmanya*. On occasion of this visit *Subrahmanya* conducted *Agastya* through *Benares*, and explained to him its various distinguishing features and excellencies.

26. Eulogy of the female sex at Benares, by *Subrahmanya* to *Agastya*.

27. Eulogy of the Ganges; in the same way narrated.

28. The depositing of bones in the Ganges. If the bones of those who die be deposited in the Ganges, the beatification of the departed is assured.

29. The specification of the thousand names of the river Ganges.

30. The praise of *Váranasi* or Benares. The *morality* of this *adhyáya* is observable. A woman entertained an improper affection for her own son, who remonstrated, and denounced on her total destruction. But on her death, advice was given to cast her bones into the Ganges, at Benares; in consequence of which her soul attained to *Sverga*. Hence *Casi* acquired the name of *Varanasi*†

31. The manifestation of *Bhairava* a terrific form of *Siva*.

32. The manifestation of *Tandapàni*. A devotee paid homage to a form of *Siva*, and received favour from so doing.

33. The magnificence of *Casi*, declared to *Agastya*, by *Subrahmanya*.

34. The beatification of *Calavati*. The legend of a woman, who took permission from her husband to quit domestic life; and, going to Benares, acquired beatification.

35. The declaration of household order. This section relates to the duties of those not devoted to an ascetic life, or the *Grihasthas*.

36. The duties of the order of *Brahmà chari* or religious novice.

37. The excellencies of the female sex: a eulogy of their perfections.

38. The duties and deportment of the *Brahmanical* order.

39. The duties of alms giving, by householders.

40. The deportment of *Saiva*-ascetics: rules as to their diet, and general conduct.

41. The knowledge of fatal indications. Certain signs are specified, by which a person may know the near approach of death. In such

* In this extensive celestial tour, the narration of which occupies from section 9 to 24 there is a sort of wild sublimity; upon the whole very superior to some puerilities of Byron; written, it may be conjectured, under like inspirations. *See his Cain.*

† See Wilson's Sans. Dict. 1st edition, page 796, or 2d edition page 735 for the derivation of the name. The above passage would seem to indicate a different one.

cases, in whatever place he may be, he is recommended to repair to Benares, that he may thereby attain beatification.

42. Account of *Abimutesam.* This person by great devoteeism to *Siva*, obtained much approbation, and many secular advantages.

43. The story of *Tilotattan ;* in subject, resembling the preceding.

44. The magnificence of *Casi*, again declared.

45. The visit of ascetics to *Casi* for the purpose of obtaining beatification.

46 to 51. Legends of individual devotees, at *Casi.*

52. Account of *Brahma's* sacrifice.

53 to 57. Visits of deities to *Casi.*

58 to 85. Legends of individuals, and formation of images, bearing some of their names.

86. The sacrifice of *Dacsha.*

89. The same subject continued.

89 to 99. Different legends of individuals.

100. A brief repetition or summary ; and description of the homage paid to the emblem of *Siva.*

Remark.—From this very brief indication the prevailing inanity, and wiliness, of the work may be inferred. The *St'hala puranas*, or local legends, of most of the distinguished *Hindu*-fanes, are drawn up generally on the same model. The bearing of such documents on the explanation of manners, and mythlogy, is very important. As to history there is, I conceive, nothing in this document of any value.

NOTE.—The manuscript is of comparatively recent hand-writing ; remaining fresh and uninjured. It is entered in the Des. Catal. vol. 1. p. 166. Art. X.

The following are Tamil versions from the great epic poem the *Rámáyana.*

2. *Ramayana*, No. 1.—Countermark I.

This manuscript contains a copy of *Camban's Ramayanam*, down to the end of the fifth *Candam*, or book ; and by consequence including the *Bála—Ayódhya—Aranya—Kishkinda* and *Sundara*-books, or *Cándams.* So far the work is complete; and so very slightly injured that it may be considered to be in good state of preservation. It is entered in Des. Catal. vol. 1. p. 163. Art. I.

3. *Yuddha Candam*, No. 2.—Countermark 2.

This manuscript, which is equal in size to the foregoing one, contains the sixth book in continuation of the preceding, narrating the war with *Rávana*. It is also in good preservation. With this book, strictly speaking, the work of *Camban* concludes. It differs, in some minor particulars, from the Sanscrit poem by *Válmica*.

It is entered in Des. Catal. vol. I. p. 164. Art. IV.

Remark.—The *Uttara Candam* or supplement is wanting in the above copy. That supplement relates to the ancestry and family relatives of *Rácana*. Tradition ascribes its authorship to *Otta Cuttan ;* but adds that *Camban* approved it, and incorporated it within his own work ; an addition which seems doubtful.

4. *Aranya, Cándam,* and *Kishkinda Cándam* or 3d and 4th sections of the *Ramáyana,* No. 4.—Countermark 2.

In this copy the 1st leaf, the 49th and a few leaves at the end, are wanting. The M.S. is very old, and much worn away at the edges ; having also one or two leaves broken; but it is untouched by insects. The necessity of restoration is obviated by the existence of a complete copy in No. 1.

This manuscript seems to be part of one uniform copy, together with the two following portions, which in every respect resemble it, in external appearance, in age, and in the hand-writing. Such being the case the copy wants the two first sections, or the *Bála,* and *Ayódhya Cándams.*

5. *Sundara—Cándam,* No. 5.—Countermark 3.

The copy is complete ; the leaves are a little injured, the M.S. being very old, but not to any serious extent.

Consequent on the above remark, the sixth section, or *Yuddha Cándam,* is wanting.

6. *Uttara Candam,* No. 3.—Countermark 5.

This copy is complete; very old ; and only slightly injured.

That this copy belongs to the preceding second series, is determined by its appearance, and general characteristics, which forbid its being considered as a supplement to Nos. 1 and 2. However being taken with 1 and 2, it forms a complete copy of the entire work ; and one copy complete, as to matter, I deem sufficient for the collection.

Remarks.—I have been informed that a prose version complete was made of Camban's poem by *Srinarasa pillai*, for R. Clarke, Esq. part of the expense having been borne by Judge Gwillim, and J. Gwatkin, Esq. I have not seen that version.

7. *Ramáyana váchya* a prose version of the *Ramayana*, No. 6.—Countermark 6.

In the title *Cavi* (or poetical) is added, but this is wrong, the whole being prose, of an ordinary kind. It is a rather large manuscript, in good order, and complete.

A man of the *Vaniya* class is said to have gone every night to hear the *Ramáyana* of *Válmica* recited and explained by a *Brahman*, according to the usual custom of such public recitations; and the next day to have written down the substance of what he had heard. By this means he completed an epitome of the original work; which hence familiarly acquired the name of *Válmica Ramáyana*; because following *Válmici* implicitly, which the poet *Camban* did not do. It is not requisite, I believe, for me to abstract the contents; a general notion of the story the *Ramáyana* being, it is presumed, very common.

The book is entered in Des Catal. vol. I. p. 165. Art. IV. as "a pr version of the *Ramáyana* attributed also to *Kamban*;" by whom attri ed is not stated. The *Ramayanam* by *Camban*, is a first rate work; one of very mediocre character and pretensions. There are two prose versions; but neither of them by *Camban*, who was strictly solely a poet.

8. *Ramayana*, another (incomplete) copy.

This book it may be supposed originally contained the w the second division of the *Ramayana*, or the *Yudha Cand Uttara Candam*, but in its present state it wants 199 leav the begining of the *Yudha Cándam*, and is thence complete to of the *Uttara Cándam*. At the close there is a superscription s that it was written, or compiled, by *Vasudeva-pillai* for Dr. The said *Vasudeva-pillai*, I am informed, was a schoolmaster a

This version, like the last mentioned copy (No. 6) follows th of *Válmica*; but it is much more full. This imperfect ma equal, in size, to the whole of the said epitome.

However apparently it belongs not properly to the Mackenzie collection. It has nothing whatever of the outward adorning bestowed on the Mackenzie palm-leaf MSS. is of the plainest possible appearance, has no label or number; and none of the usual marks of having passed through the hands of Prof. Wilson; only the name *Ramáyana* in Tamil letters written in ink, on one of the boards. Hence I look upon it as a MS. more recently introduced to the collection, by whom, or for what purpose, cannot be stated.

The following manuscripts are Tamil versions from the *Mahábharata.*

9. *Subha-parva* the second book of the *Bharatam*, No. 46—Countermark 7.

10. Another copy, No. 47—Countermark 7.

Both of these manuscripts contain an inferior version of the above mentioned portion of the *Mahabharata.* It is said to have been a production of one *Nangai*, a *Brahman* woman, and to be known familiarly by the name of *Nanga-páttu* (or the chant of *Nangai*). The versification is plain, and of common order, adapted to the comprehension, and pronunciation of women, and occasionally is sung about the streets in ballad style.

The first of the two copies is in regular and good order, and complete: the other copy is damaged and very imperfect, at the begining, but being part of the same work the damage is of no consequence.

What remains proceeds as far as to the sojourn of the *Pándavas* in the wilderness; and thenceforward is what is termed *Pulantaran dutu*, being an account of the sending of a son of *Arjuna* to the household of *Duryodhana*, and his deportment there. The former part seems to be only introductory to this latter portion, which latter portion is complete. By consequence this manuscript is improperly entitled *Sábha-parva*; being a work differing from the *Bháratam.*

11. *Udyoga-parva*, No. 48—Countermark 48.

This book contains not only the whole of the above mentioned section of the Tamil *Bháratam*, but also a portion of the *Yuddha-parva*, down to the seventeenth day's combat. It has the appearance of age;

but is in extremely good preservation. It is part of a version by *Vili-puttur-áluvàr*, and is commonly termed *Aluvàr pádal*; which version is esteemed the best of three others by *Hindu* poets. The inferior versions are by *Nala-pillai*, and by *Rangha-náthapuluvan*. This copy, it is scarcely necessary to add, is in elegant Tamil verse.

12. *Yuddha-parva*, No. 49—Countermark 6.

This manuscript contains the whole of the above mentioned section of the *Bhárata*, in an inferior kind of versification, by an obscure or unknown author. It is supposed to be part of a version made by some one of the *Paria* tribe, who are reported to have such a version among themselves.

One-half only of the book contains the said section. The other half is a portion of some work on medicine, by whom written is unknown. It is not complete either at the beginning, or end; and is damaged, by the edges of some leaves being broken off.

NOTE.—Six portions of the Mahabharata are entered in the Des. Cat. vol. I, p. 165, art. vii. I do not find more than four MSS. now remaining.

12. *Hanumanta-pattu* a chant in praise of *Hanuman*, No. 204—Countermark 182.

This is a book, very small in size, and brief as to contents. It contains ten stanzas, as a eulogy of *Hanuman*, for the assistance rendered to *Rama* in the war against *Lanca*. The eight diminutive leaves on which the book is written are much damaged by insects.

There is an appendix of eight similar leaves, of which only four are written on; the contents being an unfinished poem in praise of a local goddess, termed *Periya-nayaki-amman*, in good preservation.

It is entered in Des. Cat. vol. i. p. 228, art. lii.

13. Trincomalee *St'hala puranam*, or legend of the fane at Trincomalee Nos. 17 and 18.—Countermark, 25 and 26.

It is termed *Arnáchella puranam* in the manuscripts.

It contain 12 *Sargams* or sections. A brief abstract is here offered.

1. The first *Sarga* has the usual invocations and eulogies, and announces the name of the writer or author, that is *Yellapa-Vádhyar* of the *Saiva* class, who states that he translates into Tamil, from the Sanscrit original by *Vyasa*. It was originally delivered by *Nandi* to *Márcandeya*, by *Márcandeya* to *Vyasa*, by him to *Suta*, and by *Suta* to the *rishis* of the *Naimisara* wilderness.

2. This section contains the legend on which the distinctive name of *Arnache'lam* is founded. *Siva* appeared as a fiery mountain, and to settle a dispute between *Brahma* and *Vishnu*, as to which was the greatest of the two, they agreed to try if they could, to discover either the foundation or the summit of the mountain. *Brahma*, assuming the shape of a goose or swan, flew upwards, and *Vishnu*, in the form of a boar, dived downwards. The latter returned and stated that he had not succeeded in discovering the foundation, but *Brahma* came back and said he had seen the summit, bringing a flower* suborned to bear false witness. *Siva* in consequence doomed *Brahma* to be without fanes or worshippers, for his falsehood, and declared *Vishnu* to be superior to *Brahma*, though confessedly inferior to himself.

3. This section in the commencement narrates *Dacsha's* abuse of *Siva;* the sacrifice of *Dacsha* to which his daughter the wife of *Siva* desired to go, and going perished; in consequence *Siva* (it is here said) produced *Vira-Bhadra* from his frontlet eye, who went and destroyed the sacrifice returning afterwards to *Cailasa*. Subsequently, while *Siva* was performing severe penance, one *Sura-padma*, an *asura*, acquired so much power as to trouble both gods and men. Complaint being made to *Brahma*, he announced the future marriage of *Siva* with *Parvati*, and also the birth of *Subrahmanya* by whom the *asuras* would be destroyed. *Indra* sent *Manmatha* to destroy the penance of *Siva*, and *Siva* opening his frontlet eye reduced the assailant to ashes. Subsequently *Siva* returned to *Cailasa*, where the celestials represented to him the expediency of marrying *Isvari* the daughter of *Parvata-rayen* (or the mountain king) to which he consented, and the marriage was conducted with the customary state and splendour. At the prayer of *Reti*, *Siva* pardoned *Manmatha*, who came and paid homage without any visible form, in consequence of his body having been turned to ashes. The oppression exercised by *Sura-padma* being stated to *Siva* he produced six fires from his frontlet eye, by the union of which *Subrahmanya* with six faces was

* The Kétaki, or Pandanus odoratissimus: which, partaking of the curse, is never used by the Hindus in honouring the gods.—*Editor.*

born. He fought with and conquered the *asuras* and having done so returned to *Cailasa*.

4. After the marriage ceremony was over *Parvati* asked *Siva* what were the sun and the moon; he replied they were his two eyes; whereupon *Parvati* shaded both eyes with her hands: the consequence was universal darkness over the world; and all beings lost the use of their eyes. *Siva* incensed opened his frontlet eye, and dissipated the darkness. *Parvati* was decreed to do penance on earth, which she did under a mango-tree at Conjeveram, and there erected a small image of earth. She subsequently went on a visit to *Arnachellam*, and thither *Gautama* the *rishi*, and others, inclusive of *Siva* himself, also came.

5. This section in the commencement relates to *Mayasura* who in a former birth, for a fault committed, was condemned to be born as a buffalo. Acquiring great power *Isvari* sent for *Durga* to go and kill him. A combat took place in which *Mayasura** was slain. An emblem of *Siva* arose out of his remains. Subsequently *Siva* came to *Arnáchel'am* on his bullock vehicle, and there incorporated *Isvari* into his own form, so that on the right side the form of *Siva* was presented, and on the left side that of *Parvati*.

6. This section contains the story of *Va'ranga Pandiyan*, an abstract of which was before given, from a copy of this *Sarga* in a manuscript book. See 2d Report A. Tamil M.S. book. No. 20 section 5.

7. Notice of the *tirt'has*, or sacred pools. A *Brahman* sprung from the perspiration of *Gautama rishi*, at *Arnache'lam*. He became hierophant to the fane. Seven females were born from seven blades of *Darb'ha* grass, who became *dancuses* to the god. To the east of the fane is the *Indra*-pool. *Indra* bathed therein: by doing so removed his former defect; and obtained prosperity, co-existent with the sun and moon. To the south-east is the *Agni*-pool. If any one bathe therein at the full moon in *Panguni* (March-April) the doing so will remove the crime of infanticide. At the foot of the hill is the *Yama*-pool. If any one bathe therein the body will be healed of disease, and a golden coloured form acquired. Also at the foot of the hill is the *Nairiti*-pool; all sins are removed by bathing therein. On the west of the hill is the *Varuna*-pool. By bathing in it, the advantages bestowed by the nine planets are acquired. Beyond is the *Vayvu*-pool; by bathing in it all sorrows depart. On the north side is the *Cuvéra*-pool; by bathing in which poverty is removed, and wealth acquired. Near to it, towards the east, is the pool formed by the two *Asvinis*. If any one bathe in

* The *asuras* of this class had faces like buffaloes.

it, he will approach the feet of *Paramèsvarer* (or obtain beatification) after death. To the east of the before mentioned *Yama*-pool is the pool of *Agastya*. Those who bathe in it will acquire *Sarasvati* and *Lacshmi* (intellectual skill and outward abundance). There is also the pool of *Vasish'a*. If any one bathe therein in *Arpisi* month (September-October) he will acquire all the learning of the age. There are besides, says the *Purana*, many other *tirt'has*, the merits of which cannot be told. To the north of the hill is a river, *Nri nadi*, the effect of bathing in which is to cause *Lacshmi* to dwell with *Vishnu* (or to produce order and plenty). Other rivers are mentioned, which remove crimes. Besides there is the *Punya*-river *(vulgó Ponniar)*. A certain king bathed in it, and changed an effeminate to a masculine form. The *Cheyàr* derives its name from a weapon of *Subrahmanya*, the *vél*, which he dropped into it, and recalled. There is within the fane of *Trinomali*, the pool of *Siva*. If any one daily think on it, all kinds of crime will be removed. To the east of it is the *Chacra* reservoir. During the *Varàha-avataram Maha Vishnu* bathed therein, and by doing so acquired all the glory connected with the high office of *Vishnu*. All who bathe in it will obtain health. Finally there is the pool of *Brahma*. By bathing therein, all the evils that float in the sea of this life will be removed, and eternal happiness acquired. If any one on its bank give a bit of gold, however small, he will acquire possession of all that is enclosed within the seven seas surrounding the world. If a cow be so given, the merit of the gift is beyond the power of words to describe. If any one so give a white cow, such a one will ascend to *Cailasa*, on a white (or silver) vehicle, and be praised by all the residents there. If any one give a marriage dower on its bank, such a one will visit the *Satya-loca* (world of *Brahma)*; and afterwards permanently obtain to the paradise of *Siva*. If any one give a donation of land, the reward is too great to be described. If any persons cause a pond, or well, to be dug at *Arnàchellam*, they will acquire the prosperity of *Indra*. Further, on the place of sacrifice there being a little dust, a crow flying by swept off the said dust by the concussion of air from its wings, and *Siva*, in return for the unintentional service, gave the crow beatification. Besides a large kind of rat (bandicoot), from delving in the ground, cast up a jewel *(mànicyam)* before the shrine; and the god, saying it had supplied him with a light, gave a gracious reward. A spider spinning a web in the shrine, the god was rejoiced in being supplied with a garment, and caused the spider in the first place to be born a king, and afterwards to be beatified. Such, says *Suta* to the *rishis*, is the glory of the fane of *Arnachellam*.

8. This section specifies the rewards consequent to walking round the hill, and to bathing on certain days of the week. For example, to walk three steps when circumgyrating the hill is equal in merit to the performance of an *asramed'ha* sacrifice. To bathe on Sunday, secures the bliss of *Paremesvarer;* on Monday, secures not only equal power to that of *Indra* over the seven worlds, but also a form like that of *Siva;* on Tuesday, removes poverty, secures wealth here, and beatitude hereafter; on Wednesday will give the power of acquiring all magical knowledge and secures beatification; on Thursday will give the privilege of becoming *guru*, or spiritual preceptor, to the *Trimurti* or *Hindu Triad;* on Friday will secure the beatification of *Vishnu's* world; on Saturday will secure perfect happiness, and is equal to the merit of bathing on the night of *Siva*, at the new-year, and in the months of *Arpisi*, *Carticeya* and *Margali* (or October, November and December). The contents of this section were narrated by *Brahma* to *Sanaca*, the great sage.

9. *Brahma* to *Sanaca* in continuation, declares the extreme penalties incurred by those who presume to say any thing against the shrine of *Arnachellam*, involving death, seizure by *Yama's* messengers and severe punishment in *Naraca*, or the lowest hell. *Brahma* continues stating that the thousand-rayed sun, coming rudely with his horses and chariot, to the point, or peak, of the hill, was reproved by him *(Brahma)* and told to go and pay obeisance to the lord of the shrine. The sun paid homage, which was accepted, and he now uniformly passes to the left (north) side of the hill.

10. The legend of *Praditya-raja*. *Brahma* tells *Sanaca* the extreme punishment incurred by those who presume to steal any thing from the shrine of *Arnachellam*, being seizure by *Yama's* agents, and consequences, as in the last section. An example is given in the case of *Pradatya-raja*, who came from the north, and coveted a part of the possessions of the fane, for which his face was turned into that of a baboon, and on seeking pardon for the fault, his proper countenance was restored; by consequence no one can with impunity covet the possessions of this shrine.—See a fuller abstract of the contents of this section 2d Report Tamil MS. book No. 20. section 4.

11. This section relates to the removal of crimes. *Brahma* tells *Sanaca* that the eight *Vasus* (or leaders of celestial hosts) becoming vain and proud of the merit of their penances, and performances, boasted of the same in the presence of *Agastyar*, who denounced on them loss and degradation. To recover their former situation they were directed to go and do homage at *Arnachellam*. Accordingly the eight *Vasus* did homage, at the eight points of the compass, and were restored. Other crimes

among celestials are specified, as removed at this shrine. Among them *Chandra* (or the moon) committed a fault in reference to *Rohini* and was punished by *Dacsha*, but the punishment was removed by paying homage here.

12. This section relates to *Pulacatipa*, an *asura*, who provided the perfume of civet for the shrine, and acquired great merit for so doing. Since then civet-cats are kept, and the reward of offering that perfume is very great. A recapitulation of the transit of the contents of the *Purana*, down to its latest delivery to the *rishis*, with the mention of which the book ends.

NOTE.—The MS. No. 27 is complete. It is old and somewhat damaged by insects. The MS. No. 18 is fresher in appearance; but also a little damaged. The damaged leaves in this copy I have had restored by the aid of both copies, and one being complete may suffice. Both MSS. are in verse with a prose explanation. They are entered in Des. Catal. vol. 1, p. 168 art. xvii.

REMARK.—If the reader shall have perused the foregoing abstract, it will be only necessary further to observe, that in *Saiva* fanes of the Peninsula, to local *Purânam*, and not the *Vedas* gives the religion of the votaries.

14. *Dandi Alancaram*, or the rhetoric of *Dandi*, No. 63—Countermark 220.

In this book there are two copies tied up together. The first copy contains the *mulam*, or original poetical stanzas of *Dandi*, together with exemplifications or examples, and is complete. The second copy contains the original *sutras* together with the *urai* or commentary, in verse, by some other unknown author; added to which are the exemplifications. This last copy wants a few leaves at the end of the commentary. The book is a little injured in one or two places, by insects; but not seriously. The work is not scarce.

Dandi next to *Calidasa*, is said to have been the most celebrated poet at the court of *Bhoja-raja*. He has the traditionary reputation, in the Peninsula, of having been *Ubaiya-cavi*, or a poet in two languages, the Sanscrit, and the Tamil. The above work is on thirty-five kinds of poetical, or rhetorical, ornament; and, with reference to the Tamil art of poetry, the work is considered to be valuable.

This book is briefly entered in Des. Cat. vol. i. p. 252, art. vi.

15. *Jataca Kerala alancaram*, a treatise on astrology No. 69—Countermark 233.

This manuscript is a poem of one-hundred palm-leaves; probably written according to the notions of astrological science prevailing in the *Keraladesam*, or *Malayalam* country. It has a great variety of details on different circumstances, occurring in the course of life; respecting which mankind have usually been found to have an anxious eye directed towards the future. A full detail, as to native ideas on astrology, is quite requisite to a knowledge of their manners, or motives, or guiding principles.

Astrology is inseparable from their mythology, and both, to an amazing degree, influence the conduct of a *Hindu*. Both tie him fast under Brahmanical ascendancy. An exposition of *Hindu* astrology, by a verbal translation of recognized systems, seems to me desirable. It would be a more than usually difficult work, and might require the undivided attention of some one individual, for some length of time. Without a knowledge of the *local* mythology, and the received astrology of any portion of our *Hindu* fellow subjects and fellow men, it seems to me that legislators, and religious teachers, must equally labour in uncertain twilight, without a clear discernment of the subject on which they operate.

NOTE.—The book is entered in the Des. Cat. vol. i. p. 255, art. vi.

16. *Nurya-sastra*, or the art of building and navigating vessels, No. 78—Countermark 259.

Some directions are given respecting the materials, and dimensions, of vessels. But the work is chiefly astrological; in matters relating to prognostications concerning navigation. At the close there is a leaf or two on the *raja-yojam*: children born under that astrological sign will acquire very great success, and prosperity.

REMARK.—Seven leaves of this tract were recovered from MS. No. 97, and being added to the beginning of this document render it now complete. It is also in tolerably good order, and written in a very legible hand. It seems to be a work of somewhat ancient composition.

The *Sutras* are without commentary.
It is entered in Des. Cat. vol. i. p. 261, art. ii.

17. *Rangha Calampacam*, or incense to *Vishnu*, No. 144—Countermark 167.

18. The same (duplicate) No. 145—Countermark 202.

This is a poem of one-hundred stanzas, in praise of *Rangha*, a name of *Vishnu* at *Sri-rangham* and other places. The word which I have rendered "incense" signifies more properly a mixture of odoriferous perfumes, of which I need not extract the quintessence. It is also a technical name of one class of Tamil *Prabandhas*, as containing a mixture of various poetical measures. The first manuscript is perfect and uninjured, the second copy is somewhat damaged by insects, and will require to be looked at occasionally, though its restoration is not immediately urgent; it is otherwise complete.

One copy is entered in the Des. Cat. vol. i. p. 225, art. xxxix; but without any mention of a duplicate; both MSS. bear the usual marks.

19. *Siva-vacya-padal*, or the chant by *Siva-vacyar*, No. 132—Countermark 132.

This is a didactic moral poem, characterized chiefly by its monotheistical purport. It is very severe on idol worship, and on various abuses connected with the common *Brahmanical* system; maintaining the necessity of rejecting the names of *Siva* and *Vishnu*, and worshipping one only god. Hence it has always been made great use of by native Christians in disputing with *Hindu* natives. I was told some years ago that the *ascetics* (or *Pandarams*) of the *Saiva* class, seek after copies of this poem with avidity, and uniformly destroy every copy they find. It is by consequence rather scarce; and chiefly preserved by native Christians.

This copy is complete, as to the No. of palm-leaves, but very much injured by insects. Collating it with a copy heretofore belonging to the late Dr. Rottler, now in my possession, I have had one good copy carefully restored.

NOTE.—It is entered in Des. Cat. vol. i. p. 225, art. xxxvii, as containing "stanzas in praise of *Siva* as the only supreme or *Paramesvara*."

20. *Naladi-pada-urai*, No. 99—Countermark 208.

21. The same work, No. 100—Countermark 209.

These two manuscripts are copies of a moral work, the contents of which relate to the duties proper to various ages of life, particularly those of penance and alms-giving, on which latter subject there is much said, and much on the use, and abuse, of riches. Certain evils and crimes, are denounced as leading to future punishment in *Naraca*. The work is of superior composition in quatrains; and as each line is termed in Tamil poetry a foot, hence seemingly came the title of *Naladiyar*, by which it is popularly, and respectfully, denoted that is "the respectable four lined one."

It is ascribed as regards authorship to the *Samanar* (*Bauddhists*, or *Jainas*), and had the rare merit of being spared by the bigotted *Brahmans*, when they destroyed all other books of their opponents, by casting them into the *Vaigai* river at Madura; after the triumph of the *Saivas* in the reign of *Kuna Pandiyan*. The story is that, whereas all the other books went down with the stream, this one ascended *four feet* against the stream, by reason of which wonder it was taken out and preserved. This tale is however merely symbolical. A better reason may be its being free from sectarian peculiarities, and available to the advantage of *Brahmanism*. In the same manner the *Cural* passed the *Brahman*-ordeal, for a similar reason; but not without a symbolical tale being invented to give a colour of reason, and to render the acceptance of a *Pariar's* work pardonable.

REMARK.—As a moral didactic work esteemed to possess high merit, invested with the sanction of the Madura college and being of high popular repute, a good translation of the *Naladi-pada-urai*, well edited, would be an acquisition; and I am happy to learn that such a version is in progress in able hands. The poem does not easily admit of being abstracted except in a brief indication. The two copies are complete, and in tolerably good preservation. The first of the two is the most recently written. They are entered in the Des. Cat. vol. i. p. 246, art. lxxii.

22. *Ulaga-niti*, a treatise on morals, No. 186—Countermark 191.

This is a very concise little book, chiefly consisting of brief prohibitions against vices or evils; with a few at the close declarative or hortatory. It is a school-book for children: but in the higher dialect. The authorship is ascribed to *Ulaga-nat'ha*; who, though his name signifies "lord of the world," was a man of the barber tribe. The title may be rendered either "worldly rectitude", or *Ulaga's Treatise* on Morals. The latter I suppose to be the right rendering.

NOTE.—The manuscript is fresh, and in good condition. It is entered in the Des. Cat. vol. i. p. 231, art. lx.

23. *Adi Chudi Venpa*, No. 174—Countermark 204.

24. Another copy, No. 175—Countermark 205.

These are two copies of a didactically sententious and moral work, used in schools, ascribed to *Avvai* or *Avvaiyar*; a sister of *Tiruvalluvar*, author of the *Cural*. Her name, like his, is merely titular: what may have been the proper name of either is uncertain. This work was entitled by the authoress *Niti-chol*, "a word on morals," or as it may be rendered, "a discourse on rectitude;" but some later writer prefixed stanzas of invocation addressed to *Siva*, or *Ganesa*, using the words *àdi-chúdi*, at the beginning of his panegyric, whence the book has improperly acquired its popular title. The alphabetical order is followed, beginning each line or sentence at first with the vowels, and then with the consonants, and syllabic letters. Hence the two-fold object is subserved of fixing the alphabetical order in memory, and of ingrafting, upon the whole, useful precepts. A translation by Dr. John, of Tranquebar, was inserted in the Asiatic Researches. When the book is used in Christian schools, the spurious prefix of praise to false deities is rejected.

NOTE.—No. 175 is complete, and makes rather a large book, owing to very little being written on each leaf. It is injured by insects. No. 174 in addition to the *Niti-chol*, in a compressed form, has prefixed the *Tandaliyar-satacam*, a poem containing praise addressed to *Siva*. There are 86 stanzas out of the 100, which form a complete poem of this kind; and appended are some loose leaves seemingly belonging to another book, containing portions of a *Tevaram*, and *Manica-vasacar-padal*; both *Saiva* works of hymnology. This copy is in good preservation.

Both copies are entered in the Des. Catal. vol. 1. p. 245. Art. lxix.

25. *Cónri-vendan*, No. 170—Countermark 170.

This is another school-book, by the same authoress, following also the alphabetical order: but with sententious maxims a little longer, and a little more difficult: adapted to a child that has gone through the former one. This book was also called *Niti-chol*; but acquired the common term as above, from a modern and spurious invocation to *Ganesa*. A translation of it by Dr. John was printed in the Asiatic Researches.

NOTE.—The copy is complete in six small palm-leaves, written in a rude and school boy's hand: by consequence the measure of wisdom which it contains is concentrated.

It is entered in the Des. Catal. vol. 1. p. 245. Art. lxx.

26 *Cummi-pattu* a poem, No. 203—Countermark 158.

This is a fragment only of a work by *Vedanayak* of Tanjore, a Christian poet of considerable attainments, and eminence. He made extensive use of Scriptural subjects, put into a poetical form, which he was accustomed to recite in the public places at Tanjore, after the manner of native minstrels; *Homeric* also, if we may credit tradition. This work he addressed to his daughter, as "wise" or "well taught", ending his lines with that phrase, as many natives do with the sort of expletive *ammáné*, when addressed to some goddess, or lady of quality. In this poem there are severe strictures on idolatry, and idolatrous customs; with cautionary prohibitions against assimilation to them. From the beginning forwards there are 21 closely written palm-leaves; but much afterwards is wanting.

NOTE.—It is entered in Des. Catal. vol. 1. p. 224. Art. xxxiii, but so as to lead to the inference of its being an ethical production, mixed up with astrology.

27. *Deva-rayen-pala-padal* No. 190—Countermark 175.

28. same title, No. 157—Countermark 176.

These two manuscripts seem to be parts of two copies of the same composition; purporting, according to the title, to be various chants by *Deva-rayen*. Neither copy is complete, and in each one there is transposition, and confusion. The copy of one must have been made by a

Roman Catholic Christian, indicated by an expression at the beginning; and there is one *viruthum* or stanza, which declares the unity of the Supreme Being, and the vanity of idols, in such a manner, as evidently to be the composition of a Christian. The remainder, in both copies, as far as complete, is a sort of centum of verses extracted from various authors, and without much coherence; so as to wear rather the appearance of such kind of poetical extracts as are sometimes made in an album. Both copies seem to me quite useless; and are allowed to remain as I found them. They are entered in the Des. Cat. vol. I. p. 226, art. xlvi, and are stated to contain "praises of *Vishnu* and *Siva*, and especially of the forms of the latter and his spouse worshipped at Madura, or *Sundaresvara* and *Minakshi-Ammal*." This definition of the contents is very incorrect.

29. *Nannul Padaveyal*, Tamil etymology—No. 60—Countermark 211.

30. *Nannul*, a Tamil grammar—No. 61—Countermark 212.

The first of these manuscripts (or No. 60) is a part of the *Nannul*, being the chapter on etymology termed *padiveyal*, treating of words. It contains the original *sutras*, with the comment of *Sancara-Nama-sivaya* in *Shen*-Tamil, and another comment, or explanation of the comment, in *Codun*-Tamil, or the commou dialect. This MS. is written on *Talipat* leaves (used in the extreme south); and is in good preservation.

The other M.S. (No. 61) is an imperfect copy of the same famous grammatical work by *Pavanandi*, abridged from the *Tolcapiyam*, as the latter is said to have been abridged from a still larger work of *Agastya*. The *Nannul* had three explanatory commentators; the comment in this MS. is that by *Sancara-Nama-sivaya Pulavan* alone. The MS. is however very deficient; at the beginning it wants the preface, the two first chapters, or sections, and a small part of the third at its commencement. Part of the 4th section, at the end, is wanting; and all the remainder, what there is of the contents is on orthography only. The leaves of the book are not of equal size; and seem like fragments of two books put together; being a fragment still. The leaves are of the broad kind common only in the extreme south of the peninsula. They are in tolerably good condition.

Note.—The two copies are entered in Des. Cat. vol. I, p. 247, art. 2. —It will be seen from what precedes that if both MSS. were put together they would not form a complete copy of the entire work.

31. *Tonnul-vilacam*, a grammar of rhetoric, No. 62—Countermark 213.

This is a work of high reputation by *Viramamuni*, or *Beschi*, a Roman Catholic Missionary of the early part of the 17th century; whose philological works stand quite apart from those of any other European writer. He had many learned natives to assist him. He was, however, beyond all question, the most distinguished Tamil scholar of his age. This work is a grammar of the *Shen*-Tamil inclusive of prosody, tropes and rhetorical embellishments. It was translated by Mr. Babington of the Madras Civil Service; and is still a standard work for reference.

This copy wants five palm leaves, of the index only, at the beginning; the remainder is complete. The leaves and writing are quite fresh in their appearance; and remain undamaged.

NOTE.—It is entered in Des. Cat. vol. 1, p. 218, art. 3.

32. *Chitambara Agradi* No. 66—Countermark 224.

This manuscript is a vocabulary (termed *agradi* or *nigandu*) of the Tamil language, by *Revana Siddhar* of *Chillambram*. It is in *Sutras* or in brief verses, and does not extend the alphabetical order of arrangement beyond the first letter; under which order simply the words are arranged, and the meaning or meanings, given. It is a much more brief, and simple, composition, than the *Mandala purush-nigandu*; but better adapted for memory, or as a manual. The copy is complete, of recent hand-writing, and in good preservation.

It is briefly entered in Des. Cat. vol. 1, p. 252, art. viii.

33. *Hari-Vilakam* hymns to *Siva*.

34. *Agastya-nyanam*, the wisdom of *Agastya*.

These works were found tied up together with a few pages of the *Nanya-sastra*, which last pages were discovered to be wanting in that manuscript itself, and being restored to the proper place completed it. Perhaps the whole originally formed one book; since, in size and appearance, they correspond.

The *Hari-vilakam* is mystical poetry, of a kind needing no special abstract.

Agastya-nyanam, is, I am persuaded, a literary forgery, the work of some *Uttra Saiva* devotee, ascribing his own composition to *Agastya*. In the work of creation the order of the *Trimurti* is *Siva*, *Brahma*, *Vishnu*; in the manner of the modern *Uttra Saivas* of the Peninsula. Very strong and pointed condemnation is given of the *Vedas*, as well as of the *Ramayana*, *Bharatam*, and in short all *Vaish-nava* books, or those that are consonant to the more universally received *Hindu* system. The writer professes to give an account of his own birth as being *Agastya*, and mentions some of his works. Some moral sentences are mingled up with the other matter. I am not sure that it is not a forgery of the days of Robert de Nobili under an *Uttra Saiva* veil; but, at all events the name of *Agastya* is a *nom de guerre*, to serve some special purpose. The *Hari-vilakam* is a little injured by insects, the rest of the book is in very good order, and complete.

See Des. Cat. vol. i. p. 228, art. liii.

35. *Sivapracasica*, a work on austerity, or self-control, No. 130. —Countermark 57.

This poem is of the kind treating of the *tatva* system or different parts, properties and regulation, both of the material, and immaterial, portions of the human body. The allegorical description of the body, as a city; having gates, and a resident within, or the soul, is contained herein. The same allegory is found in the *Bhagavatam*, ascribed to *Nareda*; and also in other distinct productions, of which the present is one. The body is divided into five elements, and five qualities of the mind are specified; to the varied union, or combination of which elements, certain operations, both corporeal and mental, are ascribed. Absolute renunciation of all earthly attachments, that to father or mother being included, is taught. Severe penance, and personal subjugation are enjoined. The worship of *Vishnu* is to be rejected; and the system of *Siva* alone ought to be observed. The work bears the name of the author *Sivapracasica* (one having the splendour of *Siva*), and the contents are sufficient to indicate his having been a *Pandaram* (or ascetic) of the *Saiva*-order. There is a monasterium of that class at Madura, another at *Mailapur*, and others in different places.

Note.—The MS. is complete, and only a little injured, at present

not sufficient to call for restoration ; but it will require to be occasionally looked at for better preservation.

It is entered in Des. Cat. vol. i. p. 231, art. lvii.

36. *Aruna-giri-nat-ha-tiru-pugerzh* or hymnology, No. 138—Countermark 203.

37. Same title, ——— No. 139—Countermark 179.

38. Same title, ——— No. 140—Countermark 66.

39. Same title, ——— No. 142—Countermark 1078.

No. 138 contains 106 stanzas, and is complete.

The MS. is old, and the leaves are considerably damaged by insects. No. 139 contains 50 stanzas, and remains incomplete at the end. It is fresh and in good condition. No. 140, contains 55 stanzas, not finished ; it is old, and damaged by the breaking of one or two leaves at the beginning, and at the end. (It is supposed from the Nos. that there should be another copy ; but this has not been met with).

No. 142 contains 84 stanzas, wants the 33d and 40th leaves, and does not finish at the end. The palm-leaves are comparatively fresh ; but damaged by insects in several places.

These manuscripts are portions only of one great work ; reputed to contain in all sixteen thousand stanzas, of the kind termed *Viruttam* by *Aruna-giri-nat-ha*, so called after the god at *Trinomali*. His name forms parts of the above title, and the words *tiru-pugerzh* mean sacred panegyric. This panegyric is contained in a series of hymnology ; addressed to a form of *Subrahmanya*, worshipped at *Tirtani*, near Madras.

NOTE.—The title appears in Des. Cat. vol. i. p. 225, art. xxxviii ; but only one copy seems to be therein entered.

40. *Tiruvachacam Hymnology* by *Manica Vasacar*, No. 103—Countermark 161.

41. Same title ——— No. 104—Countermark 162.

42. Ibid. ——— No. 105—Countermark 163.

43. Ibid. ——— No. 106—Countermark wanting.

These are copies of a collection of panegyrical stanzas by *Manicavasacar* whose story is narrated in the *Vadur*, and Madura *St'halapuranas*. After relinquishing his office of minister of state to the Madura king, and undergoing severe treatment, as narrated in those legends, he became a devotee of *Siva*: and, exclusive of disputing with the *Bauddhists*, he wandered about in the manner of ascetic minstrels, such as *Appar*, *Sundarar* and others, and composed brief panegyrics of different forms, or emblems, of *Siva*, worshipped at different places. The entire amount of such chants was fifty-one; which chants (consisting at least of 10 stanzas, but generally one, two, or three more) make up a total of six hundred and sixty stanzas of the kind termed *viruttam*, with a few of the plainer kind termed *ogaval*. For a further account of the work see abstract of the *Vadur St'halapuranam*.

No. 103 is complete. There are added 27 chants from the *Tevaram*, a similar collection by *Appar*, *Sundarar*, and *Sampantar*. The whole forms a small sized pocket volume, which, though rather old, is quite uninjured.

No. 104 is complete. It also contains a portion of the *Tevaram*, not complete. This small book is old, but nevertheless in good preservation; save only a little wear at the edges.

No. 105. This copy wants seven chants, in different places. Forty eight stanzas are appended of a polemic poem against the *Bauddhas*, not complete. This manuscript is fresh, slightly punctured by insects, but to a trivial degree.

No. 106 has 38 chants wanting. It has two appendages, being fragments of poems of the *Venpa* kind, without title; but containing praises of *Siva*.

These four copies are entered, with a brief mention of contents, in the Des. Catal. vol 1. p. 224. Art. xxxv.

44. *Vriddhachala Puranam*, No. 21—Countermark 30.

This copy is in verse only, and is complete. It is generally in good order; but with an exception of five leaves in the middle, which have been restored, in order to preserve the manuscript legible and entire.

45. Same title, No. 22—Countermark 31.

This copy contains the original verse, with a prose explanation. It is in good preservation; except four leaves, near the middle, which have been restored. It is now complete; having had two sections, before wanting, added to it from the next copy.

Same title, No. 23—Countermark 32.

This copy is in verse, and prose; but is very incomplete; wanting five *sargas*, or sections, from No. 14 to 18 inclusive. What remains is without defect; and, being apparently of recent writing, it is in perfectly good preservation. It enabled me to complete the preceding copy.

Another book, having the same title on the envelope, was found to be a copy of the *Vadur St'hala-puránam*. Five copies of the *Vriddha-chala-puranam* are mentioned in the Des. Catalogue. The fifth is not now in the collection.

The following is an abstract of the contents.

1. The prefatory section. Invocations to deities, and to *Appar*, *Sundarar*, and other *Saiva* poets. It is given as narrated by *Suta-rishi*, who received it from *Sreta-muni*; he from *Vyasi*; the latter from *Subrahmanya*, who heard *Siva* relate it to *Uma*.

2. The *giri-sarga*, or section concerning the hill, narrated by *Iran* or *Siva* to *Uma*. Though the legend is unknown to *Brahma*, or *Vishnu*, yet there is a propriety in relating it to *Uma* though young, from her being mountain born. The pre-eminence of the hill, above all other hills, is asserted: so that even thinking of it will remove evil, produce good, and lead to beatification; which, by means of this hill, even the most stupid of people may acquire. Its excellence arises from its being a copy of the form of *Siva*.

3. Concerning the place: narrated by *Natha-sauma-muni* to his wife, named *Anavati*. It relates to a sacred pool for bathing named *Tiru-amrita-kunram*, formed by the *Mutta-nadi* river. Bathing therein accompanied with certain observances removes the crimes of ingratitude, theft, drinking ardent spirits, killing cows, or *Brahmans*, coveting the wife of a *Brahman*, or a neighbour. If dogs, jackals, or such like animals, die at this place they will attain to *Siva's* world; being taught instruction, while dandled in his lap. The ills, or crimes, done by children will be pardoned even as those of grown up people. The names of the seven great *rishis* are mentioned, who obtained gifts, according to their desire at this place.

4. This section relates to the high value and excellence of the *Mutta-*

nadi river. The merit of bathing in it is related. For example, if it be only seen, by the favour of the god, sin will be removed. To bathe in it is equal to the merit of an *asvamedha* sacrifice, and to remain in it during one bright half of the natural day ensures beatification. *Agastya* and several others by bathing therein, acquired sanctity.

5. *Isa* enquires of *Uma* concerning the shrine. A special eclipse is adverted to, at which time the *vimana* appeared, with various marvellous accompaniments. The benefits of worshipping thereat are narrated.

6. The section of *Viba-chittu*. One of *Cuvera's* precious jewels, was picked up by a particular kind of bird (mistaking it for its food) and carried to the top of a tree ; when the bird dropped it on the head of a person named *Viba-chittu*, doing penance. He did not know what to do with it; and, while wandering about on the mountain, an aerial voice directed him to deposit the gem in a *vanni*-tree, and then to go and receive instruction from *Romasa rishi*. He did so, and the *rishi*, by his merit formed a *Calpa-vricsha*, or tree of plenty ; yielding every thing desired. In consequence *Viba-chittu* had a golden image made for the shrine with all other needful appurtenances : and ultimately " attained the feet of the god," or was beatified.

7. The *tiru-náda* section, narrated by *Brahma*, and downward through various celestials. It relates to a particular locality, on the hill where birds are fed termed *tiru-amrita kunram* ; where also *Siva* condescended personally to make an appearance, and to receive adoration.

8. The section of *Agastya*. This relates to *Agastya's* journey to the south ; being resisted by the *Vindhya* mountain, he trampled on and lowered it ; he afterwards met with *Váthan* and *Vil-vathan* who were accustomed to kill and eat travellers when passing by : he denounced his anger on them and destroyed them. He then proceeded to *Vriddhachala*, where he bathed ; and, seeking pardon, for having killed the said cannibals, *Siva* appeared, granted his request, and then vanished.

9. The *Calinga* section. A *Calinga* king, did not pay proper respect to *Romaca maha rishi*, but mocked him ; in consequence of which the *rishi* denounced on him the doom of becoming an evil-spirit-possessed wanderer. He embraced the sage's feet, demanding when and where, the crime would be expiated, and was told it would be at *Vriddhachala*. He accordingly became possessed with an ill-spirit, and roaming about, came to *Vriddhachala*, where bathing in the *Mutta-nadi* he was relieved. As a moral, a caution is added not to mock sages, who are performing penance.

10. The section on removing the evils of the *Cali-yuga*. The sages enquired of *Suta-rishi*, the magnificence of the lord of *Vriddhachalam*, and he answered by saying that *Sanat-cumara*, and others, went to *Brahma* on *Maha-meru*, who enquired the reason of their sadness. In reply a pathetic detail was given of the poverty, and other evils of the *Cali-yuga*; in which the kings were *Sudras*, the sacred beads indiscriminately worn by all, and many other ills; on which a petition was founded that *Brahma* would form a shrine to remove them all. The request was answered by the means of the shrine at *Tiru-amrita-kunram*, which removes or sets aside all the evils of the degenerate age.

11. The *Sweta* section. *Sweta* was a king of the *Curu* race, who ruled over many persons with the integrity of a *Chacraverti*, till losing his wife by death, he became desirous to renounce the world, and to acquire as quickly as possible instruction as to the means of obtaining final happiness. In pursuit of his object, he went on pilgrimage, and among other places to the shrine of *Jambukesvara* at *Tiruvanica*. In an interview with *Agastya*, the latter stated the advantage he had acquired by doing homage at *Vriddhachala*; and recommended his pursuing the same course; which advice he followed; and, in consequence *Siva* appeared to him, and bestowed on him the gift, and happiness, which he desired.

12. The section of devout worshippers. The benefit of affectionate worship is illustrated by reference to a *Chetti* who had four sons; three of whom were liberal and charitable, and were beatified, at other fanes specified; the fourth was of a vicious disposition, and conduct, in consequence of which, and of his slighting the *Brahmans*, he brought on himself the visitation of *Brahma-hatti*. When suffering under this infliction he met with a *Brahman*, and asked how his disorder could be removed, who directed him to be liberal in donations to the shrine at *Vriddhachala*. He accordingly became extremely munificent, in providing butter-oil for the anointing of the image, and for lights, and in gifts to the *Brahmans* and servants of the fane. By persevering in this course, in the space of a year, he was entirely relieved of his disorder, and obtained consolation. The benefit of devout homage at this shrine is hereby apparent.

13. The *Siva-puja* section. *Siva* replies to *Uma's* enquiries. This section relates to various symbols of *Siva*, and to plants, and herbs, used in the ritual ceremonies of *Siva's* worship.

14. The *Vibuthi*-section. Declared by *Siva*, to the four orders of *Sanniyasi*, *Vanaprast'ha*, *Brahmachari* and *Grihast'ha*. It relates to the formation, and use, of the sacred ashes used by *Saivas*, and the parts

of the body to which the same ought to be applied. This being done the very person of god (*saeshat-kadaord*) resides in the wearer. Any *Chandalas* who ridicule the use of these ashes will go to *Naraca*. The eulogy of the *Saiva* worship is added.

15. The *rudracsha* section, narrated by *Nat'ha Sauma* to *Anavati*. The different varieties of beads termed *rudracsha* are specified, as appropriately belonging to the *brahmanical*, kingly, mercantile, and servile, classes; and the advantage of wearing them is declared. (Perhaps the origin of their use may have been a simple device to distinguish the different classes, or orders, of men).

16. The *Kirti* section. The same person relates, to the same individual, the fame of this place; stating that though beatification is of difficult attainment, generally speaking in the *Cali-yuga*, yet that it may be easily attained at *Vriddhachala*. If any one at this place, repeat the name of *Siva* three times, at the mention of the first *Siva* will appear, and give what is wanted; at the mention of the second, there will be a surplus of merit; and the third will secure his residence within the worshipper. Hence even the thousand tongues of *Adi-seshan* could not tell all the excellence, and fame, of this place.

17. The section of the bullock mountain, narrated by the same to the same. *Parviti* performed homage to a particular image, until *Siva* appeared, and asked what gift she desired; to which the reply was, that she wished a shrine to be formed at the same locality, to be called after *Nandi*, his bullock vehicle, and the request was conceded. At this place *Vishnu*, *Brahma*, and the celestials did homage, and obtained gifts. Many *rishis* did the same.

18. The section of *Sashi-vanna*. *Siva* declares to *Vishnu*, the excellence of his (*Siva's*) votaries. *Sashi-vanna* was the son of a *Brahman*, but one who despised *Siva*, the *Vedas*, the *Brahmans*, and true equity. At the same time he lived a bad life; so that many of his family went to *Naraca*, and he became a *Chandala*, afflicted with leprosy. In consequence he performed penance; and enquiring how to get his disease removed, he was directed to the above mentioned bullock-mountain-shrine, whither he proceeded; became entirely cured; and obtained beatification, both for himself, and for his relatives, who before had gone to *Naraca*. Hence the efficacy of that shrine is deduced, by way of inference.

It is added, in conclusion, that whosoever reads, hears, or copies out this *Saiva-puranam* will obtain happiness, learning and beatification.

The end of the *Vriddhachala-puranam*.

Note.—To any who has read through the preceding abstract it will be

superfluous for me to suggest any remarks. The locality of *Vriddhachala* (old-hill) I understand to be intermediate between *Trinomali* and the *Caveri*-river, that is to Verdachellum in the Carnatic.

The MS. is entered in Des. Cat. vol. 1, p. 169, art. xviii.

47. *Vadur Sthala-puranam*, No. 19—Countermark 28.

48. Another copy, No. 36—Countermark 81.

49. Ibid. No. 37—Countermark 82.

50. Ibid. No. 38—Countermark 83.

The first of these copies was erroneously labelled as a copy of the *Vriddhachala-puranam*. It is a very defective manuscript, wanting four *sargas*, out of the eight, of which the work properly consists. Of the remaining four sections the deficiencies are 95 stanzas from the cooly section, 70 stanzas from the fane-section, and 99 from the *Baudha*-section, only one section is complete. The composition is in verse, with a prose explanation or commentary. There remains 126 palm-leaves a little old in appearance; but quite uninjured as to condition.

No. 36 is apparently quite a recent copy: it is also complete in 289 palm-leaves, containing 525 stanzas; each stanza being accompanied with a prose explanation.

No. 37 has a deficiency of 10 stanzas in the 2d section, 1 stanza in the 3d section, 4 stanzas in the 7th section, and 1 stanza in the 8th section, being 16 stanzas in all, leaving the remainder complete, untouched by insects, and in perfect preservation.

No. 38 has a deficiency of 20 stanzas in the section about the horses: the remainder is complete. The copy is old; but, with a few slight exceptions in very good preservation.

No. 39 being complete, nothing needs to be done, as to restoring the remaining copies. The following is an abstract of the contents:

1. The usual invocation, and eulogistic stanzas.

2. The *mantri* section. It narrates the parentage and education of [illegible]*-râsacar*, at *Vadur*, in the *Pándiya* kingdom. He was a *Brah*[illegible] who sacerdotal string at 14 years of age. Being

superior intellectual qualifications he was chosen by the *Pándiyan* king as *mantri*, or minister of state; in which capacity he conducted the affairs of the kingdom with great equity. He received 40 crores (of money) from the king with an order to purchase horses; and on his journey, with that object in view, at *Tiru-perunturai* was fascinated by the god, *Siva* as *Jangama-svami*, chanting mystic songs. He went near with his whole retinue, and listened with great delight.

3. The *Tiru-perunturai* section. So far *Manica-vasacar*, was merely a hearer at a distance; but he was now brought specially into the presence of the god, and was introduced to the sai l *Siva*, seated on a throne. *Siva* condescended to teach him the mystic sense of the *agamas*, and various *Saiva formula*; in consequence of which his eye of ignorance departed, and he was spiritually illumined. When fully taught, the god asked what present (as customary) he intended to pay as the price of his initiation to disciple-ship; when he laid the whole 40 crores, received as above, as an offering at the feet of the god, who was greatly rejoiced. While *Manica-vasacar* was thus engaged, his attendants wondered what was become of him; and seeking him out, reminded him of the king's business, and the need of attending to it. He was absorbed in contemplation, and paid no attention to them: on their becoming more urgent, he opened his eyes, asked them who they were, and who was the *Pandiyan* king of whom they spoke; adding that they did not appear to him to be votaries of *Siva*, and told them to depart. They accordingly went, and reported the matter, to the king; who, being much incensed, wrote a severe letter and sent it to his lethargic minister. The latter, on receiving it, appealed to the god; who directed him to send word, that on such a day of such a month, horses would come. The king enquired if there was any appearance of horses at *Perunturai*; and being answered in the negative, he sent peons, with directions to seize and bring the minister to him; which was done. *Manica-vasacar* was put in irons, and cast into prison for several days; treatment which he endured with composure; and occupied himself in chanting the praises of *Siva*.

4. Horses-section. According to the word which *Siva* had directed to be sent, the said god, assembled all the jackals throughout the country, and turning them into horses, caused the celestials, under human forms, to mount them as riders, while he himself assumed the form of the king of *Ariya-desam*,* whence the horses were expected to be procured; and, on the day appointed, the whole cavalcade came to the town of the *Pandiyan* king. The latter was extremely well satisfi-

* Part of Travancore.

ed; had the qualities of the horses examined; and, finding them to be superior, appointed their location. While at the same time he released his minister from durance vile, who went to his house, and sang the praises of *Siva*. During the night by the power of *Chocapa* (the form of *Siva* at Madura) the horses re-assumed their natural forms as jackals; and greatly disturbed the whole town. The king, doubly incensed, and greatly disappointed, commanded the seizure of *Munica-vasacar*, and his being put to a certain species of torture in the dry bed of the *Vaigai* river. This torture consisted in his being stretched out on the sand with a heavy black stone on his body, to keep him down; suffering from the burning sun, and scorching sand, by day, and cold by night; until the 40 crores should be re-imbursed. *Manica-vasacar* endured with fortitude, invoking the aid of *Siva*.

5. The Cooly-section. The god knowing the sufferings of his votary directed *Ganja Bhavani*, to go down to earth, and relieve his distress. Accordingly *Ganga Bhavani* came down; and, filling the channel of the *Vaigai*, caused an inundation extending even to the walls of the fane. The king directed the customary offerings to be paid to *Ganga*; but, on throwing these into the water, the inundation swelled still higher, threatening destruction to the whole town. The king was at a loss as to what want of equity, on his part, was the cause; but directed repairs of the damages, and of the banks of the river. Every person in the town had an allotted portion of work to do. A poor widow who had no son, and lived by making and selling balls of rice-flour, represented, to the god in the fane, her inability to do her own portion of work. Soon after the god himself came with the appearance, and usual implements of a cooly, crying out for work; and was engaged by the widow as her cooly. On his enquiring about wages, she replied that she could only pay in the commodity by the making and selling of which she gained her subsistence. He took a portion in advance; and on being shewn by the widow her share of work, threw carelessly half a large hoe-full of earth into his basket: and then, dancing about as he proceeded, the widow suspected a bad bargain; but he told her to go home, and he would finish the work. Instead of doing so he laid down to repose under a tree. The king, coming to inspect the progress of the repairs, found the widow's portion neglected, and was pointed to her cooly asleep under a tree. Arousing the sleeper, the king prepared to give him a blow with a rattan; seeing which the god protected his left side, and received the blow on the right; a blow which was felt by the whole creation. *Manica-vasacar* startled at receiving a blow on the side, enquired into the circumstance, and discovered it to be an amusement of *Siva*, who had

disappeared. *Manica-vasacar* went to *Perunlara*, and, at his request, the god appeared; taught both him and the king some lessons; and directed that *Manica-vasacar* should be employed in disputing with the *Bauddhas*.

6. The fane-section. *Manica-vasacar*, again at *Perun-turaiyur*, represented all his sufferings to the god, and received various instructions from *Siva*. The god then assembled all his votaries, and told them that he was about to return to *Cailasa*, that after his doing so, a fire would appear, into which all his followers, with the sole exception of *Manica-vasacar*, were to cast themselves; and on their doing so, their beatification would be assured. On the departure of *Siva* according to the preceding declaration, *Manica vasacar* fell on the ground, on the spot where the god had been, and wept greatly. Soon after a large fire appeared, into which the *Saiva* votaries cast themselves, as they had been told to do. *Manica-vasacar* left the place, and set out on pilgrimage to the various *Saiva*-shrines in the southern part of the peninsula, such as Conjeveram and others; at each of which shrines he composed, and chanted, hymns in praise of its local *numen* (the assemblage now forming the *Tiruvachacam*). He subsequently returned to the neighbourhood of *Chillambram*; where he constructed for himself a hut, or sort of nest, in a tree. Here he continued rendering homage to *Siva*.

7. The *Baudha*-section. *Manica-vasacar* had studied, and was deeply versed in the *Tatva* system (relative to the corporeal and mental qualities of human nature, their relations, union, and consequences); and being now disposed to visit *Irza-desam* (Ceylon) he proceeded thither, and every where proclaimed the name of *Siva*, under a particular title, by which he is known at *Chillambram*. In consequence of hearing so much about this name, the king sent for *Munica-vasacar* and desired to know what it meant; when it was explained to mean the musical sounds proceeding from the shrine of *Siva* at *Chillambram*. The king of *Irza-desam*, in consequence announced his intention of sending a colony of his own people, with sacerdotal attendants, to that place, to construct there a shrine of the god worshipped by himself, that is, *Buddha*. The colony was accordingly sent, and the fane built. But the three thousand votaries of *Siva* dwelling in the *Tilli* wilderness, became alarmed at this innovation; and going to the new settlers, told them to depart. As they refused to do so, information on the subject was sent to the *Cho'a* king of the country. Ultimately both the king of *Irza-nad*, and the *Cho'a* king, came to *Chillambram*; when it was agreed on to hold a public disputation. In the interim, the god

appeared to his votaries; and told them not to engage in the discussion, since they would not be able to compete with their opponents; but instructed them to trust the entire management of the question to *Manica-vasacar*. In consequence *Manica-vasacar*, was put in the seat of honour, and the *Bauddhas* directed the discussion against him, using the *Tatva* system; and were greatly surprised that they could not overcome him therein. Seeing this state of the case the *Irza* king told *Manica-vasacar* that he had a daughter born dumb, and if *Manica-vasacar* could make her speak, then he and all his people would adopt the *Saiva* mark, and the *Saiva* way. The dumb girl was accordingly brought forward, and as *Manica-vasacar* gave, or restored, the power of speech, the king became a *Saiva*, together with his followers, and paid homage at the *Chillambram* shrine.

8. The sacred feet-obtaining section (or the beatification). The god assumed the form and appearance of a *Brahman* bearing writing materials, and an iron-pen in his hand; in which shape he came to *Manica-vasacar*, who enquired whence he was. The apparent *Brahman* said he came from the *Pandiya* kingdom, and as the fame of *Manica-vasacar's* chants in the *Tiru-vachacam* was now every where spread abroad, it was his (the *Brahman's*) desire to be permitted to write them down from the composer's own dictation. *Manica-vasacar* consented, and the chants were committed to writing, by the *Brahman;* who, having completed the whole, disappeared, together with the book. *Manica-vasacar* sought him every where in vain; and now discovering that it was an illusive form of the god, he wept over his departure. The book was however taken by the god: and deposited on one of the five lettered steps, immediately in front of the shrine. The following morning, when the attendants on the fane opened the doors, they were surprised at finding a book laid on one of the sacred steps, and paid it divine honours. On looking it through, it was found to bear the autograph signature of *Tiru-ambalan*, or the local *numen*, and it was respectfully carried to *Manica-vasacar* with the request that he would explain its meaning. To this he readily consented; and then, going with them to the presence of the image in the shrine, he there unfolded the meaning, and explained, that the said image formed its sum and substance. Having completed the exposition, a flame appeared enveloping the place, being the emanation, or effluence of the divine essence, and at the same time the soul of *Manica-vasacar*, quitted his body, and became united with the said divine essence: forming the union and identification with the divine nature, which is regarded as the highest degree of beatification. Here the *purana* ends.

Remark.—There is a close co-incidence between this *puranam*, and the Madura local legend, as far as to the end of the fourth section of this one. The Madura legend refers to the present document for the rest; briefly mentioning that *Manica-vasacar* disputed with the *Bauddhas* at *Chillambram*; and there became united with the essence of the deity. There is, I think, clear evidence, in this document, that the Madura country had not adopted the *Saiva* religion in the time of *Mænica-vasacar*. The 7th section is of some historical importance; and will be of service in its place. The account of the *Tiru-vachacam* is, at the least, curious. A native proverb declares that the person who is not affected by the tale and writings of *Manica-vasacar* will be affected by nothing. This work, at the commencement, that is, in the 1st section, is stated to be the composition of *Kadavul-nayanár*.

Note.—The three MSS. Nos. 36, 37, 38, are entered in Des. Catal. Vol. I. p. 201. Art. xvi with a brief account of the subject; having only one or two apparent, and slight inaccuracies.

b. Manuscript Books.

Manuscript book No. 1—Countermark 17.

Palani-puranam. The legend of Pyney.

Of this large manuscript, thirteen sections were abstracted in my last Report. What follows is a continuation.

Section 14. The narrative concerning *Brahmendiran*. The *rishi* named *Angirasa* had a son who was named *Agni-tama*, a name which was afterwards changed to *Brahmendiran*. He was carefully taught; and, by his own application, became well read. After making proficiency in study, he proceeded on a pilgrimage to the whole of the *Saiva* fanes, and after visiting other places he came with a retinue of disciples to *Tiruvavanankudi* (another name of Pyney). The followers of *Brahmendiran*, greatly approved of the locality; and recommended the fixing a residence there. The whole body, by consequence, continued at that place, doing penance. At length the local deity, *Subrahmanya*, appeared; desiring to know what gift or reward they required; and, at their request, gave to the whole of them beatification.

Remark.—This section is of considerable consequence; inasmuch as it clearly marks the first immigration of Brahmans, settling at Pyney; in the same way as the first location of another Brahman colony at Chillambram was before noted. Vide 3d Report.

Section 15. The narrative concerning *Nitya-nat'ha.* This account refers to the period of the *Treta-yuga* *Nitya-nat'ha* was a son of *Nala-raja.* He was powerful and wise. Proceeding on pilgrimage he came to the *Congu-nad* (modern Coimbatore in which Pyney was situated). He visited seven *Saiva*-fanes in that country. He built a town which was called *Raja-raja-puram.* Afterwards he proceeded to *Tiruvava-nankudi*; and there performed penance. *Subrahmanya* appeared; and, being praised by his votary, asked what gift, or reward, the latter required; who answered that he desired to reach the sacred feet (obtain beatification) without the pain of future births. The said god then instructed him in the *asktanga-yoga* (or eight-membered-meditation; that is *anima, makima, karima, lakima,* &c. Vide Oriental Historical MSS. vol. 1, p. 128); and assured him that if he practised these various forms of contemplation, he would attain final beatitude. As so many persons performed penance at this place, it acquired the appellation of *Yoga-vanam* or the site of contemplation.

Remark.—This section indicates the ingress of the military tribe to the extreme south; while a reference back to section 10 would seem to imply that the *Chera* race was aboriginal, and not *Hindu.* Comparing section 15 with section 14, there is visible a delicate reserve of the privileges of *Brahmans* above *Cshetriyas*: inasmuch as the former were beatified at once; but the latter after instruction and study.

Section 16. The story of *Chonna-cuttan.*

There dwelt in the *Congu* country a person who was called *Chonna-cuttan,* with his wife named *Kesai.* He worshipped both *Siva* and *Vishnu*; and his wife paid homage to *Lacshmi,* and *Narrayana. Perumal* (*Vishnu*) came to this beautiful country. The said pair besought from him the gift of a child. He replied that if a child were granted, it would soon die. They answered that their desires would be satisfied, if they might see their own child, and afterwards if needful it might go, they would relinquish it. *Vishnu* thereupon directed the chank (or conch), in his hand to be born as a child; and at the end of five years to return to him. It was accordingly born, and reared by its parents, as aforesaid, very carefully. They in acknowledgment bestowed many ornaments both on the *Saiva* and *Vaishnava* fanes. The child did well and grew, until its fifth year came. It was accustomed to rove about; playing in the sacred buildings and pools of water. One day when sporting in the *Camadhena-tirt'ha,* or pool so called, the remembrance of its former state revived; and it in consequence returned, and re-entered the conch of *Vishnu.* A report was brought to the parents

that their child had fallen into the pond. They were exceedingly grieved; went to the place, and carefully sought for the body; which however was not to be found. They roamed about seeking it; being beyond measure distressed at their loss. They both thought of casting themselves into the fire; so severe was their anguish. *Subrahmanya* at length appeared to them, in the likeness of a child. They were rejoiced, as he seemed to be their own child. They took him up in their arms, and fondled him; when the seeming child re-assumed his usual appearance, having six heads, and twelve arms. He told them that their child had been a gift of *Vishnu*, and had resumed its own form, as the chank of that deified personification; adding that from regard to them, and with a view to alleviate their sorrow, he had appeared to convey to them this annunciation. He further stated to them that there was no difference between himself, and the said *Perumal*, or *Vishnu*.

Section 17. The legend of *Vasumantan*.

Vasumantan was a king who resided at *Deva-puram*. A *rishi* recommended him to do penance at this place, where many others were so employed. An account of his penance is given. In a former state, or birth, he was of the *brahmanical* order, and a descendant of *Casyapa*; but in consequence of dwelling with a *Sudra* woman, he lost his caste, and sank to the level of a *Sudra*. The effect of his penance was, by means of the homage paid to *Subrahmanya*, to assure his regaining the rank of a Brahman, in a following birth, with all connected privileges.

Section 18. Account of the six faced river. *Subrahmanya*, looking from *Varáha-giri*, saw another hill; and was told by a Brahman that six torrents ran down it, uniting to form a river at the base. As the hill had six rivulets corresponding with his six faces (*Aru-muchan* "the six faced one" is a title of *Subrahmanya*), he granted to the river below this, the peculiar quality, or virtue, of washing away the guilt of every crime. In consequence of this especial privilege having been bestowed, the fane, which is situated on the said hill at *Tiru-vavanankudi*, is a superior place; and final beatification is there of certain attainment. *Subrahmanya* is represented as taking occasion to specify six places where he is worshipped, as being of especial consequence. These are *Tiru-paran-Kunram—Alavayi-carai—Tiru-chendur—Tiru-vavanamkudi—Tiru-varacam* and *Para-mutal-choli*: the latter being, as I am informed, another epithet of Pyney.

Note.—The abstract of the foregoing five sections may suffice, for the present, in continuation. The remaining five sections would properly

require to be specified somewhat more fully: the doing of which would encroach too much on other matter, which I am anxious to pass out of hand. An appropriate place for the remainder of the foregoing local *puranam*, may perhaps be found in a following report.

Manuscript book, No. 17—Countermark 910.

This document is entirely occupied with an account of different tribes, and orders of men in the *Malayalam* country. Fifteen kinds of Brahmans are specified: the *Namburi* class being at the head. Sixteen subordinate orders, or tribes, are detailed; one of them being the *Ceketriya*, or kingly caste, and another the *Samanda rajas*, or chiefs, at Calicut. Of several of the different classes, notices have appeared in the shape of abstracts from papers in the *Malayalam* languages: yet not to such an extent as to supersede the fuller details contained in this volume. They are many of them very minute, extending to a specification of distinctive modes of dress, and like details. The distance to be observed by each tribe in approaching another, is stated. An abstract of such matters would be in a manner impossible. A translation might be curious; and to some degree interesting; but it might be deferred until other documents had been previously disposed of. This book is of small size, and wholly written on stout China paper: the ink being very legible. The hand-writing is peculiar; being the Tamil writing of a native of Malayalam. The book has escaped injury remarkably well: the paste of the covers has attracted insects, but their work of destruction seems to have been interrupted; and, with common care, the book will last, as it is, for some time to come.

Manuscript book, No. 52—Countermark 1021.

According to the English label this book originally contained copies of inscriptions from the south of India. The number assists in referring to the Des. Catal. vol. 2, p. cxxvi: from which it appears to have consisted of 126 copies of inscriptions on stone and copper from Coimbatore, Caroor, and *Dharapuram*. The book, as received by me, has only the covers; all the inside being wanting. How this loss occurred I cannot say, but I return the envelope simply as received.

Manuscript book No. 50—Countermark 1019.

Section 5. Several leaves intended to have been filled with copies of inscriptions, from various places in the Jaghire, have been left blank, in the said book.

Section 6. Copies of inscriptions at *Tiru Karz-kunram*, and other neighbouring places.

1. Commemorates an extensive grant of land, with reservoirs, &c. to the image of the above fane, termed *Bhakta-varchatta-svámi*, and also a gift of 250 pieces of money, arising from the sale of a village, made in the time of *Hari-hara-rayer*, but without date of year, and signed by the donors.

2. Gift by *Canda-rayen* of 1360 *fanams*, to the said fane attested by witnesses, and not to be reclaimed. The astronomical day specified; but no date of year.

3. Gift by the son of *Canda-rayen* of 1560 *fanams*, inalienably bestowed on the said fane: astronomical date of cycle given, and Friday specified.

4. Gift by weavers of 70 *fanams*, date as before.

5. Donation by traders of a proportion of their profits: being 2 per cent. on some articles and 3 per cent. on others, to the said fane. No date of year.

6. Dated in the 42d year of *Kulottunga Chola*; a long strain of poetical panegyric being prefixed. It commemorates the gift of a tax on revenue proceeds, for the benefit of the said fane.

7. Dated in the 25th year of *Kulottunga Cholan*. Gift of 700 current cash (probably gold cash) for the purchase of a village, presented to the fane, to maintain a perpetual light, during their own time, and that of their latest posterity; by two brothers, landed proprietors in the neighbourhood of *Madurantacam*; attested by several witnesses.

8. Dated in the 33d year of *Kulottunga Cholan*. It commemorates no gift; but seems to be a record defining limits and privileges.

9. Gift of 22 cows to provide butter-oil, for the maintenance of lights in the fane, by persons who subscribe the deed of gift.

10. Dated in Sal. Sac. 1328, in the time of *Hari-hara Bukha-rayer*. Gift by him of land for the service of the above mentioned fane.

11. Dated also in Sal. Sac. 1328. Gift of land and of 60 gold pieces by *Bukha-rayer* to the fane.

12. Dated in Sal. Sac. 1320 in the time of *Deva-rayer* of the line of *Hari-hara Rayer*. Bestowment of land in free tenure to the fane.

13. Dated in the 13th year of *Vira Pandiya-dever.* Gift of land without any reserves to the fane,

14. Dated in the time of *Sri-vira Vijaya Bhupati-rayer* (all titular names), cycle year only mentioned. Gift of land, by a union of various classes of people specified, for the advantage of the fane.

15. Dated in Sal. Sac. 1330 in the time of *Bhupati-rayer.* Gift of 32 cows, &c. to the fane, for the supply of oil for lights to be maintained therein.

16. Dated in the 1st year of *Sambhura-dever.* Gift of 350 fanams for the service of the image in the same fane.

17. Dated in the time of *Deva-maha-rayer* son of *Vira-vijaya Bhupati-rayer.* Gift of the proceeds from the sale of these villages; amounting, in all, to 820 fanams (kind not specified); from persons subscribing their names.

18. Dated in the 21st year of *Tribhuvana-dever.* Gift of land for the service of the fane.

19. Dated in the 1st year of *Sundara Pandiya-dever.* Gift from several persons of the *Kón* tribe (bearing that affix to their names). Gift of cows, &c. to provide butter-oil for lights in the fane.

20. Dated in the 1st year of *Sundara Pandiya-dever.* Gift of a proportion of rice-grain, at the time of harvest, and 22 fanams, from four *Pandarams* to the fane.

21. Dated in the 1st year of *Sundara Pandiya-dever.* Gift of 67 fanams to the fane by certain persons, who subscribe their names.

22. Gift of 850 *fanams,* for the service of the fane; no date of year specified: incomplete at the end.

23. Dated in the 3d year of *Kulottunga Cholan.* Gift of land, to the fane.

24. Commemorates the building of a *Mantapa,* or porch, by *Canada rayen,* for the accommodation of all the *rishis,* and the 330 millions of celestials.

25. A fragment of a few words; of no connected meaning.

26. The same.

27. A fragment, somewhat longer, but incomplete.

Remark.—The copies of the foregoing inscriptions contained in section 6, are in good preservation; both as regards ink and paper.

Section 7. Copies of inscriptions at *Tiruporur (vulg.* Tripaloor) and other places between *Mavalivéram,* and Madras.

1. Gift of a proportion of rice-grain, for the maintenance of Brahmans at Tripaloor: the fane is one of *Subrahmanya.*

2. Gift of a village to the said fane; from persons who subscribe their names.

3. Dated in the 15th year of *Vijaya-Canda Gopala-dever.* Gift of 5 cows to supply butter-oil for a light in the fane.

4. Dated in the 10th year of *Vicrama Cholan.* Gift of a piece of land to the fane by private individuals.

The preceding are the only inscriptions at *Tiruporur*; but it is added in a note that the fane was built in Sal. Sac. 1429; and that some much defaced inscriptions remain, having been chipped out by a chissel. The writer asks instructions as to whether more labour and pains, ought to be bestowed on them, or not.

Copy of an inscription at *Taiyur.*—1. Dated in the time of *Achyuta-deva-rayer* in Sal. Sac. 1458. Gift by an individual named *Titta Pillai,* son of *Appaiyar,* of a village for the support of the fane, with a heavy denunciation against any one alienating the donation to other purposes.

Copy of an inscription at *Vellichakollutur.*—1. Gift of a tax by weavers on the productions of their looms for the benefit of the fane.

Inscription at *Tiruvottiyur.*—1. Gift of a certain proportion of grain; for the use of the fane, by persons whose names are subscribed.

Inscription at *Tiruvadantai* village.—1. Dated in the 11th year of *Sri Covi raja Kesari.* Gift of land for the service of the fane of *Varaha-swami* (of the appellative *nitya-calyana-svami*, a name of the image at *Covalam)* by certain *Vaishnavas,* who commemorate the donation by this inscription.

2. In the time of *Kullottunga Cholan.* Gift of rice, and other matters to the Brahmans of the fane.

3. Dated in the 19th year of the rule of *Covi Kesari.* Gift of a tax in kind, of rice and other agricultural productions, by cultivators, to the shrine.

4. Dated in the 8th year of *Cola-raja (Chola-raja ?)* "the decapitator of the *Pandiyan.*" Gift of a proportion of grain from the harvest, by cultivators.

5. Dated in the 8th year of *Ventaratipan.* Gift of 93 goats, to provide butter-oil for lamps.

Inscriptions at *Mamalipuram.*—This name seems to be intended for

Mavaliveram. It commemorates a gift of grain from persons subscribing their names; but is without any date.

2. Gift of land by persons subscribing their names. No date.

3. Dated in the time of *Deva-rayer.* Gift of 332 pieces of gold, and of some smaller sums for the service of the fane, for gathering flowers to adorn the image, and similar matters; the various allowances for different purposes being minutely specified.

4. Gift of land with a reservoir fertilizing the same to the *Vaishnava* shrine.

5. Gift of twenty-two cows, to provide a lamp with butter-oil. No date.

6. Gift of a piece of land with cocoa-nut trees growing thereon. Cycle year only specified.

Section 8. Tamil inscriptions extracted from a manuscript (a pencilled explanation, in Colonel Mackenzie's hand-writing, no longer legible).

1. An inscription of *Deva-rayer* Sal. Sac. 1270.

The purport of this inscription is to commemorate the construction of an *agrahâram* for Brahmans by *Deva-rayer;* who is termed the son of *Hari-hari-rayen;* and his ancestry is traced upwards. *Bukhan* is said to have founded *Vijayanagaram,* on the banks of the *Tungabhadra* river. *Deva-rayen* was respected by other kings, and praised by Brahmans, when they came into his presence. A minute specification is given of the location of Brahmans, distinguished by their *gotra,* or tribe, and by the Veda, which they studied: the entire inscription is curious.

2. The genealogy of the *Rayer* dynasty is given. It is dated in Sal. Sac. 1300, at *Pennaconda.* It commemorates the building or foundation, of the town of Pennaconda, ascribed to *Sika-deva-rayen.* It is very brief.

3. Dated in Sal. Sac. 1303. This inscription gives a particular statement of the parentage of *Bukha-rayen,* the founder of the *Rayer* dynasty; mentions his brothers, the name of his wife; and states his son to have been *Hari-hara-rayen.* It is of considerable importance; particularly as to the parentage of *Bukha-rayen.*

4. The said *Hari-hara-rayen* built an *agrahâram* for *Brahmans,* and the distribution of the said alms-house among them is specified, by tribes and portions.

5. Dated in Sal. Sac. 1701. The commencement of the lunar-race is given, and deduced through the line of *Crishna* of the *Yadava*-race, rul-

ing at *Dwaraca-puram*. One of this line, named *Sáluva*, saw a hare chase a tiger, and considered the place to be propitious.....
(Here there is a chasm, by reason of some leaves being cut out from the book).

19. *Crishna-rayer, Achyuta-rayer, Rama-rayer, Tirumala-rayer* and *Sada-Síva-rayer*, are mentioned; and an account follows of a repulse experienced by *Narasingha-rayer* in an attempt to take Seringapatam. The assumption of power by *Rama-rayer*, and his defeat by the Mahomedans are stated. He was succeeded by his son *Sri-rangha-rayen* who ruled at *Pennaconda*. He established his brother, named *Vencatapati-rayer*, at *Chandra-giri*, and another brother named *Rama-rayen* at Seringapatam. After the death of *Rama-rayer*, a district chief took Seringapatam, and the news coming to the knowledge of the Pennaconda ruler.....

(The following matter is wanting, owing to the leaves having been cut out from the book. This last fragment is not an inscription: but part of some historical narrative the value of which cannot now be determined).

General Remark on MS. Book, No. 50.

The whole of the contents of this book have been carefully investigated, and brief results indicated in different portions of my several reports. Copies have been taken of various portions where the ink was found to be pale, and becoming illegible. Section 6, herein noted, is in good preservation, and has not been re-copied. A copy has been taken of section 8, because, though unhappily very imperfect, its contents are of value. The whole examination gives no results of great antiquity. There are some few documents of consequence. The greater portion are of little historical use, from wanting the dates of the *Sacai* year; but they illustrate the spread, and influence of Brahmanism; and give views of the practical working of idolatry, which in any bearing upon the improvement and elevation of the people at large, are of momentous import. As such, may the brief outlines given be well considered.

Manuscript book, No. 13—Countermark obliterated.

Section 1. Account of the *Nayanmar*, in the Malayalam country.

A specification of local customs, and usages of four subdivisions of the *Nayanmar* named respectively *Ilam*, *Surùbam*, *Tamil*, and *Patha-mangala*. Social intercourse: what persons can enter the houses of others. Astrological precautions, before determining on marriage. Mode of con-

ducting marriage ceremonies. Plurality of husbands; and consequent manners, of great laxity. Modes of proceeding, consequent on the death of any one of the parties. Modes of dress. The *Nayanmars* have lengthened ears, like the *Maravas* of the Tinnevelly country; and, like them, wear jewels in their ears. (This custom on enquiry I find to be peculiar, in Malayalam, to the *Nayars*). Other details concerning the intercourse, of the most licentious kind, between the wives of the *Nayars*, and the *Namburi* Brahmans. Modes of subsistence. The *Nayars* sometimes officiate as accountants; but they disdain any trading, or trafficking, employment. They eat flesh, and drink strong liquors. They are debauched, and irregular, in their habits. They are destitute of honesty and moral principle; so much so, that their word merely is never taken; and people will trust to nothing but written security from them. Their morning and evening meals; utensils, habitations, and connected matters. Depraved, and polluted, as this class are stated to be, yet it is observable that if one of a lower caste, or if an outcaste, trespass in even so small a degree the prescribed distance of approach, the *Nayar* must bathe in order to wash away the contamination; thus following a very common error of making a ceremonial contamination a matter of greater magnitude than moral turpitude. Some other details follow, concerning the modes of proceeding by parents, in marrying out their children. Means employed of providing for children, who have lost one, or both, of their reputed parents.

The customs of the *Potemar* are stated. They are a class of Brahmans, and have their own customs. Some of these indicate their having come from the *Tuluva* country; that is, the most northern division of Malayalam.

REMARK.—The foregoing paper affords further attestation of the affinity, as to origin, between the *Maravas* and *Nayars;* heretofore observed in a note on a paper formerly abstracted.

Sections 2 to 16. Are entirely occupied with minute details, as to allowances daily to temples; revenue proceeds; and the like; of no consequence whatsoever; and therefore passed by, without being re-copied, and not susceptible of abstract.

Section 16. Boundaries of *Puntalam*.—From a slight mistake of my directions the writer copied this section: as it is somewhat more connected than preceding matter, but it is of no consequence.

Section 17. Account of the fane of *Mahadeva*, at *Puntalam*.—The etymology of the word *Puntalam*, is from *pú* a flower and *St'hala*,

a place; which by the rules of Tamil orthoepy becomes *Puntalam.* What little is stated is not of any consequence.

Sections 18 and 19.—The former a rude attempt to delineate the fort of *Conatur*, with its fane; the latter a trifling account of revenue proceeds; passed by as useless.

Section 20. Notice of the *Panikar* living in *Conatur* district.—A few details concerning this class have been copied; but of trifling consequence.

Sections 21 to 26 having little or nothing in the book answering to the section titles prefixed, the few loose and insignificant details given, have been passed by.

Section 27.—Account of *Vámanapuram* the residence of the *Atingal* chieftains.—A brief statement concerning this town has been copied; but it is insignificant.

Section 28. Account of the *Irzhavar* tribe.—A few unimportant matters, respecting them, have been copied.

Sections 29 to 32. Indicated in the section-titles to contain revenue details, have only 3 or 4 pages answering thereto in the book, of trifling and insignificant matters.

Section 33. Account of the *Nambiyar* Brahmans at *Cochin.*—A legendary statement as to their origin.

Section 34. List of commercial goods in the district of *Puranàd.*

Section 38. Legend of *Mánica-cshetram*, at the village of *Irankalgudi.*—An ascetic discovered a jewel; which, in process of time, came to be worshipped as a god.

Section 42. Account of *Pulapanàd.*—Some legendary matter of no value.

Section 44. Account of *Codagnalur.*—The derivation of the name is given.

REMARK.—This book having been found to be in a wretched plight as to paper, ink and general preservation, was given to a copyist to do what he could with it; and the results are stated in what goes before, after hearing the whole read over. They are of so little value, that the book might have been allowed to perish; though it is my wish not to permit any part of the collection to do so if it can be preserved; that is if recoverable.

Manuscript book, No. 7—Countermark 900.

Section 1. Details concerning the Brahmanical, and other tribes, in Malayalam.—Some details concerning Brahmans, and divisions of tribe, originated by *Parasu Rama*. Afterwards the *Musu-jati*, a tribe of temple servants are described, and the *Vaitiyar*, or medical class. The *uril-parichi* deduce their origin from the circumstances of a war entered into by *Kulasec'hara Perumal*. The *Cshetriya-jati*, or military class, is subdivided into three tribes. *Ambala-vási* or dwellers in a fane, are of mixed origin. The *Pushpacanmar* have no restriction, as to not marrying a second time; they gather flowers for the use of the idol. The *Pshárodi*, derived their origin from a Brahman who forfeited the privileges of his tribe. The *Variyar* derive from the marriage of a Brahman with a *Sudra* woman; and perform various offices, as servile assistants to Brahmans. The *Marayan-jati* beat drums, &c. in fanes at the time of offerings. The *Curupu* play a kind of lute. *Chákiyár-nambiyár* are minstrels, who sing the praises of Brahmans, and kings. *Atizal* were Brahmans, who from becoming worshippers of the *Sacti*, or negative power in nature, became degraded. A list of subdivisions of the *Sudra* tribe follows.

Section 2. Account of the fane at *Tirukan-kodu* from the writing of a Brahman.—In the year of the Collam era 982, two brothers gave some land to this place. There is nothing else in this very brief section.

Section 3. Account of proceeds of different kinds of lands in the *Curalapar-nad*.—This short paper relates to revenue proceeds, of no permanent consequence.

Section 4. The genealogy of the zemindar of the said district, is in the Telugu language. (See that part of this report).

Section 5. Copy of a record concerning *Calicut*, preserved in the hand-writing of a *Senatipati*, written before the times of disturbance.—(This section is in the Tamil character, and in the midst of Tamil documents; but, on examination, the language was found to be Malayalam).

The above mentioned *Senapati*, or commander of troops, was in the service of the *Calicut-raja*. He was of the *Taracal-vamsa;* a family which possessed peculiar privileges, as military chiefs, in connexion with the *raja*. Mention is made of one such chief, and of the subsequent want of posterity, supplied by adoption. Various kinds of deeds, grants, orders, and the like, were not valid, merely on the signature of the *raja*; requiring also that of the chief of this family, and the signature of another minister of the *Mangnatacha* family. These things bear on the local customs, and government, of that part of the Malayalam country; but there does not appear to be any thing of historical interest of a general kind.

Section 6. Geographical account, written in the Malayalam language. —In this paper also the characters are Tamil, the language is Malayalam. The document is an itinerary, or travelling journal, of one named *Canyuru-Namburi*, during a period of 11 or 12 years, between *Collam* era 863 and 874, respecting his journey from the Malayalam country to *Casi* or Benares; stating the names of places of repute, as shrines, or bathing pools, visited by him; and lying intermediate between Benares, and Ramaseram. He further adverts to Himalaya, on the north, and to *Irza* or *Singhála*, on the south; the latter of which he terms *Lanca*.

Section 7. Copy of a palm-leaf record of the *Cutheri-valta-nayar* of *Naduvattam* in the *Palcad* district.—This section is also Malayalam, in the Tamil character. It relates to the local rules, or customs on which the fief or barony, of the said *Nayar* is held from the *Samotiri-raja*, or Calicut ruler. On the installation of a new *Nayar*, a certain sum is paid to the minister of the Calicut ruler. On the death of a *Nayar* information must be sent to Calicut, with the mention of the legal apparent successor whose nomination needs confirmation from Calicut. The expences incurred on occasions of the installation, marriage, or funeral, of a *Nayar*, are stated. The form of writing to the Calicut chief, announcing the death of a Nayar, with the legal successor, and the form of the Calicut ruler's official reply, when affirmative, as to a successor, are given.

Section 8. Copy of an old record of the *Puthucheri agraháram*, preserved in the hand-writing of the *Manradiyar* of *Vadacheri*, in the *Palcad* district.—The *Manradiyar* was a petty chief who held a small country, of a few leagues in circumference, which was forcibly wrested from him, by the Travancore king; and afterwards made over to the Calicut ruler. The chief portion of the paper relates to the laws, and regulations, of the said small barony; as to marriage customs, and observances; domestic rules, and restrictions; rights, and privileges of Brahmans; and the illegality of any sale of land, which must go by hereditary descent. It is of local importance only; but the existence of distinct laws, in various small districts, confirms other indications, as to the want of extensive imperial power in the Malayalam country.

Section 9. Account of the fane at *Tiruválattur*.—There are some loose and unconnected lines as to *Chittur* village, and *Tiruvalattur* fane, but mere fragments, and by consequence of no use whatsoever.

General Remark.—This book was observed to be in a damaged state: it has (with the exception of sect. 9) been restored; section 1 to 3 in the Tamil language; section 4 is in Telugu (see that portion of this report) section 5 and 6 as found in the Tamil character; but section 7 and 8 are copied in the Malayalam character, as best suited to the Malayalam language. The Tamil character disguised the language of the latter sections, at first; especially as the opening sections were wholly in Tamil. The importance of the contents does not seem to be great; but, on the whole, it may be of some use to have rescued, what is of any consequence, from destruction.

Manuscript Book, No. 12—Countermark 905.

Section 1. Account of a shrine of *Crishna* at the village of *Ambalapurai* in Malayalam.—A child troubled a *Sannyasi*, by doing mischief to sacrificial implements which made the said ascetic angry; whereon the child disappeared, and was discovered to have been an apparition of the god. Much inane matter connected therewith; leading however under the influence of superstitious credulity, and of the *Namburis*, to the construction of a fane, with its shrines, out-buildings and appurtenances of festivals, allowances for them, and grants in land: the whole dedicated to the service of *Crishna*. At a late period the minister of the Travancore *raja*

made war against the head *Namburi* of this place. The details indicate that the head *Namburis* had acquired great influence, and consequence.

The account was collected by *Nitala-Narrayan*, who visited the various fanes accompanied by Mr. Ward. According to the description given, this one with its various appendages, is of more than usual magnitude, and splendour.

Section 2. Account of the Syrian Christians, in Travancore.—*Nitala-Narayan* states that being in company with Mr. Ward (an officer of the survey department) a document in the Lebbi language (probably Syriac) was explained to him in Tamil, which he embodied in the contents of this paper.

At a former time seven persons of a strange religious persuasion came to Travancore; among whom the name of Mar Thomas occurs. The king of the country had previously received some admonitions respecting them in a dream. They called on the king to embrace their system, and to allow them to build places for their mode of worship. The king demurred to their claims and said these must be proved. He also summoned a council of *Brahmans*, enquiring if the new system ought to be received; who replied most certainly not. The foreign persons ascribed to themselves the faculty of retaining the soul (when departed from a body) in the air above, and of recalling it, so as to re-animate the body; and, as stated, gave a proof of this power in the case of one among themselves. The king, however, resisted their claims. Soon after the king's younger brother died; whereupon the recently arrived strangers told the king that if he would build seven churches in different places they would restore his brother to life. The king made the promise, and the body of this brother became re-animated, awaking as if out of sleep. In consequence both the king, and his brother, adopted the new system, and along with them sixty-four householders with their families: these received the initiatory rite of baptism. Thirty-two householders refused to adopt the new mode of credence; and created disputes. The younger brother requested from the king one-tenth of his revenues, which the king granted; and, with the proceeds, the younger brother had seven churches built, in different villages. Mar Thomas was killed, and afterwards respectfully buried. In consequence of the disputes, a message was sent to Syria; whence a person came, on board ship, as spiritual superior of the Christians. At a later period *Manica-vasacar*, a person who chanted panegyrics, came to Malayalam, and disseminated the *Saiva* five-lettered system; teaching to swallow the *Saiva* compound of five substances; and to use the

Vibuthi, or sacred ashes. He drew away several families. The head of the Christians received various privileges and immunities from *Cheruman Perumal*, who always directed the election of the *Metran*. A council, or synod, was formed for the settling of disputes. Other details are given; with mention of the first arrival of the Portuguese, termed the Cochin-Feringhis. An interference of a Roman Catholic, claiming authority over the Christians, is mentioned; whom the Cochin *raja* put in fetters. A reference was made to Rome on the subject. Subsequent matters are stated; chiefly relating to discussions between the Syrian, and Roman Catholic Christians. A Roman Catholic bishop arrived; whom the Syrians refused to recognize. The affairs of the Syrian church in Travancore are narrated, down to a recent period.

REMARK.—The preceding abstract is much too brief; and very imperfect. But I have allowed it to be so, partly because it is probable that I may take an early opportunity to translate the document, which is of some length; and, as it seems to me, of some value as an authority.

Section 3. Account of the fane of *Callara-cota* in *Malayalam*.—Legendary reference to birds killed with an arrow by *Arjuna*. A fane was built; but there is no *St'hala-puranam* relative thereto.

A sort of itinerary follows, written by *Nilala Narayan*; briefly mentioning heathen edifices visited by the way. Four of these have only a few lines appropriated to each; with trifling details of no value. In the table of contents, each of these short paragraphs is entered as a section. Section 8, relates to *Vallabha Cshetram*, concerning which a long legendary account is given, but as puerile as can well be possible. A few dates of the early part of the *Collam* era are stated, with mention of some rulers, which may be of use. The place seems to have risen to celebrity, and to be one of much resort at its festivals. Sections 9, 10, 11, 12, are merely brief paragraphs of an itinerary: the subjects relating to places of inferior note.

Section 13. Account of the fane of *Panniyanna-naru-cávu Bhagavati* near to *Manàr*, in the district of *Tiruvalla*.—With this section a third division of the manuscript book begins. Some legendary matter, of no consequence, is stated. It then appears in the statement, that an annual human sacrifice of peculiar atrocity, was accustomed to be offered. The person proper to be so sacrificed was a woman, pregnant with her first child. Such a woman, being selected was brought to the shrine; and there killed by being beheaded with a sword; so that the head rolled up to the image, and the

blood of the victim was sprinkled thereupon. The origin of this sanguinary sacrifice, as to any date, is not specified: but it is stated to have been regularly of annual observance, down to the year of the *Collam* era 918. In C. E. 919, an *ávésham* or possession of the spirit resident in the said image, came on a by-stander, at the time when the sacrifice was to have taken place, directing that for the future human sacrifices at her shrine should be discontinued. (That year corresponding with A. D. 1743 the said afflatus of the evil spirit, can be accounted for, as a precautionary measure). From that date human sacrifices have been set aside. Moreover the posterity of the woman and child, spared on that occasion, now bear the name of *Adichamar*, who live in a village divided into the north and south quarters, being four or five households, and inclusive of their children, amounting, when the account was written, to 40 or 50 souls. They receive offerings made to the shrine; and by an order from the *rajah* they are exempted from the payment of any taxes. There is a small river near the said fane, and since the Collam year 920 annually on the day when the sacrifice used to be made, the headless trunk of a dead body is seen on the river bank. No explanation of this circumstance is offered: and, if any be asked, the only reply given is that it is "a divine secret."* (The inference of course is, that the sacrifice was only publicly discontinued, but is still privately practised, possibly during the night). At the present day a public sacrifice of sheep is substituted for the human sacrifice. At this fane there is neither inscription nor *St'hala-puranam*.

Section 14. Account of the *Siva-cshetram* at *Corandi*, in the same district.—In the time of *Parasu-Rama*, an evil spirit built this fane, in the course of one night. No females are allowed to enter; not even the queen. These must pay homage outside, men only may enter within-side.

Section 15. Account of the village district of *Sanganaeheri*, with its village of the same name.—There is nothing of any consequence in this section, beyond the mention of the building of the village fane.

Section 16. Account of *Siva-cshetram* of *Candiyur* in the *Mavali-karai* district.—The name of the district is derived from *Mahabali-chacravarti*. The fane is one of *Crishna*. The term *Candiyur* arises from *Mahabali* having been resident, or seen there. (An example of

* *Daiva rahasya.*

the liberties taken as to names and localities). It had its own chiefs but in *Collam* era 920 it was seized by the Travancore *raja*. Access to the *Sthala-purana* could not be gained.

Section 17. Account of the fane of *Maha-deva* at the village of *Pandala*.—The name of the village seems to be properly *Puntala*, meaning "a flower garden." This district had its proper chiefs. A *Pandiyan* king ruling over *Ten-Casi* (the southern Benares), having no offspring, adopted a child; but the people of the king refused to recognize that adoption. In consequence the rejected person took away much wealth from the place, and with it retired to Malayalam; where he purchased extensive estates, forming this district: over which he, and his posterity, ruled. It was however forcibly seized by the Travancore *raja*; and a few descendants only of the original proprietors remain; these being now poor and miserable.

Section 18. Account of the fane of *Maha-deva* in the village of *Venmanni*, of the *Puntala* district.—Certain lands were made over to the fane, in the hands of Brahmans of the *Potemar* tribe; who, in consequence, conducted the usual ceremonies and offerings.

Section 19. Account of *Tumburman*, a fane of *Subrahmanya*, in the *Puntala* district.—A possession of the spirit of *Subrahmanya* came upon a certain Brahman, ordering a fane to be built; which was accordingly done. Nothing further is mentioned.

Section 20. Account of the *Sevacshetram* of *Senganur*, in the *Mavelikarai* district.—Legendary matter, as to an appearance and marriage of *Siva* with *Parvati*. At the time of the primary marriage the concourse was so great that the earth could not bear the burden. A certain *rishi* received an order, in consequence, to go to *Senganur*. He objected to the doing so, without having seen the marriage ceremony; but was dismissed with the assurance that *Siva* and *Parvati* would come thither and be married, for the fourth time. The promise was accordingly fulfilled; and on that event the construction of the fane, and observance of its festivals, are made to depend. *Parvati* being subject to ceremonial desecration (according to the custom of women), ceremonial homage should not at those seasons be paid: but a *Namburi* Brahman ignorantly going to the shrine, at such a time, was violently assaulted by the spirit of the image, and afflicted with severe visitation of

the variola fever. A *Tantri*, of another class of hierophants, gave a proper explanation of this circumstance; in consequence of which, processions were formed to carry the image to the river to bathe, after the said time was past. Festival observances are connected with these processions. (To all evasions as to images being only tokens of remembrance of one Supreme, assisting the mind in His worship, such instances as the preceding may be opposed in reply. The puerility of idolatry, amazing as it is, could hardly proceed further than in the aforesaid example: it is on this account solely, that I allow of its mention). The fane was burnt to the ground in *Collam* year 940; and not a vestige remains.

Section 21. Account of *Armulai* fane, in the district of *Tiruvallà*.—Reference to the times of the *Pándavas*, and to five places dedicated by *Bhishma* to *Bhu-devi* or the god less of the earth, of which this was one. At the festivals large bamboos (termed *Mulai*) were brought from the mountains, to form a booth before the fane; whence the name *Armulai* (six bamboos) is derived. Certain old observances formerly existed; but have not been revived since the place was burned down to the ground in C. E. 940 (A. D. 1764).

Section 22. Account of the fane of *Pattali Bhagavati*, in the *Cottarai* district.—A spirit of *Bhadra-Cali* seized various animals as tigers, alligators, and the like; doing much mischief to the country. She also appeared to three persons in a dream; ordered a fane to be built; and promised in such case, to guarantee the country from hostile invasion. In consequence an image was painted on glass, according to the form of her appearance in vision; the same was placed, and ritually set apart by *Pratishta*, in a fane built to her honour: in which the usual observances were continued.

Section 23. Account of the fane of *Mannádi-Bhagavati*, in the village of *Mannádi*.—A potter, and his wife, lived on the banks of a stream; where a ferry boat was stationed. Two *Brahman* women, and two *Sudra* women, called to the potter's wife, one day, to send over the boat; which she stated herself to be unable to do. They bid her loose the boat; and it would come of itself. She obeyed, and the boat went over, and returned. The four females thanked the potter's wife; and announced to her much good. She begged of them to lodge for the night; to eat in one hut; and sleep in another one. They consented; and the potter aided his wife in procuring for them fruits, and other refreshments. In return they announced to him, that he would be chief of the district. During

the night all four were found to have disappeared; and a possessed *Caradi*, or black bear, appeared; commanding in the name of *Bhadra-Cali* that a fane should be built, which was done. The potter, and his wife, by means not stated, became possessed of the district. In bringing offerings to the shrine, the people who do so present them to the descendants of the said family.

Section 24. Account of the fane of *Pávumpávi-dever*, in a village of the same name in the *Manipal'i* district.—The origin of this fane is ascribed to the following circumstance. A wood-cutter in the service of a *Nayar* when performing his work in the woods, whetted his instrument on a stone; and some others did the same. During three days nothing particular occurred; but on the evening of the fourth day, when the instrument was being whetted, blood flowed forth from the stone. The man told the circumstance to the *Nayar;* who came, together with three or four *Potemar* Brahmans. These, supposing it to be some god, had a booth erected over it; which in process of time became a shrine and fane; having its attendants, festivals, offerings, and the like, as usual in other places.

Section 25. Account of the fane at *Cáyan Colam*, belonging to the *Concani* people.—Formerly, and more than three hundred years ago, in consequence of a disturbance in the *Concan*, several persons emigrated thence and came to Malayalam, where they received permission to settle, from the Cochin raja. In consequence, they formed a distinct community; and built for themselves fanes: the one mentioned among others; connected with the usual observances.

Section 26. Account of the mosque of the *Iona-mapula* people in Travancore.—Their cazi, and some other leading persons, are mentioned. Their pecular usages, and customs, are adverted to. Their class is said to have received great increase from the accession thereto, as well of *Namburis*, as of other people.

Attached to this section, is a further brief mention concerning the Syrian Christians termed *Nasrani* (that is Nazarenes): it chiefly relates to ancient books. One, written four hundred years since, is stated to be in the old *Malayala-lipi* or character. Others are spoken of as in the Syria *lipi*, and are probably intended to denote the old Syrian MSS. of the Scriptures; one of which was purchased by Dr. Buchanan. The name of Mar Thomas herein occurs; and also some mention of the

Syrian bishops; but the brief notice is such as a Brahman, and a stranger, might be expected to write. There does not seem to be any wilful prejudice.

Section 27. Account of the fane of *Rani Cavu*, in the village of *Rampulam* in Travancore.—It belongs, as hereditary property, to a *Namburi* Brahman who officiates. Little else is added, and besides many letters have been destroyed by insects.

Section 28. Account of the fane of *Nangaiyar Curangnari*, in Travancore.—Fabled to have been the hermitage of *Mricandiya-rishi*. A woman and child, passing that way, bathed in a neighbouring pool; and meditated on *Vishnu*. In consequence *Vishnu* personally appeared, and *Mrican liyar* seeing this appearance, there placed an image of *Vishnu*, which now receives all customary honours.

Section 29. Account of a fane of *Subrahmanya* at *Aripattu*, in Travancore.—The circumstance chiefly referred to in this paper is that of a great number of Brahman children being fed at this fane; and spoken of as belonging to it. A superstitious dread of saying, or doing, any thing against them prevails. *Rama r ja* of Travancore, once seized and imprisoned one of them, for some mischief committed: for doing so his arm swelled; and he released the boy, paying a fine to the fane, and apologizing for his ignorance. Hence no one dare speak against the said children; without incurring the anger of *Subrahmanya*. The document has suffered great injury from insects.

Remark.—This book was put into the hands of a copyist to be restored, on account of its greatly injured state by *termites*. The doing so has only been partially successful; many omissions of letters, words, and sometimes sentences, remaining. The contents are of greatly differing interest, and value. Heathen superstition is herein painted by the hand of *Nitala-narayan*, himself a Brahman, in its most puerile form. Moreover the shocking cruelty mentioned in section 13, can hardly escape notice. Surely no one can regret that Christianity has planted its foot, diffusing more genial influences, in that very neighbourhood.

Manuscript Book, No. 59—Countermark 1027.

Inscriptions on stone, and paper grants in the Malayalam country.

The materials on which this book is written, are China and country paper; and with some mere memoranda in pencil. The language is quite a *melange ;* consisting of a little Malayalam, some Sanscrit *slocas*, a large proportion of Tamil, mingled with *Grantha* letters, and some few portions of documents in what is termed Malayalam *lipi* (characters). A perusal of the whole shews the contents to be incriptions, but of no considerable antiquity ; being subsequent to the formation of the *Collam* era, and entirely referring to grants of land and other immunities, to fanes, and their attendants, by the raja of Cochin and a raja of *Cherakal ;* the origin of both of whose power is subsequent to the division of the country by *Cheruman-Perumal.* Such being the case I have neither thought these documents worth minute abstract, nor the book worth re-copying where practicable. At a subsequent period, if leisure or opportunity occur, it may be looked at again, and any documents that may be in danger of perishing can then be restored. The book will continue legible as it is, for a few years longer.

Manuscript Book, No. 12—Countermark 54.

Muppantottilulà a panegyrical poem on *Sôma-nát'ha*, the tutelary god at *Muppantotti*.

This book contains a poem, of the kind termed *ula*, referring to the fane of *Sôma-nat'ha*, and consisting of seven *adhyáyas*, or sections; the subject of each section referring to a distinct *sacti*, who is represented as coming to the shrine, and becoming enamoured by the perfections of the idol. The book is somewhat damaged by insects, and the ink is rather pale. I deem it however unworthy of restoration.

NOTE.—The entry in Des. Catal. vol. 1, p. 177, art. 38, would have led me to expect something better from it. However there remains a palm leaf copy No. 228 to be examined ; referred to a subsequent report.

Manuscript Book, No. 40—Countermark 336.

Account of *Tirunamalai*, or Trinomalee.

This book is a thin duodecimo; with only about one third written. Its object is to commemorate the visits to the shrine, of four kings, or local chiefs ; that is *Vajranga-Pándiyan ; Sambhuva-rayer ; Valala-rayer* and *Devà-maha-rayer*. These persons, on their visits, made certain additions to the fane. In the times of disturbance, occasioned by Hyder Ali, several documents belonging to the place were lost.

Remark.—Though this brief mention of the contents is probably sufficient, as to any valuable purpose; yet as the papers are loose, the country paper very thin, and partly injured by insects, I have on the whole thought it as well to have it restored.

Note.—The book is entered in Des. Catal. vol. 2, p. L. art. 40.

Manuscript book, No. 8—Countermark 762.

Section 1. Account of *Periyobaiya Condama-nayak*, local chief of *Ayacudi* in Coimbatore.—The account commences with the dates of C. Y. 4400, and S. S. 1321, when the head of this line was despatched, by the Padshah of Delhi, against the Mahrattas. A sanguinary contest occurred, leading to an explanation, and subsequent agreement. *Ubaiya Condama*, was afterwards invested with honours and distinctions. He, with his family, emigrated in consequence of the Padshah, whom they served, requiring wives from their tribe; to which they could not consent. They settled in the south, at *Ahóbalam*. The defeat of the *Pandiyan*, by the *Chola-raja*, subsequently occurred; leading to the appeal of the former to the *Rayer*; and the sending of *Nagama Nayakar*. His usurpation; the sending of *Visvanát'ha* to bring his head; the accession of *Visvanàt'ha* to the rule at Madura; the building of a new fort; the appointment of *Ariya-mutha-laiyar* to be chief minister of state, are narrated. Subsequently there is legendary matter to account for the establishment of the fane of *Ahóbala-isvara*. The first of the line ruled there as a feudal chief for 30 years; his son 15 years. Other descents of the chieftainship are mentioned. There is nothing particular beyond, except the Mysore invasion; and, at a later time, the war against Tanjore. The subsequent transactions, towards the close of which the English became concerned, are narrated.

Note.—This paper as being of some value, and from the ink of the record being faded, has been restored.

A brief statement of the assumption of the *pálliyam*, by Government; and also an incomplete notice of the line of *Rama Bhadra Nayak*, follow. The first is of no moment; and a full notice on the latter has heretofore been given.

Section 2. Account of *Padmachala*, and of its fane, in the Coimbatore country.—This account professedly is extracted from the *Scanda-puránam*; some *adhyáyas* of which are copied. The object is to account

mythologically for the veneration said to be due to the hill; and to narrate the first formation of different *Saiva* emblems found thereon, with their connected shrines. Nothing beyond this simple indication of contents is required.

Section 3. Legend of the fane of *Narasinha Perumal* in the Tinnevelly district.—Under this section brief notices of various *Saiva* emblems are comprised; offering nothing deserving of special notice.

Section 4. Account of *Tádi-Combu*, an *agraháram*, in the Coimbatore district.—The account does not ascend higher up than S. S. 1400, and has some minor details; not meriting much notice.

Section 5. Account of the fane of *Ahóbala*, named after *Narasinha-svámi*.—Legendary details concerning this fane, and others in the neighbourhood, are comprised under this section.

Section 6. Account of *Cutheraichuni*.

Section 7. Account of *Cannivádi* and *Cotapalli*.—A legend as to the first mentioned place; and other legends of places in the *Cannivádi*, and *Cotapapalli*, districts, are stated: each one brief and of no importance.

Section 8. Legend of *Manar-koil*, at Cape Comorin.—The legend is founded on a mythological fiction of *Siva's* coming to the south; and there being again married to *Parrati*, as *Canya-Cumari*. Similar legends are common to most of the *Saiva* fanes, in the peninsula.

General Remark.—This book is a little injured in the covers; and slightly touched by insects: the ink also is faded. Still it will last, as it is, and be legible for several years, with only common care. Its condition would point it out for restoration, were the contents worth it; which, with the exception of the first section, does not seem to be the case. All the remainder, at least for the present, is passed, without further attention.

Manuscript book, No. 5—Countermark 50.

This volume is a thin folio, and contains two parts; the first a legendary account of *Pádmachala*, professedly extracted from the *Scanda-puranam*; the second an incomplete copy of the *Bhúgóla-pramánam*, or system of Hindu geography. To the legendary details of the first it may perhaps be expedient to return, more at leisure; as a few grains of wheat may be picked out of the chaff; and the more especially since the country paper is a little touched by insects and the ink in several places faded. More important matters requiring notice, this may be passed, for the present, with a general indication as to its state of preservation. The other fragment is written on Europe paper, and will remain legible a long time. It may also be referred to the notice of a palm-leaf Tamil MS. bearing the same title, with the like contents.

Manuscript book, No. 53—Countermark 1022.

The contents of this book are of a very miscellaneous description. In the index three sections are specified, as containing respectively inscriptions from Trichinopoly, Coimbatore, and Tanjore. The included matter will appear from the following brief outline.

1. At Trichinopoly, gift of land at *Ayilur*, by *Vaiyapa-nayak*, who deduces his descent from *Achyuta-nayak* to whom a long string of titles is ascribed. The gift is perpetual, to support car-festivals, and other expences of the fane of *Tiruvalesvarer*, with heavy denunciations against any alienation of the gift to other purposes.

2. A hand-writing given in by one or two individuals, specifying certain donations relative to a large lake for irrigation. One uncertain date appears, and another date S. S. 1684, with the name of *Crishna-raja-udiyar* (of Mysore).

3. A Canarese inscription. It records certain donations made by *Crishna-raja-udiyar* of Mysore, to a fane of *Visvanat'ha-svami* at *Bhuvani-kudal*, in the Coimbatore province. The grants consisted both of land and money; of which a list is given. There does not appear any *Sacai* year; but the date of course is modern.

4. Legendary matter as to the establishment of a *Saiva* emblem in the *Dharapur* district, by the command of a visionary appearance. Some gifts made to it were partly continued, and partly subverted after the Mysore conquest.

5. Details concerning an *agraharam* in Coimbatore province, with gifts made, and fluctuations of power. The establishment of the alms-house is dated in S. S. 1100. It is signed by some inhabitants.

6. Details concerning another agraharam, and fluctuations of power indicated. Constructed in Sal. Sac. 1523.

7. Particulars of grants made to the fane of *Antiyur* in the Coimbatore district, the earliest date is S. S. 1502.

8. Specification of grants to an *agraharam* at *Hobhalli*, in the *Antiyur* talook, the earliest date is Sal. Sac. 1200; the interference of Mysore kings appears. No tax paid to the Honourable Company.

9. Like matter with reference to an *agraharam* at *Samba*, going up to the 13th century of *Salivahana*.

10. An oral statement of a person concerning some claims referred to the collector.

11. With reference to an *agraharam* in *Chacra-giri* hundred, mention is made of the early *Congu* line of rulers, and then of the succession of the *Rayer* dynasty. No certain date is specified higher up than the 13th cent. of *Salivahana*.

12. Particulars concerning a fane in the *Antiyur* hundred and mention of wild tribes living on a hill near it, who wear no clothes, and live on roots, or other spontaneous productions of the earth. Mention of a fort built by a *Vedar* king.

13. Particulars of an *agraharam*, and its possession going up to S. S 1105, and descending through various fluctuations of power as respects taxation imposed.

14. Matters relative to an *agraharam* at *Andiculam*. A composition as to tax in S. S. 1620, in the time of a Mysore ruler.

15. Reference to a fane of *Subrahmanya* at *Sicala-puri*, where the said *Subrahmanya* for some unknown cause chose to dwell. Mention of a teacher of great repute who had many followers.

16. Certain specialties relative to a fane which has several images within it and a great number without side.

16½. Stanzas in praise of an *amman*. In that fane there are no rites of homage practised.

17. Refers to *Agatesvara*, or a shrine of *Siva* said to have been founded by *Agastya*, and mention of his coming to the south to dissipate the darkness of ignorance. Legendary reference to former *yugas*.

18. An inscription dated in the 10th year of *Vira-Pandiya-dever*. Gift of land. Letters of the inscription, from being very old, cannot, it is stated, be read or copied.

19. Hand-writing of specified individuals relative to an *agraharam*. The earliest date given is Sal. Sac. 700, but it is doubtful if the writers did not mean about 700 years ago. Nothing answering to so high antiquity as S. S. 700 appears.

20. A local legend relative to a shrine of *Subrahmanya* as the slayer of *Suran*. Reference to the 13th *adhyaya* of the *Scanda-puranam* for an account of the splendour of the place. Certain old records were lost in times of disturbance.

21. Account of a fane at *Cadiyur* in the district of *Dharapuram*, given by *Brahmans*. Legend of *Siva* dancing in the forest. A *Pandiya* king, directed by a vision, obtained a victory in the said wilderness. The shrine has the traditionary fame of being self originated; that is of unknown antiquity.

22. Account given by *Brahmans* at *Agatesvara* fane. Some jejune matter panegyrical of *Siva* introducing the mention of his marriage at Madura. *Agastya* is mingled up with the account, and his fixing a *Saiva* emblem in the neighbourhood led to the name of *Agatesvara-puram*. Various *tirt'has* specified with mention of the distinguished deities such as *Indra*, *Subrahmanya*, and others, who did homage at this locality.

23. Account given by *Brahmans* of *Cangaya* fane in *Dharapuram* district carried up to the *Kreta-yugam*, and a penance performed by *Brahma*. Other matter equally inane. As *Parvati* did penance there, the place seems to derive, from that alleged circumstance, its chief repute. The legend is said to be found in the *Curma-puranam*.

24. Legendary matter from older *puranas*, applied to a particular locality, with some appended jejune details. Inscriptions in troublous times were lost.

25. Account supplied by *Brahmans* of the fane at *Kannipuram*, in the *Cangaya* hundred of the *Dharapur* district. Legendary matter to account for the name. Besides older matter, the five *Pandavas* are said to have dwelt there, which affords some test of the veracity of the whole.

26. Legendary matter as to a fane at *Tiruvalur* which refers back to sixty-four great ages; to *Marcandrya-rishi*, and some later matters; of equal importance, and veracity.

27. Inscription and account of *Tiruvalur* fane in the *Valagudi* hundred, in the Trichinopoly district. *Valmica* was performing penance in this neighbourhood when a *Vedar* or wild hunter shot at him an arrow; but the sage taught him wisdom. Reference to the *Vishnu-puranam* for full accounts of the fane. It was greatly distinguished by ancient rulers; but was allowed to go to decay. *Chokarangha-nayak*, of modern date, had it repaired; and made to it a grant. It suffered from the Mahomedans. A few subsequent details down to the time of the Honourable Company. For a time its festivals were observed; but were afterwards discontinued.

28. Record of a grant by *Crishna-rayer* of various sums of money to *Vaishnava* fanes, in the Tanjore country; and a mention of his great munificence in the *Chola* kingdom.

29. A grant made to the fane of *Govinda-raja*, at *Chittambaram*, or Chillambram.

30. Record of a donation by *Achyuta-rayer* in Sal. Sac. 1461, to a fane at the same place.

31. An inscription dated in the 8th year of *Sri-coperu-singhu-devar*. Commemorating a gift of land by the *Chola* king, apparently intended by the above name, to the fane of *Sani-isvara-bhagavan*, at the same place.

32. Dated in Sal. Sac. 1400. Inscription in the fane of *Sabha-nát'ka*, to which *numen* a string of titles, verging on the ludicrous, is attributed. Donation of a village, in free tenure, to the fane; by certain head-men, whose names are specified.

33. Inscription on the eastern porch at *Chittambaram*. Dated in Sal. Sac. 1503, in the time of *Vencatapati-rayer* of the race of *Hari-hara-rayer*. Gift by certain head-men of the revenues of a village to the fane, for the customary offerings and ceremonies.

34. Inscription on the third wall. Dated on the 14th day of the rule of *Raja-raja-devar*. Gifts of fruits, and other productions, at the appropriate seasons, for the use of the fane, from persons of the *Wiyalvar* tribe. *Calinga-rayen* is the first name, but several others are included among the donors.

35. Inscription on the great porch of the fane of *Narasimha-swami* at *Manar-koril*. Dated in *Cali Yuga* 4442, in the time of *Crishna-rayer*. The copy is imperfect, and what was given is not clear; but it seems to have been revenue arising from land.

36. On the third wall. Dated in the 10th year of *Sri-raja-raja-devar*. Gift by *Calinga-rayen*, and others, of grain arising from cultivation, for the service of the fane which contains the inscription.

37. Inscription dated in the 16th year of *Raja-raja-devar*. A gift of land by some head-men to the fane.

38. Gift of some money to purchase furniture, or utensils, for the fane in the reign of *Ku'o'tunga Cho'a*.

39. At *Chittambaram* in the time of *Crishna-rayer*, in Sal. Sac. 1436, *Mannapa-nayakar*, gave a large grant of land to furnish food for the *Brahmans* to plant a flower garden and to build a choultry or *serai*.

40. At the same place. Dated in the 5th year of *Kula-Sec'hara-devar*. Gift of money to supply all customary articles of food for *Brahmans*.

41 and 42. Donations by Vicrama Tribhavana-raja.

43. Dated in Sal. Sac. 1515. *Crishnapa Condapa* gave some lands to provide butter-oil for the fane.

44. At *Sri-rangha-nát'ha* fane, on the 2d wall. Dated in Sal. Sac. 1351. Gift of a village, for the service of the said image, by one named *Vijayapar.*

45. Same place. Gift of 300 *huns*, to *Uttama Nambi*, by *Vijaya-Bupati-rayer.*

46. Dated in 1393. Gift of some money by head-men of villages, in the time of *Raja-vipada.* Also a gift of proceeds from the sale of certain lands for the service of the fane.

47. Dated in 1343. Gift of some lands for the service of the fane.

48. Dated in Sal. Sac. 1580. *Muttira Raman* gave some land, the proceeds to supply food to the *Brahmans* in the four pillared-porch.

49. In the time of *Vira-pratapa-dever* Sal. Sac. 1400. Gift of some land, for festival processions.

50. Dated in Sal. Sac. 1433, in the time of *Crishna-rayer.* A merchant gave some land for the service of the fane.

51. Dated in Sal. Sac. 1446, in the time of *Crishna-rayer*: his general gave some land for the use of the attendants on the shrine.

52. Dated in Sal. Sac. 1590. Gift by *Mutta Raman* of money, and rice-grain, for the festival services.

53. Dated in Sal. Sac. 1445. Gift of land by *Appaiyan.*

54. Dated in the time of *Achyuta-rayer* in S. S. 1452. Gift of money by two or three persons, whose names are mentioned.

55. Dated in Sal. Sac. 1496, in the time of *Vera-pratapa-dever-maha-rayer.* Gift of a village, including wet and dry lands, the produce to supply food to the servants, or attendants, of the fane.

56. Gift of two villages by *Anna-muttamal*, a lady so named. No date of year.

57. Dated in S. S. 1459, in the time of *Achyuta-dever-rayer.* Gift by *Roma Pattar* of *Uriyur* village; for the celebration of festival processions.

58. Dated in Sal. Sac. 1602. Gift of some lands made over to managers of the fane; name of the donor does not appear.

59. Dated in Sal. Sac. 1473, in the reign of *Sada-Siva.* Gift of *Chola-nallur* village, and 109 pieces of money, to supply food for the fane.

60. Dated in the time of *Tribhuvana Chacraverti-Rajendra-Chola-dever*, 7th year of reign: gift of a flower garden to supply flowers for the image by *Narasingha-Nayak.*

61. Dated in Sal. Sac. 1596. Gift of money, for the service of t fane, by some head-men.

62. Dated in Sal. Sac. 1588. Gift of four hundred *huns* by an a nual impost on a village to supply butter-oil, for the lamps, and for f tivals.

63. Dated in Sal. Sac. 1591. Gift of two villages by *Alagiriyan* the fane.

64. Dated in Sal. Sac. 1593. Gift by *Basavapa-nayak* of some lan for the service of the idol.

65. Dated in Sal. Sac. 1613. Some regulations as to the order fir second, third, and so on, in which certain *Brahmans* were to put garlan on the idol, at the time of public processions.

66. Dated in Sal. Sac. 1588. Gift by sixty head-men, of land f the support of *Brahman* families, in an *agrahâram*.

67. Dated in Sal. Sac. 1596. *Choka-nat'ha-nayaker* gave a villag the proceeds to supply food to *Brahmans*.

68. An inscription commemorating the self immolation of a manag of the fane at *Sri-rangham* (near Trichinopoly) whose name was *A pana-ayengar*. In consequence of all supplies to the fane being wit held, in a bad time, he ascended the *Rayer-gopura* or lofty tower, a precipitated himself to the ground. The 24th of *Tai* of a cycle year on is mentioned. The precise time of this occurrence cannot be, from t document, ascertained. But possibly it is the incident related by M Orme; and by him ascribed to a somewhat different cause.

69. Dated in Sal. Sac. 1596. Gift of a village by *Chola-nât'h nayaker* of the line of *Visvanât'ha-nayaker*, for the supply of food, a for expenses of festival processions.

70. Dated in Sal. Sac. 1172, relative to the fane of *Chokesvara-sva* in the district of *Dharapur-tzeeadi*. Gift of a village; by whom do not appear.

71. In Coimbatore. Gift of six elephants, to what place is not sp cified.

72. Inscription dated in Sal. Sac. 1449. Gift of a village, by who does not appear. The gift is to a *Vaishnava* fane.

73. In *Dharapuram* district. Inscription, commemorating the gi of a village.

74. Dated in Sal. Sac. 1363, in the time of *Vallâlan-dever*. Gift of village, the reservoir to supply water for washing the image.

75. Dated in Sal. Sac. 1301. Gift of a certain portion of land; t proceeds to supply sacrifices and offerings.

76. Gift of a village, by two persons mentioned, to a fane of *Varada-raja.*

77. Inscription, publishing charitable grants at the *Vaishnava* fane of *Mascà*, in the hundred of *Ce unturai* in Coimbatore.

78. At *Dondesvara* fane, in the same district. A record of charitable donations.

79. Gift to Brahmans at *Satyavedamangalam* in the *Cali-yuga* year 4607½ (more probably Sal. Sac. 1607).

80. Dated in *Cali-yuga* 4432. What was given not legible.

81. Dated in the 3d year of *Vira-raja-devan:* the letters of the inscription could not be copied.

82. Dated in Cali-yuga 4632, in the government of *Pilla-rája;* gift of a village, to a fane.

83. Inscription at *Agastes-vara* fane in *Dharapuram.* Dated in *Cali-yuga* 4633, in the time of *Deva-maha-raja.* Gift of cows, and other cattle, by a trader.

84. Dated in Sal. Sac. 1621. Gift of 3 reservoirs, a grove, and fertile land, during the power of *Chitambara-nát'ha-Muthali.*

85. Dated in Sal. Sal. 1121. Gift of land.

86. Dated in Sal. Sac. 1313. Gift of a village, and of a house, for the maintenance of a daily rite of homage.

87. In the time of the *Vallála* king. Gift of a water reservoir.

88. Dated in the 5th year of *Vicrama Chola-dever.* Gift of a garden, well and cows, for the use of a fane.

89. Dated in *Tribhuvana Chacraverti's* reign. Gift of some coins, current at that time.

90. Gift of food for the servants or attendants of a fane by the headmen of a village.

91. A similar donation.

[It appears to me profitless, and uninteresting, to continue so minute a detail, the whole has been carefully examined; but in what follows that only which seems to be a little more special is given].

92. In the time of *Achyuta-rayer* Sal. Sac. 1200: a gift of land.

93. A tabular list of inscriptions; with the date; year of kings' reign; or other distinctive mark; which may be of use to refer to: the number is but small.

94. A paper referring to some modern affairs, in the wars of the south; the names of English officers occurring.

95. A few dates which refer to later periods of rule, than Sal. Sac. 1600.

REMARK.—The *materiel* of this book was observed to be in a rapidly perishing condition; and restoration by a copyist was necessary in order to ascertain the value of the contents. This may be judged of from what goes before. My own estimate would be but moderate; though there certainly are dates, and names, that are of use in confirming or correcting other written documents. The book itself will not long continue legible; but the restored copy can be referred to, should occasion so require.

(To be continued.)

VIII.—*Remarks upon Colonel* REID'S *"Attempt to develop the Law of Storms."**—By T. G. TAYLOR, ESQ. Astronomer to the Honourable East India Company.

The author commences by stating, that his attention was first directed to study the subject of storms, when employed at Barbadoes in rebuilding the Government offices which had been blown down in the hurricane of 1831; when "1477 persons lost their lives in the short space of seven hours." Pursuing the subject, Col. REID has collected from various sources, a large connected mass of information; from which it would appear—that the character and disposition of the larger gales of wind, or hurricanes, are not of that casual order that they have generally been supposed to be.

We may mention, that Col. REID has not exactly proposed a new theory, but in the end, has rather instituted an inquiry into—how far the whole of the facts relative to hurricanes (derived principally from the logs of different ships) may be explained *by a* theory.

Col. CAPPER, as far back as 1801, had mentioned in his history of storms upon the Coromandel Coast, that "it would not, perhaps, be a matter of great difficulty, to ascertain the situation of a ship in a whirlwind, by observing the strength and changes of the wind. If the changes are sudden, and the wind violent, in all probability the ship must be near the centre of the vortex of the whirlwind; whereas if the wind blows a great length of time from the same point, and the changes are gradual, it

* *An Attempt to develop the Law of Storms by means of facts, arranged according to place and time; and hence to point out a cause for the Variable Winds, with the view to practical use in Navigation. Illustrated by charts and wood cuts.—By Lieutenant-Colonel* REID, C. B. *(of the Royal Engineers), London*, 1838.

Fig. 1.

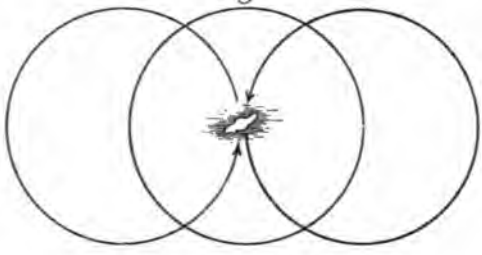


Fig. 3.

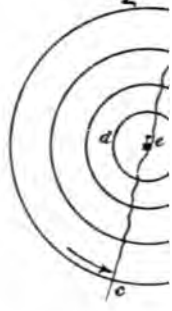


Fig. 2.

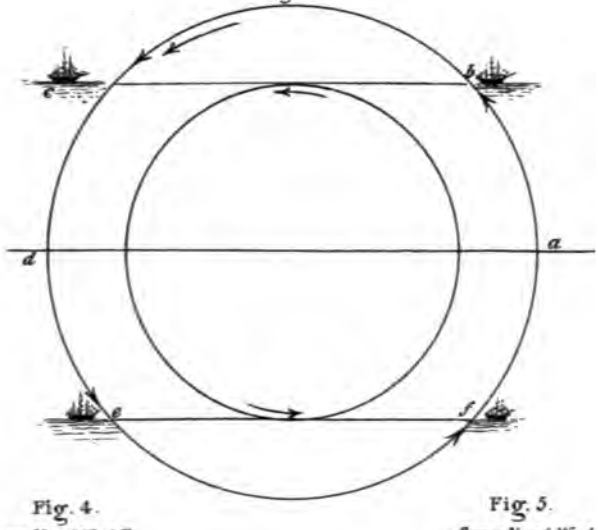


Fig. 4.

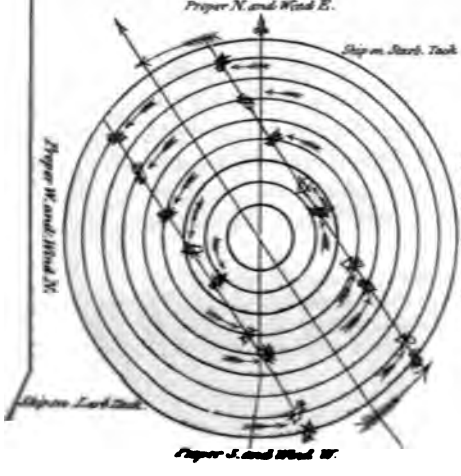
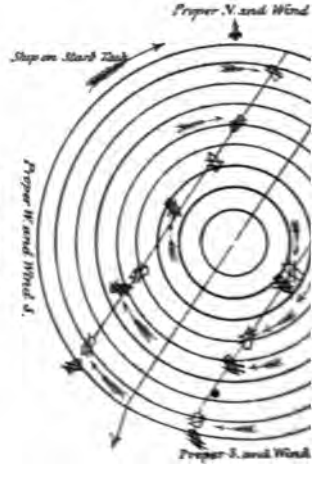


Fig. 5.



may be reasonably supposed the ship is near the extremity of it."* These views too had likewise been entertained by Mr. W. C. Redfield of New York, from a consideration of the storms occurring in the West Indies. On laying down on a chart the position of ships situated at various places within the ranges of several of these storms, Col. Reid found, that "*the more exactly this was done, the nearer appeared to be the approximation to the tracks of a progressive whirlwind.*"

To understand the effect of a progressive whirlwind, it is only necessary to inspect the figures 1, 2, and 3, Pl. 8. In figure 1, the Island, with reference to the circle to the right, would experience a *northerly* gale; and, supposing the storm—the whirlwind—to be travelling towards the left, or due west, the northerly gale would continue, until, by its progressive motion, the island were situated in the centre of the circle, when a calm might be expected; after which, the gale would assuredly set in from the directly opposite quarter (from *the south*); until, having arrived at the position occupied by the circle to the left, the storm would here cease.

If, instead of an island, we consider the case of a ship under sail, the circumstances might be considerably altered; for, were the ship's course the same as that pursued by the storm, it might, by keeping pace with the storm, continue for days within its influence; whereas, by an opposite course, it would in a comparatively short time be got rid of. If the ship were situated at *c*, as in fig. 2: supposing the direction of the whirlwind to follow the course *a b c d*, then, the wind at the commencement of the gale would set in from the N. E.; after which it would shift to the east, and terminate eventually at S. E.: but, were the ship situated in the lower portion of the circle (at *e*), then the wind would set in from the N. W., after which it would shift to the west, and eventually terminate at S. W. If, however, the whirlwind were to follow the direction *d c b a*; the direction of the wind, both at the commencement and end of the storm, would be different: for the upper position (*c*), the wind would in this case commence at S. W.—shift to the west, and terminate at N. W.; and for the lower position in the figure (*e*), the wind would commence at S. E.—shift to the east, and terminate at N. E.

Hence it became a matter of some importance, to learn—if whirlwinds in the southern hemisphere revolved in the same direction as did those in the northern. The investigation was difficult, from the few observations which could be met with in the southern hemisphere; but, on the whole, it appeared that there was no exception to the general rule, *that the whirlwinds in the northern hemisphere all revolved after the order N. W. S. E. (according to the order of the signs); whereas those in the*

* Reid, p. 2.

southern hemisphere all revolved in the opposite direction, or N. E. S. W. (contrary to the order of the signs).

If we could now discover, that the tracks of storms in various parts of the globe, followed fixed laws; for instance—that the tracks of storms on the Coromandel Coast travelled from east to west *always*,—that the Mauritius storms pursued a south westerly course; and that the storms peculiar to the West Indies originated from the east, and, recurving parallel to the coast of America, terminated in a westerly course;—cou'd we be sure that these laws were *always* observed by storms, we should be then in possession of facts, sufficient to enable us to sail in a direction at the commencement of a storm, so as to avoid encountering its worst effects. With regard to the rate of progression of storms, it appears that they are various; being, in some cases, as low as seven miles per hour; whilst others there are, whose velocity has reached forty or fifty miles per hour.

In Col. Reid's work, the tracks of nine storms which have occurred in the West Indies are laid down in a chart. In each of these the course of the several storms has been accurately traced to be from W. by N. to W. N. W., when encountered within the limits of 10—20 degrees of north latitude; after which, gradually curving towards the north, in the 30th degree of N. lat., its course becomes due north: from thence—apparently with perfect symmetry—the curves incline towards the east.

The East Indian gales appear invariably to travel from the coast of Arracan:* towards the west; the curves conforming gradually to the slope of the shore, until in about the latitude of Madras, when their course is due south: after which the curve bends again towards the west, the violence of the storm seldom extending below Cuddalore, or Porto Novo.

The Mauritius and Madagascar storms appear likewise to travel from the eastward at their commencement: but the point of recurving, from want of sufficient observation, does not appear yet to have been clearly made out.—We meet with the following description of the hurricane at the Mauritius in 1818.

"La salle de spectacle est un très-grand édifice. Sa forme est celle "d'un T dont la tête est un avant-corps considérable, puisque la partie "postérieure, formant la queue du T. a seule 53 pieds de largeur sur 82 de long. Si cet édifice eût été brisé par la tempête on aurait pu attribue

* The progress of the Madras storms has not yet been correctly ascertained:—the storm of 1836 appeared to come from the eastward direct, but the matter is very doubtful.

"cet événement á la manière dont il était construit; mais, ce qui est à-"peine croyable, cet immen-e arrière-corps de 34 pieds et surmonté d'un "comble en charpente, lié en outre avec l'avant-corps qui forme la "façade, a cependant chassé de près de cinq pieds sur son soubassement. "Quelle force prodigieuse que celle qui a pu produire, le déplacement "horizontal d'une telle masse! son renversement eut été un phéno-"mène ordinaire; sa translation, si l'on peut employer ce terme, ne se "conçoit pas."*

In the concluding chapter, we find as follows.

"It is a well known fact, that some parts of the globe are more subject "to storms than others; and I have throughout this investigation felt "impressed with the opinion, that the force and frequency of storms "may have some connexion with the law of magnetic intensity.

"The islands of Mauritius and St. Helena are nearly in the same de-"gree of south latitude; yet at St. Helena a gale was scarcely ever "known, and it is said to be entirely free from actual storms. Those "who study Major Sabine's report on the magnetic intensities of the "globe, and follow his isodynamic lines which express unity, will find "them opening from each other in the northern part of the south Atlan-"tic, and including a space which thus really appears to be the true "Pacific Ocean of the world. Within this space, on Major Sabine's "charts, will be found two other lines, marking intensities in decimal "parts less than unity; and he states that the intensity at St. Helena "as observed by Captain Fitz Roy, is 0, 84: the lowest denomination "recorded, and the locality of the weakest intensity yet observed on the "globe.

"When we examine the lines of the greatest intensity, we find them "'approaching each other in longitude 110° and 260°' (100° W.), but "in different latitudes; for the line of least intensity does not coincide "with the earth's equator. In the Chinese sea, in longitude 110° E., "it is to the north of the equator, proceeding thence in a direction south-"ward of St. Helena.

"Of the supposed four magnetic poles, the positions of the two in the "northern hemisphere are the best ascertained. The meridians which "run through these two poles, run also through the Chinese sea and "near the Caribbean sea, the localities of typhoons and hurricanes; and "Major Sabine's isodynamic lines indicate the magnetic intensities so "strongly marked there, that we are led to the belief that there must be "some connexion between the magnetic intensity and the force of "storm."†

* Reid, p. 141. *Ibid.* p. 415.

The above contains the spirit of pretty nearly all the subjects adverted to in Col. Reid's work. Among the rest, there are suggestions for registering the state of the barometer at the several light-houses at places on this side of the Cape, and for collecting information from the logs of ships which have encountered bad weather, &c. Account of water-spouts—whirlwinds, &c. In furtherance of these wishes I will here mention one objection—which, although not disproving the theory that storms arise from rotatory and progressive whirlwinds—still renders necessary some explanation beyond that of rotation and progression. In England, for several years I had been in the daily habit of noting the indications of the barometer, and on the occurrence of gales of wind, my attention was very particular. I have no memoranda by me at this moment to offer in evidence, but I may mention, that I had invariably noticed—*that the rate at which the barometer rose after gales had reached their climax, was always much more rapid than that it had observed in falling previously thereto;* and, on consulting the observations made at Madras and other places, the same circumstance I find *always* occurs. Thus, during the gale of wind at Madras in 1797, we have the following recorded observation :—

Date.	Barometer inches.	Hourly var.	Wind.	Remarks.
Oct. 25th at noon	30.005	.011	——	Gale of wind.
27th — 2 P. M.	29.465		——	Do. at height.
28th — 6 A. M.	29.819	.022	——	Do. had subsided.

In the gale of wind at Madras in October 1818 :—

Oct. 23d at 8 P. M.	29.80	.....	N.	Very high wind.
24th — 5 A. M.	29.50	.131	N.	A violent gale.
24th — 10½ A. M.	28.78		calm	An awful lull.
24th — 12 A. M.	29.28	.333	S.	Hurricane at 11 h.

In the gale of wind at Madras in May 1820 :—

Oct. 8th at 10 A. M.	29.750	.....	N.W.	Very strong wind.
8th — 8 P. M.	——	.....	N.W.	Strong gale.
9th — 6 A. M.	29.400	.....		Gale increasing.
9th — 12 A. M.	29.135	.106	W.	Ditto.
9th — 3 P. M.	28.816		——	Still stronger.
9th — 5 P. M.	28.670	.073	——	Continues.
9th — 9 P. M.	28.5*	.125	S W.	Gale at its height
10th — 6 A. M.	29.633		——	Moderate weath

* This is assumed with reference to the two previous observations, but it appears observation of the barometer was made at this moment.

In the gale of wind at Madras in October 1836:—

30th at 12 A. M.	29.707	.....	N.	Approaching a gale.
30th — 1 P. M.	.586	.....	N.	Brisk gale.
30th — 2 ——	.321	.....	N.	Do. do. [gale.
30th — 3 ——	.269	.....	N.	At times a violent
.... — 4 ——	.111	.....	N.	Very violent gale.
.... — 5 ——	28.891	.266	N.	Approaching to a
.... — 6 ——	.625			[hurricane.
.... — 7 ——	.285	.340	N.	Do. do.
.... — 7-45 m. —	.285	.550	N.	Approaching a calm.
.... — 8-30 m. —	.725		calm	From 7.15 to 7.45 an awful lull.
.... — 9 ——	29.027	.302	S.	A furious hurricane.
... — 10 ——	.258	.....	—	A strong gale.
.... — 11 ——	.415	.....	—	Very strong wind.

In Colonel Reid's book there are given several registeries of the barometer during storms, but these having been made on board of ships (which probably occupied different places at the different times of observations) are not available for our present purpose. There is, however, one hurricane (which occurred in March 1836 at the Mauritius), in which the barometer was not only registered on shore, but that too, with more than ordinary care:* thus—

Mean Time.	Barometer inches.	Hourly var.	Direction of wind.	Remarks.
March 6 at 6 A. M.	29.220	.050	from S. to E.	Strong and sudden gusts.
..... — 8 ——	.120	.137	E.N.E. to S.W. by W.	
..... — 10 ——	28.845	.150	Do. to Do.	
..... — 12 ——	28.545	.107	Do. to Do.	
..... — 2 P. M.	28.330	.037	N. E. to S. W.	
..... — 4 ——	28.255		S. by W. moderate.	
..... — 5½ ——	28.235	.....	.....calm.	
..... — 7 ——	28.275	.145		
..... — 8 ——	28.420			

Varying with the barometer, is likewise the intensity of the storm, as will be seen with reference to the above five cases, thus—

Storm observed at			Interval begin. and mid.	between the mid. and end.
			D. H.	D. H.
Madras	in	1797	..... 2. 2	..... 0.16
——	—	1818	..... 0. 5	..... 0. 2
——	—	1820	..... 1.11	..... 0. 9
——	—	1836	..... 0.10	..... 0. 4 or 5
Mauritius	—	1836	..... 0.22	..... 0.11 Doubtful.

* Reid p. 155.

Now the continued occurrence of phenomena of this nature, militates against the theory, "that storms are progressive whirlwinds," or rather —as I have observed before—leaves the theory incomplete: for, we should naturally expect from a whirlwind, that its sectional outline would be circular, and, that the time occupied between the commencement and middle, would correspond with that observed between the middle and termination, whereas we have just found them to stand in the proportion of 2¼ to 1. In other respects too, the theory adopted by Colonel Reid has not met with complete confirmation, as will be seen with reference to particulars observed in the Madras storm of 1836: it appears from the little information I was then able to obtain, that the centre of this storm passed over a ship (the Water Witch), at a distance of 780 miles to the eastward of Madras, at ¼ past 7 o'clock on the evening of the 29th October—just 24 hours before it reached Madras; exhibiting a velocity of progression of 32 miles per hour: hence, whatever may have been the rotatory velocity of any point such as *a* fig. 3 (call it x), it follows, that, at some place (*b*) to the northward of Madras, a hurricane of the velocity $x + 32$ miles per hour must have been experienced; whereas at a corresponding place (*c*) to the southward, a velocity $x - 32$ miles per hour only would have been experienced; or, since x represents the velocity which would be experienced at Madras, it would appear, that the gale must have been 64 miles per hour more rapid—stronger—to the northward of Madras than it was to the southward: whereas, from enquiries made at the time, it appeared that a trifling difference only was experienced. With this view of the subject, it will, perhaps, eventually be found necessary to admit, that the onward progression of storms is propagated by *undulations*, and not by an actual movement of the particles composing the whirlwind:—and, further, with reference to fig. 3—if the smaller circle *d e*, represent the space within which the air was quiescent, the theory would lead us to suppose that at *d* and *e* a similar strength of wind would be experienced; whereas, in the storm of 1826, as well as that of 1818, and indeed in every storm which has occurred at Madras, the wind experienced after the lull, is far more violent than that which preceded it.

In conclusion, I may say for myself, that I have been led to make these remarks, not with a view of finding fault with Colonel Reid's book or his theory, but with an earnest desire of forwarding, to the best of my abilities, what he has so ably commenced.

Madras Observatory:
1st June, 1839.

[We have been induced to make the three following extracts from Colonel REID's book, as a supplement to Mr. Taylor's paper; the first, from the local interest it possesses, as exhibiting the fact that the first observation leading to the new theory was made by a distinguished Madras Officer, from what passed before his eyes here on our own coast; the second, as describing a phenomenon calling for elucidation, which may probably be rendered by some of our readers in the Straits, or by those who voyage thither; and the third, because it explains the useful practical results, which, it is hoped, may spring from the new theory.

Colonel REID seems not to have been aware of the able meteorological observations made by Mr. GOLDINGHAM, late Astronomer of Madras, published in the *Appendix* to the 3d vol. of the *Transactions of the Royal Asiatic Society* and republished in this Journal, No. 12, p. 157.—EDITOR.]

Colonel Capper's Whirlwinds.—The late Colonel James Capper's opinion, that hurricanes are vast whirlwinds, was formed during twenty years' observation and study of the subject, on the coast of Coromandel. In the preface to his work, published in 1801, he says, that when he first attempted an investigation into the winds in India he had great doubts of success, from the number and variety of them: but as he proceeded, he found that there were many words to express the same thing, and that the hurricane, the typhoon, and the tornado, were but English, Greek, or Persian, and Italian or Spanish names, for a whirlwind.

In classing the winds, he observes, "the tempest is, both in cause and effect, the same as the hurricane or whirlwind; and that the storm, or what the Englishman calls a hard gale, is likewise nearly the same." He also states, that it is a long standing error that hurricanes in India occur only at the changes of the monsoons; and that Dr. Halley must have been misinformed on that subject.

There is this difference in the observations of Colonel Capper and Mr. Redfield, that the former seemed of opinion that all whirlwinds are local and temporary, whilst Mr. Redfield has clearly shown that they are progressive. It is not improbable, however, that some storms are local, and end nearly at the same place where they began.

The accounts of those storms, quoted by Colonel Capper, extracted from Orme's History, all occurred on the coast of Coromandel: but the reports given of the winds, though they show that these hurricanes were whirlwinds, are not sufficiently detailed to enable us to determine their tracks, and from what directions (if they were not local) they came.

The following are extracts from Colonel Capper's work on the winds and monsoons.

"During the siege of Pondicherry, at the time of the N. E. monsoon and on the 30th of December, 1760, the weather was fine in the evening; but a heavy swell rolled on the shore from the south-east. The next morning the sky was of a dusky hue, accompanied by a closeness of the air; but without that wild irregularity which prognosticates a hurricane. Towards the evening, however, the wind freshened from the *north-west*, and at 8 at night increased considerably. About midnight the wind veered round to the *north-east*; fell calm, with a thick haze; and, in a few minutes, flew round to the *south-east*, whence it blew with great violence. Almost all the ships might have been saved, had they taken advantage of the wind blowing off the land: but the roaring of the wind and sea prevented the captains from hearing the signals for standing out to sea. The Newcastle and Protector were driven on shore, a few miles south of Pondicherry, and the crews were saved. The Norfolk, Admiral Stevens, returned next day; and on the 7th came in the Salisbury, from Trinco Trincomalee, south: and the Tiger from Madras, north: so that in these opposite directions, of east, north, and south, the violence of the storm had not been felt.*

"The next in succession was that of 1773: on the 20th of October that year, many days after the north-east monsoon had apparently commenced, the wind began to slacken, and the clouds in the evening appeared uncommonly red; particularly on the day preceding the storm. On the morning of the 21st, a strong wind blew off the land; and, in the course of a few hours, flew all round the compass. At this time the Norfolk, man of war, Admiral Cornish, with the America and Weymouth, and the Princess Charlotte, country ship of 400 tons, remained in Madras roads, with several other country vessels. The wind began to blow from the north-west, and continued from that quarter for three or four hours; of which time the men of war availed themselves to put to sea: but it then suddenly shifted to the *eastward*, and prevented most of the country ships from following their example. After having blown with incessant

* After this went to the Press, I obtained, from the Admiralty, copies of the log books of the Norfolk, the Salisbury, Tiger, York, and other ships of Admiral Stevens' squadron in 1780-1. The storm above alluded to began about N. N. W., and ended about S. S. E.

The Tiger, as well as the Salisbury, York, and Weymouth, were all to the *southward* of Pondicherry; and were, in different places, within the influence of this storm; apparently, showing that this storm came from the direction of the equator, as well as the others, although it must have moved a little southerly at Pondicherry, by the wind veering from N. N. W. to S. S. E.

violence for fourteen hours, and with almost equal strength from every point of the compass, it at length ceased; but literally left only wrecks behind.

"All the vessels at anchor were lost, and almost every person on board perished; but the men of war and Princess Charlotte returned into the roads on the 21th. The former had felt the gale very severely whilst near the coast; but without sustaining any material injury: the latter vessel likewise, from staying rather too long at anchor, had lost her fore and main masts, and was otherwise much damaged."

After accounts of other storms, Colonel Capper continues:—

"Ships which put to sea in due time, very soon get beyond the influence of the hurricane to the eastward; and it is very well known that they never extend far inland. All these circumstances, properly considered, clearly manifest the nature of these winds, or rather positively prove them to be whirlwinds, whose diameter cannot be more than 120 miles; and the vortex seems generally near Madras or Pulicat. Those which happen in the north-east monsoon, generally fall with most violence within a few leagues of this place, and never, I believe, reach south of Porto Novo.

"But at the commencement of the south-west monsoon, violent gales are sometimes felt on the east side of Ceylon, and the southern extremity of the coast."

After describing a hurricane, encountered in south latitude by the Britannia, Indiaman, on the 10th of March, 1770, and explaining that it did not extend above 30 leagues, since the Britannia fell in with two ships which were within this distance, Colonel Capper proceeds:—

"Thus then it appears, that these tempests or hurricanes are tornadoes or local whirlwinds, and are felt with at least equal violence on the sea coast and at some little distance out at sea. But there is a material difference in the situation of the sun when they appear at different places: on the coast of Coromandel, for example, they seldom happen, particularly to the northward, except when the sun is in the opposite hemisphere. On the Malabar coast they rage with most violence during the monsoon, whilst the sun is almost vertical. Near the island of Mauritius, they are felt in January, February, and March, which may be deemed their summer months; and in the West Indies, according to Mr. Edwards's 'History of Jamaica,' the hurricane season begins in August and ends in October."

In Colonel Capper's work, we find Franklin's explanation of what first led him to observe that the north-east storms of America came from

the south-west. It is in a letter to Mr. Alexander Small, dated the 12th of May, 1760, and is as follows:—

"About twenty years ago, we were to have an eclipse of the moon at Philadelphia, about 9 o'clock; I intended to have observed it, but was prevented by a north-east storm, which came on about 7, with thick clouds as usual, that quite obscured the whole hemisphere; yet when the post brought us the Boston newspaper, giving us an account of the same storm in those parts, I found the beginning of the eclipse had been well observed there, though Boston is north-east of Philadelphia about 400 miles. This puzzled me, because the storm began so soon with us as to prevent any observation; and, being a north-east storm, I imagined it must have begun rather sooner in places further to the north-eastward, than it did at Philadelphia; but I found that it did not begin with them until near 11 o'clock, so that they had a good observation of the eclipse. And upon compairing all the other accounts I received from the other colonies, of the time of the beginning of the same storm, and since that, of other storms of the same kind, I found the beginning to be always later the further noth-eastward."

Whilst introducing the above paragraph, Colonel Capper says, it affords us a proof that a current of air in America moved many hundred miles during a north-east storm, probably from the Gulf of Mexico to Boston. Thus, having stated his belief that hurricanes were whirlwinds, he was upon the point of showing also that they were progressive.*

Ripplings in the Straits of Malacca.—A disturbance of the surface of the sea of a different kind has been observed in the Straits of Malacca, which is not easily accounted for; and I shall here insert Horsburgh's description of it, in the hope that it may create inquiry and observation.

"In the entrance of Malacca Strait, near the Nicobar and Achen Islands, and betwixt them and Junkseylon, there are often very strong ripplings, particularly in the south-west monsoon; these are alarming to persons unacquainted with them, for the broken water makes a great noise when a ship is passing through the ripplings in the night. In most places, ripplings are thought to be produced by strong currents, but *here* they are frequently seen when there is no perceptible current. Although there is often no perceptible current experienced, so as to produce an error in the course and distance sailed, yet the surface of the water is impelled forward by some undiscovered cause. The rip-

* REID, pp. 363-7.

ılings are seen, in calm weather, approaching from a distance, and in he night their noise is heard a considerable time before they come ıear; they beat against the sides of a ship with great violence, and pass ın, the spray sometimes coming on deck; and a small boat could not ılways resist the turbulence of these remarkable ripplings."

Naval officers, who have often seen these ripplings, represent them ıs being met with out of soundings, and in other localities besides the Straits of Malacca. They are supposed to be circular in form, and of ′arious diameters, from a few hundred yards to a mile. The ripples are ɔbliterated by strong winds, which raise waves on the surface of the sea; ɔut they are distinguished from other undulations by a breeze, which ıas carried a ship two knots an hour with sky-sails set. If two ships n company meet these ripplings, they might, by heaving-to on opposite ıides of the disturbed portion of the sea, observe if there were any cir-ɔular current. If water-spouts are electrical phenomena, and if the Orontes was carried forward by such a cause, the same cause might ɣive motion to the sea in the manner described, and might agitate its surface.

The great height to which the salt water of the sea is sometimes car-ied up into the air, whether by the mere force of the wind driving it as pray, or by some lifting motion, as in the water-spouts, deserves atten-ion. That which follows is an extract from the April report from Barra ıight-house for the present year (1838), sent me by Mr. Robert Steven-ɔn, the engineer to the northern light-houses.

"On the 16th it rained spray and snow all day; so that for a week ′ter we had no fresh water on the island." And Mr. Stevenson added ıis note to the report:—"The top of the island, or base of the light-ouse, is 600 feet above the level of the sea."

It had blown a storm, and the height of the barometer was, according ɔ the same report, as follows:—

April, 1838.	Barometer.	Wind.
Saturday 14	9 A. M. 29.30	s. w. & w. breeze.
	9 P. M. 28 93	
Sunday 15	9 A. M. 28.80	N. W.
	9 P. M. 28.93	Ditto.
Monday 16	9 A. M. 28.94	Ditto.
	9 P. M. 28.96	Ditto.
Tuesday 17	A. M. 29.20	N. N. W.
	P. M. 29.34	North.

Rules for laying Ships to in Hurricanes.—That tack on which a ship should be laid-to in a hurricane, has hitherto been a problem to be solved; and is one which seamen have long considered important to have explained.

In these tempests, when a vessel is lying-to, and the wind veers by the ship's head, she is in danger of getting stern-way, even when no sail is set; for in a hurricane, the wind's force upon the masts and yards alone will produce this effect, should the wind veer a-head; and it is supposed that vessels have often foundered from this cause.

When the wind veers aft, as it is called, or by the stern, this danger is avoided; and a ship then *comes up* to the wind, instead of having to *break off* from it.

If great storms obey fixed laws, and the explanation given of them in this work be the true one, then the rule for laying a ship to, follows like the corollary to a problem already solved.

In order to define the two sides of a storm, that side will be here called the right-hand semicircle which is on the right of the storm's course, as we look in the direction in which it is moving; just as we speak of the right bank of a river.

The rule for laying a ship-to will be, when in the *right-hand* semicircle, to heave-to on the *starboard* tack; and when in the *left-hand* semicircle on the *larboard* tack, in both hemispheres.

Fig. 4, Plate 8, is intended to represent one of the West Indian hurricanes, moving towards the east-north-east, in the direction of the spear drawn obliquely. The commander of a ship can ascertain what part of a circular storm he is falling into, by observing how the wind begins to veer. Thus, in the figure, the ship which falls into the right-hand semicircle, would receive the wind at first about east by north; but it would soon veer to the east, as the storm passes onwards. The ship which falls into the left-hand semicircle, would at first receive the wind at north-east: but with this latter ship, instead of veering towards east, it would veer towards north.

The explanation of the rule will best be made out by attentively inspecting figures 4 and 5. In both, the black ships are on the proper tacks: the white ships being on the wrong ones.

Figure 5 is intended to represent one of those hurricanes in south latitude which pass near Mauritius proceeding to the south-westward. The whirlwind is supposed to be passing over the vessels in the

direction of the spear head. It will be seen that the black ships are always coming up, and the white ships always breaking off; and that they are on opposite tacks on opposite sides of the circles. Thus, the Astrea, commanded by the late Sir C. Schomberg, was on the proper tack on the 20th of March, 1811; and an inspection of the log of that ship shows how gradually she came up; but the Buccleuch, on the 22d of January, 1834, having had the wind from east-south-east, veering to south, and then to south-south-west, thereby proving her to be in the right-hand semicircle of a storm moving southerly, was in the wrong position when laid-to on the larboard tack. Had she been on the other tack, the wind in veering would have drawn aft; then, perhaps, she would not have lain so long "with her broadside in the trough of the sea, and with her lee-waist full of water."

If hurricanes were to move in the opposite course to that which they have hitherto been found to follow, then would the rule be reversed; for the white ships would come up, and the black ships break off.

It can require no comments to point out, that if the wind in storms follows a fixed law, much advantage may be gained by the knowledge of that law.

In following the tracks of storms here detailed, we find that the hurricane drawn on Chart VI. passed over the Island of Antigua in six hours. Yet the ship Judith and Esther, not far from that island, was twenty-four hours in the same storm; for that ship ran along with it; and many other instances of the same nature occur in this inquiry.

If one side of a storm be to a ship in her voyage a foul wind, the opposite side of the same storm would be a fair one. Thus, within the tropics in the Indian Ocean, the left-hand semicircle is a fair wind for ships in their voyages from India to the Cape of Good Hope, whilst the right-hand side will assist the voyages of outward bound ships: but there is this important difference, that in the first case ships would carry the fair wind with them; whereas in the other semicircle, owing to the ship sailing in the contrary direction to the progression of the gale, she would have the benefit of it during a short time only. Thus, if a hurricane coming from the eastward were passing over Mauritius, moving at the rate of ten miles an hour, and a ship sailing eastward were to fall into the side of the storm next the equator, the ship and storm would pass each other in half the time in which the hurricane would pass over the island, since they would be travelling at the same rates, but in opposite directions.

In the 12th edition of the 'American Coast Pilot,' will be found some practical rules, by Mr. Redfield, applicable to ships meeting storms in the North Atlantic, and all I have collected proves that these rules are correct. That a seaman may be able to apply them, however, requires that he should study the subject and understand the principle.

When storms recurve in either hemisphere, and cross the tracks of ships, the practical application of such knowledge as we have gained becomes more complicated. This will frequently happen to ships on their homeward voyage from India, and as they cross the meridians of the islands of Mauritius and Bourbon, about the 25th degree of south latitude. This may be a reason why the neighbourhood of these islands is so much dreaded; for the Mauritius hurricanes, instead of originating there, appear to come from the eastward.

If two ships, one in each hemisphere, were sailing west, and each met storms after they had recurved, the centres of both of which storms were also on the same parallels of latitude as the ships, the vessel in north latitude would meet the wind at south, and that in south latitude would meet the wind at north. Each ship would be most likely to avoid the storm by putting her head towards the equator: but they would be on opposite tacks. The ship in north latitude would be on the starboard tack, the ship in south latitude on the larboard. In both cases the wind would veer towards west, and both ships would come up until the storms passed by them, in their progress towards their proper poles; after which the wind might be variable.

The storm tracks here traced are far from sufficient in number to afford that knowledge of the winds, at which we are now capable of arriving. My object has been to prove, that the subject deserves the attention of abler men than myself, and that we have hitherto studied meteorology in far too confined a sphere. Since our own country is too limited for the comparisons required, nations should combine to study the atmospheric laws. The light-houses along the coasts of the civilized world might exchange their observations for this end. The great steam navigation companies might place their log-books where easy reference could be made to them; and, in the Pacific Ocean, many useful observations be made by the large body of Englishmen settled there as missionaries. A more perfect knowledge of the subject would improve international communication, which it is to be hoped for the benefit of mankind.*

* REID, pp. 423-31.

IX.—*Special Report on the Statistics of the Four Collectorates of Dukhun, under the British Government.*

(Concluded from our last.)

Irrigation.

Preliminary to speaking of agriculture, it is necessary to state that lands are watered artificially in two ways. First, by conducting streamlets from running rivers or brooks. Lands so watered are called Paat-sthul, from Paat, a channel, and Sthul, a field.* These streamlets do not always last through the hot season; and though this species of irrigation, while available, is infinitely less onerous and less expensive to the cultivator, affording also a more plentiful supply of water than the well watering and great returns; yet it is not so certain, and, on the whole, is less permanently efficient than well watering. The second method is by well watering. Lands so watered are called Moht Sthul, from Moht, the water-bucket, and Sthul, a field. There is a good deal of trouble attending this method, and it requires the continual expense of the support of two or four bullocks, the wear and tear of materials, and the keep of one man, who, however, can readily manage two buckets, and two pairs of bullocks: at the same time it requires also a boy in the garden or field to open and shut the different channels. This is the most common method of irrigation in the districts reported on. Usually only two bullocks are attached to each bucket; in some instances, however, where the wells are deep, four bullocks are attached to each bucket. The cattle pull down an inclined plane and discharge the water, and readily walk backwards up the plane to the highest part of it; on the bucket being refilled, they go down the plane again; the driver sings to them and rides down on the rope. The process is suspended for an hour or two during the middle of the day. A very considerable quantity of water is brought up by this method. The buckets in use vary little in size, and the wells, probably, range

* Literally "firm land."

from 25 to 45 feet deep: some experiments of mine, therefore, to ascertain the quantity of water brought up from a well 35 feet deep in a certain time, may be considered as an average of the efficiency of this method of irrigation. I found a moht (of six paahls) average a delivery of 198 wine bottles of water each time. The bottle contained 28 ounces of water, apothecaries' measure, consequently the bucket contained 5544 ounces wine measure, 231 quarts, or 57 gallons 3 quarts. There is a singular uniformity of time between the delivery of two buckets, seldom exceeding seventy seconds; a man and a pair of bullocks, therefore, in an hour deliver 2931 gallons of water; and, labouring seven hours a day, give 20,517 gallons wine measure; and the same man with two pairs of bullocks delivers 41,034 gallons of water; a quantity infinitely exceeding what Europeans usually believe to be drawn up by the simple means employed. At eight pounds troy to the gallon, the weight of water drawn up by one pair of bullocks in one day will be 164,136-lbs. troy; and by two pairs of bullocks, 328,272-lbs. troy. This account appears very considerable, but my experiments have been repeated with care; and, on the whole, the delivery of water may be rather underrated than overrated.

Near the village of Piroorgoot, I observed a simple method of watering a field. The bed of a nullah, or rivulet, with very low banks, had been dammed up; three pieces of wood, like a gin, were put over the water; a scoop was suspended by a rope to the apex of the gin, and a man scooped out the water into his field. The labour was great, and the supply of water small. This apparatus is called Dohl.

It would appear to be of considerable importance to encourage the making of wells, as the only means of increasing the very limited exports of the Dukhun.

Agriculture.

Some general observations will be necessary, as the crops and agricultural process in the Mawuls* differ materially from the crops and agricultural process in the Desh.† The principal crop of the Mawuls is that of the rains, and the most valuable of its produce is rice. The severe labour attending the preparation of the rice ground in the hot weather is great, and in the rains the cultivator has to trample up to his knees in water and mud ploughing the rice field, probably in a deluge of rain, but

* Hilly districts along the crest of the Ghâts.

† Flat country, eastward of the Mawuls.

with his head and back most securely protected by the Eerluh,* however much exposed the rest of his body may be. The transplantation is performed under similar exposure. The other monsoon grains of the Mawuls are the Sawa, Wuree, and Natchnee, and Karlee, or Kalee Teel† which is an oil plant of the only other monsoon product.

The labour attending the cultivation of these grains, in a very unfavourable climate, at the time they are grown, falls very severely on the people, but they are compensated for their labour and suffering by good returns of that valuable produce rice; and the returns of the other grains are great, and the crops seldom fail.

The Koonbees, or farmers of the Mawuls, also have an advantage which those of the Desh are not always assured of, i. e. the certainty of finding a market for one of their products, rice.

Dry Season Crop (Mawuls).—The dry crop of the Mawuls does not call for any mention in this place.

Dry Season Crop (Desh).—With respect to the Desh, the most valuable is the Rubbee, or *spring* crop‡. The agricultural processes in both crops is certainly defective, less owing to the ignorance of the cultivators, who are well aware of the advantage of a ploughing adapted to the character of the soil, of good manuring, complete weeding, rotations of crops and fallows; than to their necessities, which compel them to rack their land; they cannot generally afford to purchase a sufficiency of manure, they have not any stable-yards, and the dearth of fuel compels them to burn much of their cow-dung; and, with a singular fatuity and injurious caution, they sow half a dozen grains and pulses together in the same field, which necessarily impede the growth of each other, exhaust the soil, and give limited returns. The professed object is to assure, in the occasional uncertainty of the monsoons, some kind of return at least for their labours, which might have been wholly unproductive had one grain only been sown. In short they want to have half a dozen strings to their bow instead of one.

Wet Crop (Desh).—The grains so sown ripen in succession, and two of them remain on the ground between nine and ten months; that is to say, from the beginning of June to the end of February. In their management of the plough, the Koonbees do not want dexterity. Their cattle have all names, know their names, and are obedient to them; with four bullocks to a plough, the leaders are guided entirely by the

* Eerluh, or basket-work hood, covered with leaves and quite impervious to rain.

† Wet season crop (Mawuls).

‡ Consisting of wheats, gram, barley; Shaloo, (*Andropogon Saccharatum*); Dhal, (*Cytisus cajan*), oil-plants, &c.

ıd I have frequently seen quite a youth managing alone very
his plough and four bullocks.

e Desh, in manuring land, the cart called *Jang* or *Janj-eea*, is
ıt consists simply of the common cart with a quite flat basket tied
top of it, made by the Koonbees from the twigs of the Neer-
:e, (*Vitex trifolia,*) or of the twigs of the Tooree, (*cytisus cajan*).
ıanure generally consists of the sweepings of their houses, which,
›eing usually cow-dunged every day and daily swept, are not trifl-
ıd from the ashes also from their hearths.

›ps are carted to the *Kulleh*, or farm-yard, from the fields by the
a. This consists of an upper horizontal rude frame-work supported
thick axle-tree, and is removeable at pleasure. The wheels are of
l wood, small, placed under the frame-work, are not sufficiently far
't, and consequently subject the cart to upset, which is but too fre-
nt an occurrence. Wooden pegs and thongs keep the whole vehicle
ether, and there is no more iron about the cart than the tire round
wheels and the hollow cylinders within the naves. This vehicle,
ısidering the circumstances of the Koonbees, is expensive, costing
›m eighty to one hundred rupees, and it is only the most substantial
nong them who have carts. Having carted their grain, the Koonbees
:move it to the Kulleh, or farm-yard.

Farm-yard.—The grain is stacked round a spot in the open air in a
:orner of one of their fields. This spot is circular, and has been pre-
›ared by beating and cow-dunging: a pole, called *Tewrah*, is fixed in
the centre of it. In the reedy grains the heads are broken off by wo-
men, and strewed round the pole* to the depth of 5 or 6 inches. In the
ligneous pulses, the extreme twigs, bearing the legumes, are broken off
and strewed round the pole: and in the herbaceous leguminous pulses
and straw-culm grains, the whole plant is put on the floor: six, or eight,
or more bullocks (I saw sixteen at Munchur) are tied side by side, half
on one side of the pole and half on the other; they are muzzled and
driven round the pole, treading out the grain. This process usually oc-
cupies two men, and it is called the *Mullnee*. It is neither inefficient,
nor dilatory. It would appear to be of great antiquity, and widely
practised; in Deuteronomy, xxv. 4. we read, "Thou shalt not muzzle
the ox when he treadeth out the corn."

Winnowing.—We are now brought to the winnowing the grain. This
is done in the Kulleh; and when there are sufficient members in the
family of the farmer after the first treading, the process is carried on si-
multaneously with the Mullnee. The process is very simple, but cer-

* Tewrah.

tainly not very efficient, as it is dependent on the wind blowing. In case the wind blows very hard, the grain is blown away; and in case the wind is not strong enough, the husks fall with the grain. A man stands upon a tall three-legged form, called the *Wawhree*, and pours the grain taken up from the treading ground, out of the winnowing basket (*oopunwutee*). The full grain falls perpendicularly and is pretty free from husks, but the lighter grain falls obliquely, and is partially mixed with the husks. A man sits at the base of the stool or form with a broom (*aatuee*) in his hand to assist in removing the chaff from the edges of the mass of fallen grain. After all is done, however, it is requisite to pass a good proportion of the grain through the sieve (*Chalun*). After the grain is winnowed it is carried home and laid in store.

Preserving Grain.—There are various ways of preserving the grain. Where the soil is sufficiently dry, chambers are dug in the earth for it; but the most usual plan in the districts is to preserve it in large baskets, called Kuneeng, made of twigs of the Neergoondee, (*Vitex trifolia*,) or of those of the Tooree, (*Cytisus cajan*). These baskets are plastered with cow-dung inside and out, and are perfectly impervious to rain or damp. Where the habitations are sufficiently large, or the baskets few in number, they are lodged in the house, but not unfrequently are placed outside of the house within reach of any pilfering hand. A few stones are put under each basket; the lid, in case it has a lid, is sealed down with cow-dung, and in case it has not a lid, a plaster of cow-dung a couple of inches thick is put over the grain; a little cap, or roof of grass, is put over the basket, and it is left exposed till required, being deemed equally protected from the elements and man. In the Mawuls, in the hot months, the whole of the grain baskets of the village, full of grain, may be seen assembled in front of the village, temple, and left to the custody of the village god. The roofs of all the houses are of grass in the Mawuls, and the dread of fires (the people having no chimneys to their houses) induces them to put their monsoon and winter stores in a place of safety, the extreme dryness of the period rendering accidents by fire frequent. It is not an unfrequent practice with the Koonbees of the Mawuls to unroof their houses for the months of April and May.

In addition to the baskets for the preservation of grain, earthen jars, called *Kothee*, made by the people themselves, are met with to hold grain, but they are not common.

Preparing Grain for Food.—The preparation of grain for food is the last process. Husk grains, such as rice, Wuree, (*Panicum miliare*); and Sawa, (*Panicum frumentaceum*); and the Johr, or husked wheat, require to be pounded to remove the husks. This process is entirely

within the province of the women : the implements used mav b the pestle and mortar; the mortar is called the ookul, and the moosul. The mortar in the Mawuls is frequently very rude i being a rough stone with a hole scooped in the middle of it to the grain. In the Desh, however, the mortar is of wood, of a go and sometimes carved. The *moosul*, or pestle, is always of woo or five feet long, tipped with iron, and in thickness and weight to the strength of the person to use it. The final process is th ing the corn ; this also is the duty of the women, and two of t usually employed at the mill. Christ says, " There shall be two grinding at the mill ;* one shall be taken and the other left."

Hand Mill.—The mill is portable, and is called Jatuh : it co two flat circular stones, fourteen or eighteen inches in diameter, one on the other : the lower one has an upright peg in it, the up has a hole in the centre through which the peg of the lowe passes, and the upper stone is made to perform an horizontal motion round the peg by means of another upright peg near its The grain is put in at the hole in the centre. This form of mill very ancient, for I saw remains of such mills in the ruins of P and one nearly perfect in the ruins of the Roman villa of Sir W Hickes's estate near Cheltenham, Gloucestershire.

Raw Sugar Mill.—Under the head of agriculture it will be ne to speak of the Gool, or raw sugar-mill. Sugar cane is not so muc vated as it might be, and it is seldom found but at populous villa have seldom seen more than two mills at a village ; and as the and accompaniments are somewhat expensive for the circumstan cultivator, the mills are seldom found belonging to him, but he is of them for the term requisite. The mills are in the open air, a sist of two vertical screws which are sunk in a square chamber e ed in the earth ; one of them is moved by a double lever so much ed above the level of the field as to admit of bullocks being atta the ends of the lever. The cattle go round incessantly in a circ work the mill. The bits of sugar cane are passed twice betw screws, and the juice runs out into a wooden or copper vessel pl receive it. The fire-place (Choolangun) and great iron pan (Ku to boil the juice in, are close at hand ; a ladle to stir and skim the it boils, and some circular holes in the ground to receive the juic sufficiently thick, complete the material and close the process work is continued night and day till the cane-field is exhausted. is not refined in the Dukhun.

*Matth. xxiv. 41.

Oil Mills.—Although the oil mills belong to a class of persons who are not agriculturists, the Koonbee is quite dependent on them to turn his numerous oil seeds to account; some mention therefore of them is necessary under "agriculture." The body of the mill is generally of stone, and the machinery, even when of the rudest construction, shows a good deal of ingenuity and an acquaintance with some of the mechanic powers. It is entirely the work of the village carpenter.

At Neelsee, a Kohlee village in the wilds on the brink of the Ghâts, the body of the mill is of wood, the lever works in the hollow of an upright cylinder, and by the great weight attached to its upper end constantly presses against the sides of the hollow and forces the oil from the seed which is put into the mill. The whole expense of the machinery of this particular mill was only five rupees*. In the Desh the body of the mill is of stone, the machinery is the same as in this mill. It is worked by a bullock.

Average Size of Farms.—There are not any farms of large size under the management of a single farmer; the largest I recollect meeting with was about 200 acres, but in general they average very considerably less in size. In the Poona Collectorate the average size was 29 beegahs†, in Ahmednuggur 35 beegahs, in Dharwar $43\frac{4}{8}$ beegahs, and in Khandesh $23\frac{6}{8}$ beegahs. The average rent of a farm in Poona was less than 48 shillings per annum; in Ahmednuggur about 86 shillings; in Dharwar 64 shillings; and in Khandesh, where a good deal of the land cultivated is garden land, 74 shillings per annum. In Poona the average rent per beegah is within a fraction of two shillings; in Ahmednuggur about two shillings and six pence per beegah; in Dharwar not quite eighteen pence; and in Khandesh, where there is proportionably a good deal of garden land, it is somewhat more than three shillings a beegah. The average for the whole of the lands of Dukhun is two shillings and ninepence, one-eighth per *English acre*, or one rupee and fourteen reas per Dukhun beegah.

Proportion of Yoke Cattle to each Farmer.—Generally in the population returns there were great omissions of the draft or yoke cattle of the cultivators; no very satisfactory statement can therefore be given of their agricultural means in this kind of stock. In one Talook, or county of the Dharwar Collectorate, the yoke cattle were filled in, with the exception of two or three village returns, and the proportion is only 1·33 bullocks to each cultivator; but as the ploughs are 3733 in number in the Talook, at two bullocks to a plough, the proportion should be 2·89

* About ten shillings.

† The Dukhun beegah is three-fourths of an English acre. The rupee is valued at two shillings.

bullocks (nearly 3) to a cultivator: the returns must be defective, for I am satisfied, although a farmer may not have two bullocks to each of his ploughs, and he has generally a heavy plough and a light one, yet he has always two bullocks at least for one of his ploughs.

In the Ahmednuggur Collectorate the yoke cattle are not distinguished from the pack or carriage cattle, but the whole amount is very considerable, being 212,008. In the Poona Collectorate the returns give 2½ yoke bullocks to each farmer, but the farmers near to the city of Poona are much better off, averaging 3½ bullocks each. Only a portion of the returns from Khandesh had the column of draft or yoke cattle filled up; it is impossible, therefore, to give the proportion to each farmer for the whole collectorate; but as far as the returns went, it appeared that each farmer averaged only 1·62 bullocks, not quite 1¾.

Milch cattle.—The proportion of milch cattle, on which so much of the comfort of the people depends, whether rural or urban, in the Dharwar Collectorate, is greater than in the other collectorates, being one cow or milch buffalo to 2·45 souls. In Poona it is 1 to 5·24 persons: in Ahmednuggur 1 to 3·04 persons; and in Khandesh 1 cow or buffalo to 2·26 souls.

Ploughs.—As I have before stated, ploughs are of two kinds, the Nangur or heavy plough, and the Hulka Nangur or light plough; the same obtains with respect to drill ploughs, no grain being sown broadcast, the heavy drill plough being called Mogurh, and the light Pabhar. The proportion of ploughs in the Dharwar Collectorate is 1·41 to each cultivator, or nearly three ploughs to two farmers; the number of ploughs in the returns being 99,883, and the number of cultivators 70,488.

Carts.—Were a judgment to be formed of the state of the roads, and of the facility of communication and transit by wheel carriages, from the proportion of carts to the farmers, the estimate would be low indeed.* In the Dharwar Collectorate there is only one cart to thirteen farmers. The carts are universally of two wheels.

Pack Cattle.—The unusual number of pack bullocks, which carry loads on their backs, in the Dharwar Collectorate, would seem to indicate that they are the chief means by which agricultural and other produce is transported from place to place. In Khandesh there is the least number of pack cattle, and the greatest proportional number of carts. In Poona a great number of pack cattle, and only one cart to eleven farmers. The proportion in Ahmednuggur I do not know.

* It is nevertheless true, that had the farmers carts, they could rarely use them from the want of roads, unless in the dry season.

Land and other Tenures,

Lands are held under a great variety of tenures in Dukhun, some by virture of offices which are hereditary, some as hereditary freehold property, some in free gift from the state, some in Jagheer or military or feudal tenure, some on a quit rent, and in many other ways; but a rapid notice of the different tenures, and of the office-bearers holding lands, will best assist to give a clear idea of their quality and number.

In the first place, the proprietary right of the soil was (and is) in the people, and not in the sovereign. The sovereign could assess the land as he pleased, and assign away a part of the whole of the revenue arising from the land-tax or assessment, either in free gift (Eenam), military tenure (Jagheer), or quit rent, or in any other way; but he could not *justly* take away a man's land either for his own purposes or to give it to others; although, as a despotic prince, like all other princes of India, he had the undoubted *ability* to do so at his pleasure: yet few instances are known of this oppressive exercise of their power, and there are many instances on record of their purchasing land from their subjects. I have laid before the public translations of official documents, in which the sovereigns have been parties, containing the most irresistible proofs of the people having the uncontrolled right to dispose of their lands as they pleased, by gift, or sale, or devise, or in other ways. These translations are too lengthened to be introduced in this report, but they will be met with in the Journal of the Royal Asiatic Society of Great Britain and Ireland.

All lands in Dukhun were classed within some village boundary or other; and to this day these boundaries are guarded with such jealousy by the inhabitants as to be productive of broils and bloodshed on their slightest invasion. The village lands were divided into family estates, called Thuls, which bore the name of the family, and the estates bear the name to this day, although the family be extinct or Gutkool, as it is called; and half the estates in Dukhun are now Gutkool, but preserve their family names. These estates were hereditary and freehold, burthened only with the sovereign's land-tax, and assessments for village expenses, as a gentleman's estate in England is burthened with land-tax and assessments for highway and poor-rates, &c.; there were not any tithes, but in each village there were lands assigned for religious objects, either to temples or to sacerdotal persons. Every village had a constitution for its internal government; it consisted of the Pateel or chief, assisted by a Chowgulla; the Koolkurnee, or village accountant, kept the village records and details of assessment and revenue; and there

were twelve hereditary village officers, the well-known Bara Bullooteh, whose numbers were complete or otherwise as the population of the villages was capable of supporting them. All these officers and the chief land-owners formed a village council, called Pandreh, which managed the external and internal relations of the village, whether with respec tto raising the government assessments, managing its police, or in settling civil disputes, excepting in cases where Panchaeits or juries of five persons were specifically appointed to arbitrate by mutual consent of the litigating parties. And it is somewhat remarkable that this isolated and internal government has withstood the shocks of all the changes of dynasties, invasions, rebellions and the destructive anarchy which have so frequently disgraced the annals of India.

A certain number of villages constituted a Naikwuree, over which was an officer with the denomination of Naik. Eighty-four villages constituted a Deshmookee, over which was an officer called a Deshmook, or governor,* possibly equivalent to our lord-lieutenant of counties; this officer was assisted by a Desh Chowgulla; and for the branch of accounts there was a Deshpandeh or district accountant and register. The links connecting the Deshmooks with the prince were Sur-Deshmooks, or heads of the Deshmooks; they were few in number. It is said there were also Sur-Deshpandehs. The Sur-Deshmooks, Deshmooks, and their assistants, Naiks, Pateels, and Chowgullahs, indeed all persons in authority, were Mahrattas; the writers and accountants were mostly Brahmans. Such was the state of things under the ancient Hindoo governments. The Moosulmans on their conquest, in the civil divisions of the country, introduced the terms of Soobeh (a province), Pergunnah (county), Tallook (manor, lordship), and Turruff (a division of a county). The Hindoo hereditary officers were deprived of their authority, (excepting those in the village constitution,) but, very liberally, they were not deprived of their tenures; and their places were supplied by Zemindars,† Maamlutdars, Sheristehdars, Havildars, &c.

I have stated that the family estates were called Thuls, from the Sanscrit *Sthul*, "firm land;" and in case the family became extinct or Gutkool, from the Sanscrit *Gut*, "gone, passed away," and *Kool*, "a race or family," the property did not pass to the sovereign, but it was at the

* Called also Desaee or Deshaee in some parts.

† Mistakes, very serious in their consequences, have been made with respect to the supposed rights of Zemindars. They were introduced by the Moosulmans, superceding the ancient Hindoo Deshmooks and Desaees, and were government officers for the collection of the revenue, and for the civil government of districts. In Bengal, the British considered them proprietors of the soil, and constituted them as great freeholders; sweeping away the village freeholds.

disposal of the Pateel solely, or the village corporation conjointly, to do as they pleased with it; and I have multiplied proofs in my possession of freeholds having been created in such estates of extinct families, by letters of inheritance, called Meeras Putra, which were granted by the Pateel or village authorities for a sum of money; and such letters became title-deeds, similar to those of an estate in England. The law of succession by primogeniture not obtaining amongst the Hindoos, these estates became necessarily much divided, and the individual holders were called by the Hindoos Thulwaee or Thulkuree; and the light in which the Moosulmans looked upon such proprietors, when they took possession of the country, is sufficiently manifest by the term they applied to them, namely, Meerasdars, or patrimony-holders, from the Arabic word *Meeras*, "patrimony," "heritage," and *Dar*, "a holder;" and this is the term by which such proprietors are distinguished at the present day. The Meerasdars were of two kinds; the descendants of the original proprietor, whose *surnames* and the name of the estate or thul were identical, and those who had obtained a share of the estate by purchase or otherwise, whose surnames were not the same as that of the estate. In no instance, that I am aware of, have the former class documentary proofs of their right; with the latter class documentary proofs are not uncommon.

There is further proof of the Moosulmans having acknowledged hereditary rights in the term they applied to the Deshmooks, Desaees, Deshpandehs, and others, namely, Hukdar, *Huk*, in Arabic, meaning "right," and *Dar* "a holder;" these persons in virtue of their offices having lands in tenure and fees in money and kind in the districts in which these duties lay. The Meerasdars considered that they might be temporarily dispossessed of their freeholds in case of non-payment of the government assessments and dues, but they claimed to resume them whenever they had liquidated their debts; and they did not consider the question of these freeholds compromised by the government doing justice to itself, any more than the existence of freehold property would be questioned in England because the owner might be compelled to yield up his property in payment of arrears of land-tax, poor-rates, &c.

Meerasdars.—Meerasdars set a very high value upon their lands, and they clung to them with that feeling of personal and family pride which are characteristics of freeholders in Europe; even under the most grinding oppressions of their own government and its local officers, it was only when driven to despair that they abandoned them. The Meerasdar had to pay the government land-tax, all fees in kind to the district and village officers in common with the tenant at will or leaseholder; more-

over, he had to pay a tax applicable to himself only, called Meerasputtee, a kind of smart-money for the distinction his freehold gave him; this was levied every third year. Such was the Meeras tenure of land. His advantages were, first, the distinction; next, his being a constituent of the Paudreh, or village corporation, which the mere renter was not; and thirdly, in some parts of the country where such taxation existed, he was exempt from marriage fees, widows' marriage fees, buffalo tax, hearth tax, and he may have paid a diminished per centage, in the rights of district officers levied in kind. Of late years, from the low prices of agricultural produce and the comparatively heavy money assessments, Meeras-land has scarcely had a saleable value. The terms Meerasdar and Wuttundar have usually been considered identical, but in some village papers I observed them classed separately; and, on asking for an explanation, was told that the Wuttundars were hereditary office-bearers, or the relations of hereditary office-bearers with the possible right of succession, whilst the Meerasdars were merely hereditary land-holders; a Wuttundar would necessarily be a Meerasdar, but a Meerasdar was not necessarily a Wuttundar.

Oopuree.—From the extinction of numerous Mahratta families who were in possession of estates, a considerable portion of the land in Dukhun is without proprietors, and much of it is rented to Oopurees or annual tenants by the Pateel or village corporation, under native governments; but, under the British government, by the collector or his officers. The term Oopuree means "a stranger," or a renter of land in a village in which he has not corporate rights: of course, Meerasdars can let their lands to each other, but they do not become Oopurees. The Oopuree holds his lands on the Ooktee, or word-of-mouth tenure, which is a verbal agreement for one year.

Kowl Istawa—The third tenure is that of Kowl Istawa; *Kowl* means a contract, and *Istawa* is applied to lands let under their value. In practice, to induce cultivators to break up land that has long lain waste, a lease is given of three, five, seven, or nine years; the first year a trifling rent is fixed, and it is annually increased, until in the last year of the lease the full rent is paid; this tenure is highly desired, and great abuses exist under it: the permanently assessed cultivator is prompted to quit his village, and abandon even his hereditary lands, and get Kowl Istawa lands in another village; and the moment the favourable lease is up he changes his location, and endeavours to obtain similar terms elsewhere: the practice, therefore, is detrimental to the permanent revenue, detrimental to the sound advancement of agriculture, and detrimental to the cultivator himself in encouraging vagrant habits. The local authorities also are found to be great occupiers of Kowl Istawa lands.

Owand tenure.—Any inhabitants of a village, cultivating lands in a neighbouring village, but not residing in that village, do so on the Owand tenure. The rate and terms are the Ooktee, and with respect to the village such cultivator is, in fact, an Oopuree, but his distinctive appellation is Owand-Kuree.

The above are the tenures on which the government land revenue is raised, which in the four collectorates of Dukhun amounts to 82·372 per cent. of the whole revenue; this per centage, however, includes some trifling rents from government lands, gardens, orchards, grass lands, and sheep grazing, quit rents, fees, Hukdars, and extra cesses.

Tenures involving alienations of lands.—I have now to speak of tenures which involve alienations of lands, from a few beegahs in a village, to whole districts: these are *Jagheer* and *Eenam* in Khandesh; *Surinjam*, *Eenam*, and *Doomalla* in the Ahmednuggur Collectorate; *Eenam*, *Surinjam*, and *Eesaphut* in Poona; and in Dharwar, *Jooree Eenam*, *Surwa Eenam*, and *Jagheer*: at least, such terms appeared in the population returns sent to me, and in the public papers which I have.

Jagheer.—Jagheer, which is a Persian word in its orign, is applied to lands given by government (or the government share of the rents) for personal support, or as a fief for the maintenance of troops for the service of the state: some service is implied in the personal as well as in the military Jagheer. In the Collectorates in Dukhun upwards of 400 populated villages appear to be alienated in Jagheer.

Eenam.—Eenam is a word of Arabic origin, meaning a "gift," "present;" and lands so held should be entirely free from tax to government; but a subsequent explanation of various tenures will show that Eenam has a much wider signification than is generally supposed. This tenure is very extensive in Dukhun; for independently of the grants of whole towns and villages to individuals, of which there are 231 alienated in the Poona collectorate alone, and the other collectorates have a proportional share; independently also of grants for temples and religious institutions, almost every village has Eenam land held by the Pateel, Koolkurnee, and Mahrs, and very commonly the Deshmooks and Deshpandehs have also land rent free appertaining to their offices in the villages of their districts. The Bara Bullooteh, or twelve village artizans and officers, have often Eenam lands, but their Eenam is qualified by the imposition of some professional service, and it pays also a quit rent. Many of the Eenams are very curious in their objects; for instance, at the village of Wangee, Pergunnah Wangee, Poona collectorate, 15 beegahs of land to a mendicant for reading stories before the goddess Dawai at her festival; 15 beegahs to the tabor players at the temple;

30 beegahs to the tumbling and dancing women at the the clarionet and double-drum players had respectivel Eenams; the gardener, for the supply of flowers, had 30 b 22½ acres. These Eenams existed untouched under the bigo sulman government, and still remain.

Surinjam.—Lands held in Surinjam involve the condition service: the term is of Persian origin, meaning "furniture," tus," implying that the lands are to defray the expense of ec in fact, Surinjam is synonymous with military Jagheer. In Collectorate 181 villages appear to be alienated in Surinjam.

Doomalla.—Doomalla, in the etymology of the word, mea rights" or "properties," from *Do* two, and *Maal* property: t only found in the list of villages of the Ahmednuggur Collect plied to villages and lands granted to individuals, on which g has a reserved right. In this sense the tenure appears to be th rent, and the term is synonymous with the Jooree Eenam of t war Collectorate. In the Ahmednuggur Collectorate 581½ vi pear as Doomalla, but this, no doubt, includes Jagheer and E lages.

Eesaphut.—In the Poona Collectorate the term Eesaphut is a 37½ villages: it is probably a corruption from the Arabic *Zeaph* ing "feast," "entertainment." Lands so held are rent free, have been given to assist in celebrating festivals.

In the Dharwar Collectorate the terms Jooree Eenam, Surw and Jagheer occur: the first corresponds to the Doomalla of nuggur, and is, in fact, a quit rent tenure; the second means " from *Surwa* "all," and *Eenam* "gift," there not being any upon these lands: Jagheer has been explained before.

Tenure of Deshmook and Desaee.—It is a general belief that ficers were coeval with the establishment of the land institutio Mahratta people.* Deshmooks were the civil governors of dist lectors of the revenue, and executive officers of the gov The name is probably a corruption of the Sanscrit *Deshuk*, a or ruler. In early times they were exclusively Mahrat not Brahmans or Moosulmans. The importance of the offi tested by the fact that, in the earliest mention of the chiefs of th great Mahratta families, they are styled *Deshmooks* of such districts. Their rights were hereditary, and saleable, wholly o like those of every other hereditary office or right: the right of s

* I mean, of course, long antecedent to the Moosulman invasion.

is proved by different casts being now associated in the office. At Ahmednuggur a *third* of the Deshmookee belongs to a Brahman, and *two-thirds* to the ruling Mahratta family at Nagpoor. Similar instances are very numerous. In some cases a Deshmook is also Pateel of one of the villages in his district. The rights and emoluments of the Deshmook are very extensive, but not uniform throughout the country; they had a per centage on the revenue varying from one to five per cent. In the Poona Collectorate the mean charge for Deshmooks and Deshpandehs amounted to 3·06 per cent. of the *gross revenue*, but on the *nett revenue* it amounted as nearly as possible to six per cent; although these persons are now *non-efficient*, their authority being superseded. As a single illustrative instance, it may be as well to state, that at the village of Ankoolsur, Talook Ahmednuggur, out of a village revenue of 4533 rupees, the Deshmook received 265 rupees, and the Deshpandeh 150 rupees; the former sharing 5·84 per cent., and the latter 3·31 per cent. Their next advantage is in some of them enjoying villages in free gift; the third, in possessing Eenam land in most of the villages in their districts, sometimes to a large amount. At Mohol Talook Mohol, the two sharers in the office of Deshmook have each 450 acres of free (or Eenam) land. The fourth right of the Deshmook is a portion of grain from each village, called *Googree*, from all the land under cultivation. In addition to the above, from some villages they were entitled to a sheep and some butter annually; from some villages a dress, from others a turband, and where sugar-cane was cultivated, they had a portion of the raw sugar. They possessed the above advantages on the tenure of executing the duties previously stated. They were to a district what a Pateel is to a village.

Deshpandehs.—The Deshpandehs are contemporary in their institution with the Deshmooks; they were the writers, accountants, and registers of districts; they were always Brahmans. The terms appear to be derived from the Sanscrit *Desh*, country, and *Punnah*, to do business. They were to districts what Koolkurnees were to a village: they had, and have nearly the same rights and emoluments as the Deshmooks, but in a diminished ratio of from 25 to 50 per cent. The offices of Deshpandeh and Koolkurnee are sometimes found united. Their duties are in abeyance, but, like the Deshmooks, they enjoy their rights.

Pateel.—The next and the most important tenure of all is that of Pateel or headman of towns and villages. Pateel is a Mahratta term, and may be derived from the Sanscrit *Puttruh*, "deed," "lease," the Pateel anciently having had the disposal of all vacant lands in his vil-

lage by deed or lease. Originally the Pateels were Mahrattas, but sale, gift, or other causes have now associated in the office various casts, and there are sometimes six or seven or more sharers in the office,—Brahmans, Mahrattas, Moosulmans, Shepherds, Lingaeets, &c., and these not holding in equal proportions. I have elsewhere* given a translation of a very remarkable and curious Mahratta document, proving in the most distinct manner the right of the Pateel, not only to sell his family, or hereditary property, and the lands he held in virtue of his office, but also the lands of extinct families, and his other emoluments and advantages; but, in doing so, he also alienated part of his dignity, rights, and authority as Pateel: the honours went with the lands. The rights and emoluments of the Pateel are very numerous; free land, fees of grain on the cultivation, called googree, presents on investitures, on granting letters of inheritance, on marriages; annual presents from the shoemaker of shoes, from the potmaker of pots, from the shopkeepers of cocoa-nuts, &c, market fees, *all the sheeps-heads offered in the temple of Duwai!* daily service, and supply of wood and water by the Mahr and the potmaker; precedence in all religious or other festivals, in communicating with government, and with others. The details of the translation before noticed show with what jealousy the Pateel maintained all the minutest rights and dignities. Of such importance and so profitable was the office, or in such estimation was the dignity of Pateel anciently, that princes of the Mahratta empire established themselves wholly or in part in the office in various towns and villages; *Holkur*, for instance, at Munchur; *Seendeh (Sindiah)*† at Jamgaon; the Nagpoor *Bhosleh* at Ahmednuggur, and *Powar* of Dhar at Multun and Kuweeteh. There are traditional accounts of a share of the Pateel's office having been sold for 7000 rupees.

The right of the Pateel to dispose of the village lands not occupied by hereditary proprietors, together with his responsibility for the government revenue, involves the proof that the government assessment was anciently Mozehwar, or by the whole village, and not by direct agreement between the government agents and individual farmers. The village, in fact, was assessed at a certain fixed sum, which was called the *Tunkha*, which means an assignment; and this Tunkha appears in village accounts to this day, although no longer a standard of assessment, as the

* Journal of the Royal Asiatic Society.

† This prince has six out of seven shares in the office; nevertheless the poor Mahratta who has the seventh share has precedence of the prince.

tish government settles directly with the farmer, and has also abro-
ed the right of the Pateel and the village corporation to dispose of
ste lands; in alienated villages, however, these rights remain. Al-
ugh the translation before noticed gives a minute detail of the rights
l emoluments of the Pateels of Kuweetch, it is to be understood they
not uniform either in number or value throughout the country. An
a of the value of the Googree, or right to a share in the grain-produce
cultivated lands, may be formed from the fact, that at Kurjut, Ahmed-
ggur collectorate, in 1827, there were 8491 beegahs of land under
tivation, and the Pateel was entitled to 128 seers for every 120 bee-
is; he received therefore, 9057 seers of grain, a sufficiency for the
ual support of 25 persons.

The duties of the Pateel were, to be responsible for the revenue of the
age, to superintend its police, and regulate its internal economy. He
l power to seize, imprison, and fine offenders.

With regard to joint proprietary in the office, independently of shares
ng held by different casts and families, the Hindoo law of inheritence,
ich gives equal shares of all property to all children, necessarily made
ny joint owners in a family; but as the executive duties are only
formed by the head of the family, this person is called *Mokuddum*,
hief" or "leader;" and the term of course is applicable to the head
each proprietary family, who is designated in the village papers as half
kuddum, quarter Mokuddum, or seventh Mokuddum, according to the
ire of the Pateelship held by the family.

Koolkurnee.—The next village tenure is that of Koolkurnee, from the
nscrit *Kool* "to count," and *Kroot* "to do," "make;" literally an
ountant. The office is of very great importance, for the Koolkurnee
not only the accountant of the government revenue, but he keeps the
vate accounts for each individual in the village, and is the general
anuensis; few of the cultivators, the Pateels frequently inclusive, be-
able to write or cypher for themselves. In no instance have I found
office held by any other cast than the Brahmanical. The office is
metimes united with that of Deshpandeh, and not unfrequently to that
Johesee or village astrologer. The Koolkurnee, like the Pateel, has
nam land, sometimes salary, fees of grain, and miscellaneous rights of
ter, raw sugar, &c., rarely having equal rights, either in number or
ue, with the Pateel, but commonly averaging from 25 to 75 per cent.
ow. Where the villages are very small, there is only one Koolkurnee
several villages, as in the case of Turruff Muhr Khor, Poona collec-
ate, where the duties of this individual extend to one small town and

eleven villages. He is here paid by a money rate for every 30 beegahs of land under cultivation ; it varies from 1 rupee the 30 beegahs to 3 rupees.

Unlike the Deshmooks and Pateels, no instance came to my knowledge of shares of the office being alienated from the family ; the numerous sharers being all connected by ties of blood, who each in turn take their annual duties ; and these sharers are sometimes so numerous, that at one town the execution of the duties only came to the same individual after a lapse of 20 years. The executive duties should be confined to the same person.

Mahrs Tenure.—A very important tenure in villages is that of the low-cast people, called *Mahr* by the Mahrattas, and *Dher* by the Moosulmans. They have Eenam lands in all villages, divided into *Hurkee* and *Arowlah* ; the former is rent free, and generally bears a small proportion to the latter, which pays a low quit rent. The Mahrs conceive that they have the right to mortgage or otherwise dispose of lands held for the performance of specific duties to the village and the government, and numerous instances of mortgage came to my knowledge ; but whether they can wholly alienate their lands or not, they *cannot* absolve themselves and their descendants from their duties : these are to cut wood and grass for government officers and travellers, to act as guides, as porters to carry baggage from village to village, and to go as messengers ; they have to attend strangers and see to their wants being supplied, and if the strangers be of consequence, they or the Ramooses have to look to the safety of their baggage at night. They are the guardians of all village land-marks ; they are the Pateel's messengers, (something like parish beadles,) and it is their duty to carry the collections to the treasurer of the district ; they have to pass on all news or information received, whether written or verbal, whether by sign or by token, to all the surrounding villages, and it is perfectly astonishing the rapidity with which intelligence is diffused by their means. It is no uncommon thing for a distant public event to be whispered about in towns before any account of it has been received by the government post. Occasionally the answer to my inquiries respecting the duties of the Mahrs was, that they were to do every thing they were ordered, whether by the Pateel, the village corporation, or by the government. There are many families of them in every village : in some villages they have to pay a tax to government called *Rabta Mahr*, and this is in lieu of personal service in cutting wood and grass for the officers of government, but it does not absolve them from their other

duties. So strictly is it their province to cut wood and grass, that their signature to all village or public documents is a sickle or hatchet to cut grass and wood, and a rope to tie them up. In addition to their Eenam lands, the Mahrs, in virtue of their office as one of the Bara Bullooteh or twelve village officers, craftsmen, and professions, receive fees in kind from all the cultivators; the fee in kind is a per centage upon the produce, but it is not uniform in amount throughout the Dukhun. These twelve village officers are divided into three classes, according to the supposed importance of their services to the village; the first class in some villages received 50, the second 20, and the third 10 or 15 bundles or sheaves of Joaree, (*Anthropogon sorghum*,) stalk and grain included upon every 1000 cut down; and the same proportion of other grains. Many farmers in various parts of the country assured me that they put by 25 per cent. of their produce for the village craftsmen and professions; and as the Mahrs from their usefulness share in all those classes, their returns must be considerable; the individual benefit depending of course upon the magnitude of the body constituting this class of persons in the village. As low casts do not cultivate their Eenam lands, they derive less advantage from them than other Eenamdars, but make the best terms they can with the Koonbees to cultivate their lands for them. The Mahr does not pay any tax to government upon his Bullooteh. In the whole of the duties of the Mahrs, whether for government, the village, or individuals, they are not bound to go beyond the village next to their own: here they hand over their charge and return.*

Bara Bullooth Tenure.—The twelve craftsmen or professions which were originally in every village were, the *Sootar* (Carpenter), *Chambar* (Shoemaker), *Lohar* (Ironsmith), and *Mahr*; these constituted the Torlee Khas or first class. In the Mudlee Khas, or second class, were the *Pureet* (Washerman), *Koombar* (Pot-maker), *Nahwee* (Barber), and *Maang* (Skinner and Rope-maker). And in the third or Dhaktee Khas, the *Kohlee* (Waterman), *Johesee* (Astrologer), *Gooruw* (cleaner of, and attendant at the temple), and the *Sonar* (Silversmith); and, since the Moosulman rule, the *Moolana* or Moosulman priest and schoolmaster has been added. These persons, in their several lines, and according to their several abilities, were to do for the cultivators individually and the village collectively whatever might be required from them; and they were paid by an an-

* In speaking of the duties of the Mahrs I ought to have used the past tense instead of the present in *some cases*, government having partly absolved them from duties, the performance of which is their tenure for holding their lands and fees.

nual per-centage in kind upon the produce of the farmer; and this was called their Bullooteh, whence the term Bara Bullooteh: the fee being called Bullooteh, and the receiver of it Bullooteh dar. Very rarely could I get either farmer of Bullooteh dar to state specifically what the one gave, and the other was entitled to receive; it depended very much upon the crops, and also upon the extent of services performed for each individual cultivator. These craftsmen have frequently small portions of Eenam lands, and part of their Bullooteh goes to government as a tax.

Shet Sundee Tenure.—Lands were given to a kind of militia in the districts in place of pay, for the performance of certain duties, principally in the protection of their villages: this tenure is called Shet Sundee from *Shet* "a field," and *Sunnud* "a grant;" constituting the holders, in fact, a landed militia. Although this tenure may have been general at one period, I only observed lands set apart as Shet Sundee in five Pergunnahs of the Poona collectorate, and I remarked it also at Kurmulla, Ahmednuggur collectorate.

Tenure of Chowgulla.—There are several other tenures, of which a brief notice only may be given. The Chowgulla is the Pateel's assistant; he is found in most villages; sometimes he has a trifling grant of land, but most commonly grain-fees from the landholders. This personage is called Buglah where the Kanree language is spoken.

In some Turruffs a Havildar is met with; the term is of Arabic origin, from *Hawala* "charge," "custody," and *Dar* "agent," "holder." This officer was introduced by the Moosulmans as a supervisor in the collection of the revenue of a certain number of villages. He replaced the Hindoo Naik, who is still met with in some of the hill districts. The Havildar was paid by half a seer of grain from each beegah under cultivation; and for the Hindoo officer the same is levied, under the name of Naikwaree. At Kanoor, Ahmednuggur collectorate, the Naikwaree is 12 seers of grain on every 30 beegahs under cultivation.

Tulwar.—In the southern villages bordering on the Kanree tracts, I met with the village or Turruff officer called Tulwar; but the term is unknown to the genuine Mahrattas. His duties assimilate him to the Havildar and Naik of more northern tracts.

Tenure of Ramooses.—Between the parallels of latitude 17° and 19° north, and longitude 73° 40′ and 75° E., there are few villages in Dukhun without their Ramooses. These vagabonds are thieves by birth and cast, which is abject; most of the villages have them in employ to guard the village from robbery. In some villages they have Eenam lands, but they are generally paid in fees of grain upon the cultivation.

There is a perfect community of interest amongst the fraternity, however dispersed; and as they are dissipated, idle, and reckless, they not unfrequently assemble in bands, take to the hills, and commit depredations in the country, and it is necessary to chase them back to their villages by means of the regular troops. They are expert sportsmen and good shots.

Bheels.—Where the Ramooses are wanting, their places are mostly supplied by the Bheels, or by the Kohlees; the former are low casts, the latter are Shoodrahs. Their duty is to afford protection to the villages, and they have either Eenam lands or fees in grain. In many parts of the country, particularly in Khandesh, the inhabitants of entire villages, and even districts, are Bheels, or Kohlees (Coolies).

Sheteh.—Sheteh is the person by common consent admitted to be the head and spokesman of the mercantile and trading classes, in places in the districts where they are in sufficient numbers to require one; and as combination is universal, he is of some importance in the districts as their organ in regulating prices. The *Sheteh* is assisted by the *Mahajun*, which properly means a banker; but, as the colleague of the Sheteh, he is an inferior personage in the districts: both these people, in some towns and villages, have trifling Eenam lands and claims for money and grain; but on what tenure of service to the community is not very apparent.

Sur Pateel, and Sur Deshmook, and Sur Desaee.—I should scarcely have introduced any mention of the Sur Pateel, and Sur Deshmook, and Sur Desaee, as it has not come to my notice that they hold lands in tenure, but their names frequently occur in village accounts as Hukdars,* or entitled to certain rights in money, grain-fees, &c. One of the Sur Pateelships is vested in the great family of Eshwunt Rao Dabareh, of Tullegaon; and one of the Sur Desaeeships in the ancient family called Chaskur. Captain Grant Duff, in his History of the Mahrattas, makes mention of several Sur Deshmooks, and says, that Arungzebe allowed the old Sur Deshmooks 2 per cent. on the revenue. But the Sur Deshmookee of modern times which appears in all village accounts, was 10 per cent. of the Moghul revenue, exacted by Sewajee from the Moosulmans; it was levied over and above the land tax. The sufferers, therefore, by Mahratta violence were the Mahratta cultivators; and on the whole of the possessions of the Moosulmans coming into the hands of a Mahratta government, the Sur Deshmookee should have been abandon-

* *Huk* "a right," and *dar* "a holder."

ed, but it remains to this day ; for instance, at Jehoor, near Ahmednuggur, the Tunkha, or government revenue or *assignment*, from the town was 10,817 rupees, 2 qr., 3 reas; the Sur Deshmookee 1350 rupees, 3qr., 3 reas ; but the Kumal, or total sum raised from the cultivators, including village expenses and Hukdars, was 19,303 rupees, 3 qr., 1 reas : so that the Moosulmans originally took little more than half of the revenue now raised from the town, that is to say, the Moosulmans took 10,817 rupees: then came Sewajee, the Mahratta, and wrenched from them 10 per cent. of their revenue, which should have been 1081 rupees. The Moosulmans, instead of paying it out of 10,817 rupees, clapped the demand of Sewajee upon the town as an additional burthen ; and instead of honestly fixing it at 1081 rupees (10 per cent. of 10,817), they adroitly took occasion to exact a little more from their Mahratta subjects.

Many individuals have shares in the village revenues under the names of *Mokassa*, *Sahotra*, *Babtee*, and *Nargowra*. The most intelligible way to describe these, is to say that persons have money assignments, amounting to a definite per centage on the revenue, under these names. In their origin, Mokassa is 66 per cent., Sahotra 6 per cent., Babtee 25 per cent., and Nargowra 3 per cent. of the *Chout*, or fourth of the whole Moghul revenue, which was extorted from the Moosulmans by the Mahrattas. Sewajee and his chiefs shared it amongst themselves ; the chiefs had the Mokassa for military services ; the Sahotra was given to the Punt Suchew, one of Sewajee's ministers ; the prince's own share was the Babtee ; and the Nargowra, which is synonymous with Sur Pateel, or chief of all the Pateels, was at the disposal of the prince. As these grants were hereditary, the equal division of property and rights amongst children has occasioned the reduction of some of the shares to the most trifling amount where families have multiplied.

Such are the tenures that came under my notice ; and it is necessary to state that, with the single exception of Surwa Eenam or "entire gift," there was an obligation of specific service on the individual or parties enjoying advantages under the several tenures; the non-performance of these duties involved the forfeiture of their rights ; but independently of such forfeiture, all grants whatever (unless specified to the contrary) were resumable by the sovereign or other grantee. Grants for religious purposes were rarely recalled; but for other objects they were frequently abrogated, particularly *Jagheer*, *Surinjam*, and *Hukdar* grants. To such an extent did this exist under the Peshwa's government, that the Hon. M. Elphinstone, in his report as commissioner, enumerates as an

item of revenue, *Wuttun Zubeet*, or sequestered lands of Zumundars, which yielded annually 50,000 rupees.

Revenue.

A few figures perspicuously arranged, are more efficacious in affording just impressions of the resources of a country, their ramifications, pressure, and availability, than the most laboured verbal details. In 1827-28 the assessments in the four collectorates of Dukhun amounted to 8,435,214 rupees, 3 qr. 79 reas, being a diminution of 535,499 rupees, 2 qr. 80 reas in the revenue of Fuslee 1231, A. D. 1822, as stated in Mr. Chaplin's report; from this sum also were to be deducted the remissions of 415,000 rupees, 1 qr. 25 reas in the Ahmednuggur, and 416,320 rupees, 3 qr. in the Poona collectorate in 1827-8, amounting to a total diminution of 1,360,725 rupees, 3 qr. 05 reas, or 15 16 *decl.* per cent. of the revenue of 1822.

The revenue of 1827-28 in its constituents is shown in the following table:—

Denomination of Revenue.	Fuslee 1237.—Revenue, A. D. 1827-28.			
	Poona Collectorate.	Nuggur Collectorate.	Dharwar Collectorate.	Khandesh Collectorate.
	rupees. qr. reas.	rupees. qr. reas.	rupees. qr. reas.	rupees. qr. reas.
Land revenue	1,5 6,323 .. 37	1,8 5,8 7	1,945,323 2 08	1,664,904 3 32
Sahyer*	231,262 1 ..	59,007 3 78	334,668 .. 85	131,710 3 ..
Customs	241,114 1 25	159,150	141,524 2 46	155,560 3 ..
Miscellaneous.	3,301	.. .. ..	.. .. ..	35,556 2 68
Total	1,992,000 2 62	2,033,994 3 78	2,421,516 1 99	1,987,733 .. :

Grand Total 8,435,244 rupees 3, qr. 79 reas.

From the preceding table it will be seen that in the several collectorates, although of very disproportionate superficial extent and population, in Ahmednuggur, Poona, and Khandesh there is a close approximation in the total amount of their revenues, although with some difference in the value of their great branches.

* Sahyer is the revenue raised from shops, markets, liquors, &c. Sahyer is a "market" in Sanscrit.

The following table exhibits the proportion per cent. of the gr branches of the above revenue.

Denomination of Revenue.	Proportion per cent. of the great branches of revenue.			
	Poona Collectorate.	Nuggur Collectorate.	Dharwar Collectorate.	Khandesh Collectorate.
Land revenue.	per. cent. 76·12	per cent. 89·275	per cent. 80·335	per cent. 83·76
Sahyer	11·62	2·900	13·820	6·63
Customs.....	12·0	7·825	5·845	7·82
Miscellaneous	0·16	..	..	1·79
	100.	100.	100.	100.

There is considerable uniformity in the respective proportions of t land revenue in the different collectorates. Poona has the smallest, b it is compensated for in the magnitude of the Sahyer and customs. Ahmednuggur the proportion of the land revenue exceeds that of Poo by 13 per cent, but this is counterbalanced by the singular smallness the Sahyer branch. In the land revenue of Dharwar and Khand there is a sufficient approximation to a mean per centage for the f collectorates, which averages 82·30 *decls.* per cent. The whole reve of England being £52,000,000, has only a land revenue of £2,000,00 3·846 *decls.* per cent. The whole revenue of France being £40,000,0 the land revenue is 12,000,000. or 30 per cent.

The following table shows (in 1827-28) the amount of the land venue in each collectorate, the number of cultivators, the average ren farms, the number of British populated villages, and the average re nue of a village : the last column is intended to show the pressure cluding land Sahyer and customs) of the assessments and taxes, vie as a capitation tax.

Names of Collectorates.	Number of British populated villages.	Average revenue per village.	Land revenue.	Number of Cultivators.	Average rent of farms.	Land revenue Sahyer, Custo &c., viewed a capitation t
		rup. qr. rs.	rup qr. rs.		rp. qr.rs.	rp·qr.rs. £. s.
Poona.....	1469½	1253 1 98	1,516,323 .. 37	52,668	28 3 16	4 1 78 0 8
Nuggur	1878½	1082 2 99	1,815,837	41,948	43 1 15	3 3 77 0 7
Khandesh	2367½	839 3 7	1,664,905	44,608	37 1 33	4 1 92 0 8
Dharwar. ...	2104	934 2 33	1,945,323 2 80	60,701	33 .. 19	3 1 60 0 6
Total	7819½	887 3 32	6,942,388 1 77	199,925	34 2 90	4 .. 03 0 8

The population, inclusive of Sholapoor and Cheekoree and Munowlee, of the Company's possession in Dukhun, but exclusive of alienated villages, is 2,105,886 souls, and the gross revenue 84,435,245 rupees; equal, therefore, to 4 rupees, 0 qr. 02 reas per head.

In forming the above table, the collectors were good enough to supply the number of villages and cultivators in 1827-28, and the amount of the land revenue was obtained from the Accountant-General's office. In striking the average revenue per village, I have omitted, in the division of the Dharwar collectorate, 175 villages, (subsequently reduced to 155,) which I found by the population returns lately completed were uninhabited, but parts of whose lands were under cultivation by neighbouring villagers, and therefore included by the collector in his list. In Khandesh 330 villages have been struck out under similar circumstances. In Poona and Ahmednuggur, villages of this class are very limited in number, and I have, in consequence, not made any deduction on their account.

To give a fair average of the village revenues in the Poona collectorate, 151,241 rupees, including a share of the customs, have been deducted from the whole revenue for the city of Poona previously to striking the average. The manner in which the Poona capitation tax is struck is as follows:—1108 towns and villages sent in population returns, containing 331,615 inhabitants, averaging 226 souls and a fraction to a village. The population of the city of Poona (81,315 inhabitants) being deducted before striking the average; of these villages 212½ are alienated, leaving 895½ British villages with a population of 283,567, including Poona. These in 1827-28, yielded a gross revenue of 1,261,711, averaging 4 rupees, 1 qr. 78 reas to each person.

The capitation rate in the Ahmednuggur collectorate is obtained as follows: In 1827-28, 1877½ towns and villages were on the collector's list; they contained 494,669 souls, estimated from the average number of inhabitants to a village, namely, 263·47, struck from the census of 1822, to which the *present* population of the city of Nuggur is to be added, namely, 21,208. The revenue from the collectorate was 2,033,994 rupees, 3 qr. 78 reas; equal, therefore, to 3 rupees, 3 qr. 77 reas per head.

In Dharwar the averages have the following elements:—in 1827-28, 2279 British towns and villages produced a revenue of 2,421,516 rupees, 1 qr. 39 reas. This included the villages, revenue, and population of the Talooks of Cheekoree and Munowlee, received from the Kolapoor state; population returns were not received from these Talooks; their

revenue from 225 villages, namely, 197,406 rupees, 3 qr. 29 reas, is therefore deducted from the total revenue of the collectorate, leaving 2,224,199 rupees, 2 qr. 10 reas, and 2054 villages. From the latter are to be deducted 175 depopulated villages, but having a small part of their land cultivated by neighbouring villagers, leaving 1879* British villages, with a population, agreeably to the census, of 653,892 souls, giving 3 rupees, 1 qr. 60 reas per head.

There is some difficulty in ascertaining how the revenue of Khandesh would fall as a capitation tax, in consequence of the increased number of villages (335½) rendered productive since 1825-26, (the date of the population returns,) their population not being known. In 1825-26 the inhabited villages amounted to 2032, and 330 were Pyegusta, i. e. deserted, but having part of their land cultivated by neighbouring villagers. Supposing the new villages to be peopled in the same ratio as the old ones, the number of inhabitants in the government villages in 1827-28 would have been 443,548, which is 24,031 souls more than I have put into the population returns; and as the revenue was 1,987,733 rupees, the people averaged an individual payment of 4 rupees, 1 qr. 92 reas: nevertheless, I have reason to doubt the actual increase in population to the extent I have given Khandesh credit for; and should it have remained stationary, the revenue as a poll-tax would amount to 5 rupees, 1 qr. 40 reas per head.

With respect to the branch of revenue called Sahyer, it will be seen that the different collectorates raise it in very unequal proportions. The unusual lowness of it in the Ahmednuggur collectorate is of difficult explanation. The following table shows the number of persons of each class paying this tax, the amount paid, and the average per head.

Collectorates.	Number of taxable persons.		Amount of taxes.	Average per head.
	Sahyer.	Bullooteh.	rup. gr. rs.	rup. gr. rs.
Poona.....	14551	8481	231,262 1 00	10 .. 16
Ahmednuggur.	9,287	4980	59,007 3 78	4 .. 54
Dharwar.....	29,046	2811	334,668 .. 45	10 2 02
Khandesh	9,147	2348	131,711	11 1 83

It is consequently found, that Ahmednuggur, with a greater num-

* Subsequently increased to 1899, with a population of 660,852.

ber of taxable persons in the Sahyer branch than in Khandesh, averages a payment per head of little more than one-third of what the shopkeepers, trades, and Bulloteh pay in Khandesh ; and the tolerable uniformity in the individual averages of the collectorates of Poona, Dharwar, and Khandesh, proves that their Sahyer taxes are raised equitably. I have to notice, that in village papers there is a want of uniformity in the classification of the extra cesses, sometimes articles being placed under the heads of Sahyer which bear upon the land, and others again being classed with the land which are money commutations for labour.

From the definite character of the elements in the preceding table, great confidence may be placed in the correctness of deductions from it. The numbers of taxable persons in 1827-28 were supplied to me by the collectors, and the amount paid is extracted from their Jummabundy settlements for that year.

Customs.—The customs vary considerably in the different collectorates; those of Poona, being above 12 per cent. of its whole revenue, may be looked upon as high, but their magnitude manifests a favourable commercial industry. Contrary to expectation, Dharwar, which has indications of internal comparative prosperity, has the lowest revenue from customs, with a greater population, a greater revenue, and falling lighter upon the people than in any of the other collectorates, and with more than ten times the number of manufacturers* to be found in Poona and Khandesh, nevertheless shows a commercial return 52 per cent. less than that of Poona, and even 25½ per cent. below the exhausted province of Khandesh. It seems anomalous that the proportional percentage of the customs on the whole revenue in Ahmednuggur and Khandesh should be identical, the population of the former being 23.75 per cent. greater than that of the latter, while a parity seems to exist in the wants and export resources of the people of both.

Expenses.—I have put into juxtaposition some of the items of expense in the collectorates, and their rate per cent. on the gross revenue; but the want of a systematic classification of charges under common heads throughout the collectorates, renders a rigid comparison, item for item, unattainable. The information is extracted from the Jummabundy returns of the collectors for 1827-28. A government form for this paper for common adoption would render the multitudinous details involved in it more available for comparison by inspection than in the

* Thirteen thousand and forty-five weavers.

present forms. The total expenses of two of the collectorates only is given in the following tables.

Few comments are necessary, as the charges and the rate per cent. they bear upon the gross revenue of each collectorate are seen at a glance.

TABULAR VIEW OF THE EXPENSES.

Denomination of expenses.	Expenses 1827-28.			
	Poona Collectorate.	Nuggur Collectorate.	Dharwar Collectorate.	Khandesh Collectorate.
	rup. qr. rs.	rup. qr. rs.	rup. qr. rs.	rup. qr. rs
Village & land expenses. ..	136,659 .. 12	149,761 2 26	.. .. ..	388,016 .. ..
Native establishment for collections..	.. .. ..	.. .. ..	246,174 3 80	157,202 2 ..
Mokassa..	55,997 3 43	.. .. ..	.. .. ..	45,358 .. ..
Hukdars.	61,005 3 00	115,876 1 25	.. .. ..	.. .. ..
Contingent charges, including presents..	.. .. ..	101,055 3 22	190,768 3 39	339,410 3 ..
Shet Sundee or native militia.....	34,435 2 43	.. .. ..	.. .. ..	.. ..
Pensions, Eenams.....	.. .. ..	466,493 3 89	33,522 2 94	45,619 2 24
Collector's salary.....	.. .. ..	59,653 1 33	113,745 .. 42	93,277 1 75
European Judicial	.. .. ..	53,546 2 58	.. .. ..	16,909 1 41
NativeJudicial	.. .. ..	229,366 2 73	.. .. ..	90,306 .. ..
Total	288,098 .. 98	875,754 1 26	584,211 2 55	1,176,099 2 40
Remissions ..	416,320 3 ..	415,005 1 25	None.	None.
To H.H.Seendeh	.. .. ..	.. .. ..	.. .. ..	90,796 3 33

TABULAR VIEW OF THE PROPORTION PER CENT. OF EXPENSES.

Denominations of expenses.	Proportion per cent. of the expenses on the whole revenue in the several Collectorates.			
	Poona Collectorate.	Nuggur Collectorate.	Dharwar Collectorate.	Khandesh Collectorate.
Village, land and Sahyer expenses.....	per cent. 6·86	per cent. 7·36	per cent. ..	per cent. 19·52
Native establishment for collections.....	..	..	10·17	7 92
Mokassa	2·81	..	..	2 28
Hukdars.....	3·06	5·70	..	..
Contingent charges....	..	4·96	7·87	17·08
Shet Sundee, militia...	1·73	..	..	..
Pensions, Eenams	..	8·18	1·39	2·29
Collector's salary.....	..	2·93	4 69	4·67
European Judicial....	..	2·63	..	0·85
Native Judicial	..	11·27	..	4·52
Total.....	14·46	43·03	24·12	59·13
Remission.....	20 89	20·40	None.	None
Grand Total.....	35·35	63·43	24·12	59·13

For the proper understanding, however, of some omissions in the above abstracts, short notices are called for.

Under the items of "village, land and Sahyer expenses," "Shet Sundee," "Mokassa," and "Hukdars," there are blanks in the Dharwar collectorate, the whole land expenses amounting to 24·12 per cent.; it is to be presumed the charges under these heads have merged in the "Native establishment for collections." Under Khandesh there is a blank for the Hukdars; the expense of these persons is no doubt included in "village, land, and Sahyer expenses." Under Nuggur there are blanks under "Mokassa" and "Shet Sundee;" they must be included in the "Land and village expenses." Of the omissions in the Poona abstract it is unnecessary to speak, as they are intentional.

The charges, revenue, magisterial, and judicial, upon the revenue of Ahmednuggur in 1827-28, amounted to 43·03 per cent., and remissions were granted in that year to the amount of 20·40 per cent.; the total

deduction from the revenue was 63·43 per cent. In Khandesh, without any remissions, the charges were nearly six-tenths of the whole revenue. In Poona I have only shown the charges which are strictly and permanently fixed upon the land in all the collectorates, which are not mutable, and therefore scarcely susceptible in justice of modification; these amount to 14·46 per cent.: they comprise village expenses, militia, Mokassa, and Hukdars. In Dharwar, the collector's establishment has been added to the above, and it brings the charges strictly bearing on the land to 24·12 per cent. on the revenue.

A review of the above tables and abstracts suggests the following observations. The collectorate of Dharwar, having the smallest area[a] (with the exception of Poona) of the collectorates of Dukhun, has the greatest population, and produces the greatest revenue, which bears lightest by average upon the inhabitants individually.[b] Judging from the lowness of the customs, it has the weakest indications of commercial industry; nevertheless, the manufacturers, particularly the weavers, exceed those of the other collectorates in the ratio of 100 to 11, or 89 per cent. The shopkeepers and trades people are very numerous, and their individual taxes[c] rise to the average of those of Poona and Khandesh. Finally, the means of the people (remissions not being called for) must be more efficient than in the other collectorates, and a proportional ratio of imports and exports might have been looked for.

Khandesh has the largest superficial extent,[d] a population[e] 29 per cent. less than that of Poona, or granting an increase to its population 15·32 per cent. less, with a revenue nevertheless equal to that of Poona, bearing in consequence with unusual pressure upon the people, its average being 5 rupees, 1 qr. 40 reas to each soul; involving the fact that the assessments in this collectorate are greater than in any of the others. Admitting, however, the estimated increase to the population previously noticed, (which certainly exceeds the truth,) the average[f] individual payment will still exceed that in the other collectorates. It is possible this apparent pressure may be referred to the extent of its garden cultivation, which is much greater than that of Dharwar, and, as far as I can judge from observation, that

a 9122 square miles, including the cultivated area of the Talooks Cheekoree and Manowlee.

b 838,757, including the estimated population of the Talooks of Cheekoree and Manowlee, 3 rupees, 1 qr. 6 reas per head.

c 10 rupees, 2 qr. 2 reas.

d 12,527 square miles.

e 371,404, but supposed this year to be 443,548 in government villages.

f 4 rupees, 1 qr., 92 reas.

of Poona and Ahmednuggur also. In Khandesh in 1826, there were 32,697 beegahs[a] of garden-land, being 9·36 per cent. of the whole cultivated land, the garden-land in Dharwar not amounting to one-half per cent. In the Nuggur and poona collectorates, in the towns of Kurmalleh, Kurjut, Angur, and Rawgaon, the proportion of garden to field-land in cultivation was 5·45 per cent. only. But, under all circumstances, the villages of Khandesh average[b] the least revenue in Dukhun; it stands third in the number of its cultivators,[c] but second in the amount of the rent of its farms.[d] The magnitude of this rent, it is inferred, originates in the comparative high rate of assessment per beegah, and not in the greater size of the farms. I have not the number of beegahs of land in cultivation in 1827-28 in Khandesh, but justify my inference from the following data:—In 1826 there were 37,311 cultivators, and 883,548 beegahs under cultivation, averaging 23·68 beegahs to each farm.[e] Last year, there were 44,608 cultivators, and supposing them to hold individually the average number of beegahs of 1826, the result will be as

cult.	beegahs.		cult.	beegahs.
37,311 :	883,348 : :		44,608 :	1,056,345 ;

and as the land revenue of 1827-28 was 1,664,904 rupees, the rate per beegah is therefore 1 rupee, 2 qr. 30 reas,[f] which exceeds[g] that of the other collectorates from 50 to 100 per cent.

In the Sahyer branch of revenue the increased pressure is still visible upon the people; it exceeds the mean pressure of Dharwar and Poona 10·35 *decl.* per cent., and that of Ahmednuggur in the extraordinary ratio of 63·91 per cent.

The customs' per centage on the whole revenue is identical with that of Ahmednuggur, although, in the present state of Khandesh, it could not have been looked for.

Ahmednuggur stands second in superficial extent.[h] The land revenue is only inferior in amount to that of Dharwar, although it has the least number of cultivators[i] in all the collectorates. The average rent of farms therefore is the greatest; and from averages struck in different

a 62,023 acres. b 839 rupees, 3 qr., 7 reas. c 44,608.

d 37 rupees, 1 qr., 33 reas.

e Beegahs 883,448. / Cultivators 37,311. = 23·68.

f Rupees 1,664,904 ru. qr. rs. / Beegahs 1,056,345 = 1 2 30 per beegah.

g Poona and Nuggur 3 qr. 58 reas per beegah, including garden-land. The whole of Dharwar 2 qr. 94 reas per beegah, including garden-land.

h 9910 square miles. i 41,948 cultivators.

villages in various parts of the Desh in this collectorate, I would refer it to the increased size of the farms rather than to enhanced assessments.

In a table, which will be met with in treating of the condition of the people, farms are made to average about 45 beegahs each; and the assessments, including extras, do not amount to a rupee per beegah.[a] In the hilly tracts the farms are necessarily much reduced in size, and an average for the whole collectorate would bring them down probably to 35 beegahs each; 41,948 cultivators therefore would occupy 1,468,180 beegahs of land, which, divided into the land revenue, (1,815,837 rupees,)[b] give 1 rupee, 95 reas per beegah. I am rather disposed to rely upon the general average, than upon the average struck from the examination of the papers of a few towns in the most favourable parts of the country.

The very low amount of the Sahyer, which is only 2·90 per cent. of the whole revenue, has been already adverted to. The taxable persons,[c] nevertheless, under this head, exceed those of Khandesh.

The customs bear a fair proportion to the whole revenue.

The average revenued per village may be subject to a slight modification, as in the number of British villages, amounting to 1878½, furnished to me by the acting collector, which paid revenue last year, deserted villages are not distinguished, part of whose lands are under cultivation; and the want of population returns disables me from ascertaining them.

The revenue, viewed as a poll tax,[e] bears easier than in any other collectorate, excepting Dharwar. The means to insure an approximate accuracy in this calculation have been already explained.

Poona has the smallest land revenue, and the smallest superficial extent.[f] Previously to the addition of the four Talooks of Sholapoor, Mohol, Moodeebeehall, and Indee, agreeably to information furnished by the Survey Department, it comprised an area of 4990 square miles only. Neither the extent nor population of these Talooks being known, it was necessary to estimate them; the process was conducted by analogy, which has been explained elsewhere; 2888 square miles resulted from the calculations, giving the Poona collectorate an area of

a 2*s.* 8*d.* per acre.

b Rupees $\frac{1,815,837}{\text{Beegahs } 1,468,180} = 1$ rp. 0 qr. 95 rs. per beegah.

c 14,267.

d 1082 rupees, 2 qr. 99 reas.

e Revenue as a poll tax, 3 rupees, 3 qr. 77 reas.

f Area 7878 square miles.

7878 square miles. Poona has the greatest number of cultivators[a] excepting Dharwar; and this is to be attributed, not to the extended cultivation, but to the Mawul, or hilly tracts, occupying a great deal of the collectorate, where the farmers are multiplied and the individual agricultural operations of very limited extent. In the whole Turruff of Mhurkhoreh the farms average only 13 beegahs each; [b] but in the eastern and south-eastern parts of the collectorate they have the same average as is given to Ahmednuggur. From the above facts the farms might be expected to average a very low rent, as is found to be the case. The following estimate justifies the inference that the land assessments are comparatively not very onerous.

In the Desh, or Table Land, the farms average.....	45	beegahs.
In the Mawuls, or hilly tracts.....	13	do.
	2)58	
Mean average of farms.....	29	beegahs.

In 1827-28 there were 52,668 cultivators, which multiplied by 29, the average number of beegahs to each farmer, will give 1,527,372 beegahs of land under cultivation; and as the land revenue of 1827-28 amounted to 1,516,323 rupees, 37 reas; the assessments would only be at the rate of 3 qr. 97 reas per beegah,[c] including garden land and extras. There are still however some marked features which are not satisfactory: the villages average a greater revenue (excluding the city of Poona) than in the other collectorates, although the average village population is less for that part of the Poona collectorate, whence population returns have been received.

The 574 villages of the sub-collectorate of Sholapoor average 1272 rupees, 1 qr. 12 reas each,[d] including customs. The magnitude of the average of the remaining villages may be attributed to the great amount of the customs;[e] but deducting a suitable proportion of the customs[f] for the inhabitants of the city of Poona,[g] and the whole of the revenue of the city, Sahyer,[h] land,[i] and Abkauree,[k] and mint[l]; villages (always excluding the four talooks of Sholapoor) still average 1241 rupees, 1 qr. 76 reas each, which is higher than in any other collectorate; and as the

c Rupees $\frac{1,516,323}{\text{Beegahs } 1,527,372} = 3$ qr. 97 reas per beegah.

a 52,668. b 9¼ acres.

d Revenue of sub-collectorate of Sholapoor 730,289 rupees, 1 qr. 93 reas.

e 215,361 rupees, 2 qr. 37½ reas. f 61,756 rupees, 1 qr. 63 reas.

g 81,515 inhabitants. h 56,202 rupees, 3 qr. 50 reas.

i 27,981 rupees, 81½ reas. k 12,000 rupees. l 3301 rupees.

villages in this part of the collectorate average a fraction more than 226 inhabitants,[a] the taxes, assessments, and customs,[b] after deducting the share for Poona, 151,241 rupees, fall upon the people with the unexampled pressure of nearly 5¼ rupees per head,[c] while the people in the city[d] average only one rupee, 3 qr. 44 reas per head, including a proportional share of the customs, and the city, Sahyer, and land-tax, &c.

For the whole collectorate of Poona, including the four talooks of Sholapoor, by a process previously explained, the assessments average 4 rupees, 1 qr. 78 reas per head, which closely approximates to that of Khandesh.

Poona has the greatest number of taxable persons[e] after Dharwar in the Sahyer branch of the revenue, and ranks second in the total amount of the sum raised, which falls with a less pressure individually than in Dharwar and Khandesh, but greater than in Ahmednuggur. The manufacturers, as contributors to the Sahyer, are very limited in number.

The proportion that the customs bear to the whole revenue is a very striking feature: they are derived principally from imports, a good part of which passes on to the eastward; much is consumed in the city of Poona, and the rest is dispersed into the districts. I have observed that imports from the coast have gradually cheapened in their retail price within the last three or four years, owing, no doubt, to the combined causes of increased importation and scarcity of money in Dukhun.

The collectorate of Dharwar, whether viewed with respect to the quantity of land under cultivation; the size of its farms;[f] the amounts of its revenue; the lightness with which it falls upon the people, considered as a poll-tax;[g] the magnitude of its Sahyer; the comparative denseness of its population; its numerous towns[h] and tolerably well-peopled villages; the facility offered for instruction in the number of its schools, and the manifestations of manufacturing industry in its numerous weavers,[i] is unquestionably the finest British province in Dukhun.

Dharwar Land Revenue.—The land revenue, in its proportion to the whole revenue, stands third in the Dukhun collectorates, being 80·336 per cent.; but this apparently inferior station is to be attributed, not to the diminished quantity of land under cultivati-

a 891½ villages with inhabitants, 202,252. b 1,110,470 rupees.
c 5 rupees. 1 qr. 96 reas,
d Inhabitants of Poona 81,315. Taxes and proportionate share of customs &c. 151,241 rupees.
e 23,042. f 32·74 acres, or 43·65 beegahs. g 3 rupees, 1 qr. 60 reas.
h 119. i 13,345.

on,[a] which far exceeds that in the other collectorate, (i. e. 61·11 *decls* per cent. of the whole lands, leaving only 38·89 *decls.* per cent. of waste,) but to the lowness of its land assessments, amounting only to 2 qr. 94 reas per beegah, including all extras falling on the land. The process by which this average assessment was struck is as follows. In 1827, agreeably to the population returns, the land in occupation of a cultivator averaged 32·74 *decls.* acres, or 43·65 *decls.* beegahs; in 1828, in the Jummabundy settlement, there were 60,701 cultivators, which, multiplied by 43·65 *decls.* gives 2,649,598. 65 *decls.* beegahs of land under cultivation. These divided into the land revenue, 1,945,323 rupees, 2 qr. 8 reas, give 294 reas per beegah, a low rate, which neither the examination of village accounts, nor a similar process, will give in Poona, Ahmednuggur, nor Khandesh.[b] This light assessment, equal only to 1*s.* 1½*d.* per acre, is certainly advantageous in insuring the realization of the revenue; but when put into comparison with the rent of land in England, shows the unproductive and limited character of Indian agricultural resources.

The Sahyer branch of the revenue is highly favourable, amounting to nearly 14 per cent. of the whole, and, though so productive, falls as a tax lighter on individuals than in Khandesh. The customs, being 2 per cent. lower than in Khandesh and Ahmednuggur, is at variance with the tolerably efficient character of the general resources of the Dharwar.

From the examination of village papers I find that remissions were very rare under native governments, and the facility with which they are granted under the British government, and their magnitude, testify strongly to its paternal character. Great caution, however, is requisite in granting them, not less on account of the government than on account of the cultivator himself. If obtained with facility, and without rigid and sharp examinations, and some personal inconvenience to the applicant, (from the habitual indolence of the native character,) his ordinary industry, which always requires stimulating, would be paralyzed, applications multiplied, labour diminished, and the farmer would trust to the forbearance of government rather than to his own exertions. There is another reason for caution in the strong motives that the native agents have for urging remissions, with a view to intercept them in the transit of accounts through their hands.

The collector cannot possibly personally ascertain the truth of one-

a 2,308,064 acres in 1827.

b Ahmednuggur 1 rupee, 95 reas; Nuggur and Poona, partial average, 3 qr. 28 reas; Khandesh 1 rupee, 2 qr. 30 reas per beegah.

hundredth part of the claims set up; he must leave this labour to his servants, and it can scarcely be believed they will not avail themselves of the opportunity to turn the discretion given to them to private profit; in fact, I know such to be the case.

In an examination of the papers of the villages of Muhrkoreh, Poona collectorate, I found that many of the cultivators had paid instalments of their assessments (for 1827-28) previously to remissions being granted, which exceeded the amount they were required to pay after the deduction of the remissions; the poverty of some of the cultivators, consequently, must have been misrepresented. I ascertained also that part of the remissions of 1827-28 had been intercepted. Remissions are unavoidable in all calamitous visitations of Providence, which are not of confined or local operation, and which affect the returns of the earth; but to insure the benefit of the remissions to the cultivator, they should be made in a definite per centage on his total assessment, and the amount should be proclaimed more than once, and by different persons, in the public place of every village.

A few words in conclusion will suffice with respect to the great branches of the revenue. It is seen that 82·30 *decls.* per cent. of the whole is derived from the land: already the supply of agricultural produce exceeds the demand, and the farmer has a difficulty in finding a mart. In the present state of agriculture therefore, this branch of revenue is at its maximum, and will probably decline until supply and demand be adjusted.

The prospects of improvement in the Sahyer branch are not more favourable than in the land revenue.

The trades pay to the full extent of their means at present, and manufactures cannot increase when the European importers of cottons can afford to undersell the native manufacturers. Indeed I believe little more than coarse Sarhees[a] for women, and common tent cloth, are now manufactured in the British provinces in Dukhun.

The improvements in customs should usually depend upon increased wealth and commercial industry in the people. The extent of imports will only be commensurate with the means of purchase. If therefore the opinions I have advanced on the land revenue and Sahyer be well founded, with respect to the limited means of persons paying taxes under those heads, the customs will be influenced by causes affecting them.

[a] Dresses.

Any general improvement in the revenue would seem to require the creation of exportable articles in agriculture, horticulture, or manufactures; and to effect this desirable object, the introduction of persons with capital, enterprize, ingenuity, commercial tact and industry, is necessary; essentials, of which the country is at present destitute.

The manner in which the revenue yielded by a village is partitioned, is well exemplified in Neembawee, Pergunnah, Kurdeh, Ahmednuggur collectorate. The village is in Jagheer to Bala Sahib Rastia, one of the great Jagheerdars. The shares in the village are called amuls[a], and there are six of them; Rastia has three, Suchew[b] Punt one, and the Honourable Company two. The whole shares are considered as an integer of 123 parts.

Sun, 1236.—A. D. 1826.

Rastia has the Jagheer[c]	50	
Sur Deshmookee and Nuzzur[d]	23	
Kussur,[e] or remainder	7	
		80
Suchew Punt has the Sahotra	23	
		23
The Honourable Company has the Mokassa	15	
and the Neem Chowthace, or half of the tribute called "Fourth"	5	
		20
Total		123

In addition, the fixed money rights on the village are—

	Rupees.
Sur Pateel Dabaree of Tellegaon	5
Kundeh Kurdehkur Deshmook	101
Amrut Row Joonurkur Deshpandeh	101

Besides the Pateel and Koolkurnee, Chowgulla, Bullooteh, who have their fees.

It would seem very desirable to abolish the above absurd verbal dis-

a Amul, "rule," "sway."
b Suchew, "friend," "minister;" one of the eight ministers of the Rajah of Sattara.
c A fief.
d Nazar, "sight," "look," a present made on introduction to a person.
e Kasr, "a fraction."

nctions, and to fix the rights of individuals as simple money dues, ithout reference to Jagheer, Nuzzur, Kussur, &c.

The revenue of Dukhun, contrasted as a capitation tax, with that of England, France, and America, would appear to be as follows. In England, the gross revenue of 1828 was £50,700,000; poor-rates, parish rates, lighting, watching, £12,000,000; contributions of congregations to their clergy, colleges, schools, &c. about £17,300,000: total £80,000,000.[a] The population being 20,000,000, the tax per head is £4. In France, the taxation, including provision for the clergy, schools, &c. is £40,000,000; the population 30,000,000; equal therefore to £1. 6*s*. per head. In America the population is between 10,000,000 and 11,000,000, and the taxation £5,000,000, or not quite 10*s*. per head. The revenue of Dukhun, viewed as a capitation tax, is 8*s*. per head.

Assessments.

Assessments and land measurements are so intimately connected, that it would not answer any good purpose to treat of them in separate sections. With respect to the portions of land variously denominated for the purpose of assessment, I am clearly of opinion that the prevailing denominations amongst the Hindoos were not descriptive of superficial extent, and that the assessments were founded on the productive power of the land without reference to its quantity, and were uniform only for similar denominations of land in a village.

The Moosulmans, no doubt, endeavoured to be more systematic; they measured garden lands, and probably in some few villages, the field lands, under the denominations of Kundhee, Mun, Tukeh, Piceh, Seer, &c. with a view to the general conversion of such terms into the uniform and appreciable term of Beegah; but the Hindoo terms not applying to quantity, the beegahs of different villages could only be equal when there existed an accidental identity in productive power in the *unmeasured* Mun or Kundhee, &c. of land in one village with the *measured* Mun, Kundhee, &c. intended as common types. This will account for the varying extent of the beegah in field cultivation in Dukhun. How little successful the Moosulmans were in their attempt to supersede the old terms, is proved in the limited extent to which the assessments by beegahs obtained when we took possession of the country. It may be well doubted whether we shall be more successful in our introducti-

[a] Speech of Colonel Davies in the House of Commons, May 8, 1829.

on of acres : the ramifications of ancient usages amongst a people are in general too deeply fixed to be eradicated by legislative enactments. A plant may be cut off by the surface, but there is always a latent disposition to reproduction from the untouched roots. Whatever may be our success, a revenue survey was imperatively called for under the indefinite Hindoo land denominations, to enable a collector to regulate his assessments with a shadow of equity.

With respect to the denominations under which land is assessed in the comparatively limited space of my inquiries, their variety and absurdity demonstrate a wanton *bizarreness* that could scarcely have been looked for in a people reputedly simple and uniform in their opinions and economy. The assessment on a beegah is definite as it depended on positive measurement, and I have remarked that it obtains at, and in the neighbourhood of the established seats of Moosulman authority, as at Ahmednuggur, Purunda, Sholapoor, Mohol, Barlonee, Wamoree, Tacklee, &c. The Chahoor and Rookeh, as at Alkootee, Kheir, Wangee, Taimbournee, Kurkumb, Angur, Mahreh, Kurmalleh, Kurjut and Meerujgaon, being multiples of the beegah, are intelligible. Even the Doree or rope, used at Hungawarreh and Neembee, as it implies measurement and superficial extent, is admissible. The old Hindoo terms, Kundlee and Mun, at Ranjungaon, Jamgaon, Parnair, &c. &c. as they are founded on positive properties, furnish sufficiently precise ideas. But the Tukeh, with its constituents of Sujgunnees and Piceh, (copper coin,) at Dytna and Ankolner, the seer of weight and its Nowtanks or ¼ Seer, as at Koorul and Wangee, and the Pyhnee and its Annas[a] at Serrolee, Bruhmunwarreh and Muhr, are not reducible by any operation of the mind to an appreciable portion of land, whose produce shall admit of the government share on it being equitably assessed. The assessment by the hatchet, rude as it is, still involves the idea of as much copse-wood land as one hatchet can clear, and one man can sow and reap in the year. To add to the confusion, similar denominations of land are not made up of common and uniform constituents. The Tukkeh at Kothoul is raised from the Rookeh, each of which is supposed to contain 10 beegahs, or 7½ acres. At Ankolner the Tukkeh is composed of Sujgunnees, Piceh and Rookeh; the Rookeh being equal only to 2½ beegahs, or 1¾ acres. At Lakungaon there are 10 Tukkeh to one Pyhnee, and as the Pyhnee is said to contain 30 beegahs, the Tukkeh here contains only 3 beegahs instead of 480, as at Tellegaon ; or 210, as at Ashtee.

[a] One-sixteenth of a rupee.

In respect to the Mun at Ranjungaon, it is rated at 10 beegahs; at Jamgaon, belonging to Seendeh, it is not reducible into beegahs at all; at Parnair 6¼ beegahs only are equal to the Mun. The Pyhnee at Seerolee has the Chahoor of 120 beegahs as a typical standard, 4 Pyhnees being equal to one Chahoor, or 120 beegahs; at Muhr the Pyhnee of 30 beegahs is considered as identical with the Kundhee of 20 Muns, reducing the Mun therefore to 1½ beegahs.

Under such complex definitions and involved contradictions, my limits will not permit me to give further explanations, but which my lengthened tables afford.

The principal assessment necessarily falls on the land, and it is raised on the various land denominations above noticed; the land in the first instance being separated into the two great classes of Bhaghaeet, or garden-land; and Zerhaeet, or field-land. Both these terms are evidently of Moosulman introduction, Bhaghaeet being a word of Persian origin, meaning "gardens," "orchards;" and Zerhaeet, of Arabic derivation, meaning a "sown field," "sown land."

There are marked traces of the land assessment having once been systematic in the Sostee or permanent rate, which was uniform and unchangeable for all lands of the same denomination. This rate is found in most villages, it is distinctly stated in the accounts, and separated from subsequent and increased assessments, and its existence is a proof that assessments formerly were not on the superficial extent, but on the productive power of the soil; since, as lands were not all equally fertile, more of the unfertile land must have been held than of the fertile, to enable the cultivator to pay a fixed sum in quantity of grain for a piece of land under a common denomination. The *Sostee Dur*, or permanent assessment, was the pride of the Meerasdar, but unhappily not his safeguard. The various governments which have passed away do not appear ever to have *raised the permanent rate*, but they rendered the advantages derivable under it abortive from gradually adding extra cesses; their excuses in the first instance being unlooked-for contingencies. The cesses were originally mostly in kind, and temporary; but the exigencies of government, or the facility with which they were raised, made them perennial, and their pressure upon the cultivator has been enhanced, particularly under our government, by the cesses in kind being commuted into money payments. The Moosulmans, on introducing measurements, must necessarily have subverted the Sostee, or uniform rate, since the same rate could not have been equitable for beegahs of land of different qualities. We find, in consequence, that when the lands are classed in beegahs

otherwise than as constituents of Hindoo land denominations, that there the assessments are on the quality of the soil, and vary accordingly.

Gardens being dependent on the local advantages of a suitable supply of water and some depth of soil, usually met with in hollows or on the banks of rivers, it might be expected that considerable uniformity would prevail in the quality of garden-land, and that it would rarely be divided into classes; such is usually found to be the case. Most commonly all garden-land appertaining to a village pays the same rate per beegah; and where classification exists, it is founded, not on the quality of the land, but on the extent of the supply of water.

The first great feature, in this respect, is whether the garden is watered from small streams conducted from rivulets or rivers, or whether it is watered from wells; in the former case it is called Paatsthul,[a] and in the latter Mohtsthul.[b] Most Pahts failing in the dry months of March, April, and May, the former land is usually assessed at a lower rate than the latter, as at Tellegaon and Parnair; but where the Paht supply is perennial, as at Dytna, both descriptions of land pay the same rate. Dependent on these primary distinctions, are modifications, affecting garden assessments: land with a perennial and sufficient supply of water, whether from pahts or wells, is called Wohol-Waho, or fully watered, and pays the highest rate; this rate, unless on rice land, and isolated spots, where fruits of considerable value are raised, such as grapes and golden plantains, &c., as at Joonur, within my observation, has never exceeded 6 rupees per beegah,[c] including sugar-cane land. The other classes of land are comprised in the Kord Waho or not fully watered. It is readily intelligible that a well may supply a sufficiency of water for great part of a garden within a reasonable distance of the well, but that the extremities may be inadequately watered, and this affords just grounds to demand a lighter tax for the extremities: two classes should result from such circumstances, i. e. fully watered and not fully watered, and such is generally the case where distinctions are made at all: but at Ahmednuggur there is an affectation of discrimination, which has determined that garden-land receives its watering in the proportions of "fully," "thirteen-twentieths," "three-fifths," and "one-half," and such lands are respectively assessed at 5 rupees, 3¼ rupees, 3 rupees, and 2¼ rupees per beegah. The assessment on garden-land at present is unequal, and the whole requires revision. There is every motive to make garden-cultivation assessments light with a view to insure to each cultivator,

a From Paat "a channel," and Sthul "a field."
b From Moht "a water-bucket," and Sthul a "field."
c 16*s.* 8*d.* per acre.

if possible, his well and little plot of garden ground. Gardens produce all the year round; they are comparatively unaffected by the droughts which destroy field crops; and independently of the constantly saleable garden stuffs, fruits, and aromatic seeds, there is usually room for a beegah or more of bukshee or johr wheats, which require watering, and a plot or two of sugar-cane. To his garden the cultivator is indebted for many of the little enjoyments his situation is susceptible of. In some instances, in the Mahloongeh Turruff, Poona collectorate, I found cultivators paying their entire assessments, and reaping profit by their garden produce of chillies[a] alone, which were sent into the Konkun.

Usually it has been deemed sufficient to arrange Zerhaeet or field-land into four classes, as at Jehoor, namely, Awul (best), usually black land, Rehsee (modified black), Burrud (dashed with lime and some decomposing greenstone), and finally, Khurrud (stony, thin, and poor). The first, throughout the country, does not average more than 1 rupee the beegah, the second $\frac{3}{4}$, the third $\frac{10}{16}$, and the last $\frac{8}{16}$ of a rupee per beegah; but at other places there are other distinctions. In the Mawuls, or hilly tracts along the Ghauts, lands are classed as Bhat, Khatan, and Wurkus, the first being rice land, the second wheat and grain land, and the third being on the slopes of hills, producing the dry grains Sawa[b] and Wuree;[c] there being a great deal of red soil also in these tracts, it is distinguished by the term Tambut or copper-coloured. The Awul, or best, where it occurs, is called Kalwut (black), and the rocky and stony Maal.

These explanations are sufficient to show that where assessments on the quality of the land have been introduced, uniformity has not obtained in distinguishing the qualities; they show also that the people were satisfied to limit the qualities to four gradations; but at Ahmednuggur, the Shaikdar or inspector of cultivation has had the microscopic ability of vision to mark twelve shades of difference in the field-land. The accounts are, in consequence, a mass of perplexity, and it is very probable the revenue is frittered away in distinctions which the cultivator never dreamt of, and never profits by.

Field-lands, on which the cultivators sink wells, are not assessed as garden-lands. At Kanoor, Nuggur collectorate, I found lands so circumstanced had been free from any extra assessments from a period beyond the memory of man.

a Capsicum annuum, and other species.
b Panicum frumentaceum. c Panicum miliare.

The above notices are sufficient to show the anomalous character of the money assessments strictly on the land. Not only are they arbitrarily fixed on the productive power of the land, or on measurements, real or supposed; but lands of the same denomination and quality are differently assessed in neighbouring villages without apparent cause.

The average of all the rates at many towns and villages in all parts of the country, derived from personal inspection of the village accounts, gives 3 rupees, 41 reas for a beegah of garden-land, or 8*s.* 3½*d.* for an English statute acre. The average of field-land is 3 qr. 93¼ reas per beegah, or 2*s.* 7½*d.* per English acre.

To determine an approximate average assessment per beegah in Khandesh, I may use elements, which although not just, may be expected to give results not very far from the truth; namely, the total number of beegahs of land under cultivation in the population returns in 1826, and the land revenue in 1827-28: the former is 883,548 beegahs, and the revenue 1,664,904 rupees: the average rate per beegah is 1 rupee, 3 qr. 54 reas, a much higher rate than exists in the other collectorates.

These assessments comparatively with those of all European countries, of most Asiatic countries, and relatively to the valuable nature of the garden produce, comprising, independently of the ordinary fruits and vegetables, grapes, oranges, sugar-cane, cotton, two kinds of fine wheat, and aromatic and pungent seeds,—the field produce also embracing all the bread grains, gram, and other pulses,—are unquestionably very low; and were there no extra cesses even in the present depreciated value of agricultural produce, could not only be borne by the cultivator, but he might flourish under them even with the burthen of 25 per cent. on his produce—fees paid to the Hukdars and Bullootehdars. These rates, however, are considerably enhanced by extra cesses called Puttees, many of which were levied for contingencies and particular exigencies, or resulted from the conversion of voluntary offerings in kind into compulsory money payments.

These cesses are no less than 62 in number in the three collectorates of Poona, Ahmednuggur, and Khandesh, and the whole of them are for different objects; many of them result from local circumstances, and are therefore of a local bearing. The majority of these Puttees are not of uniform operation in the three collectorates, but one or more of them up to a score may be found in every village.

A few observations on the origin, character, and practical effects of some of these Puttees may be necessary. Most of them profess to bear directly on the land, such as those for grain, forage, and ropes to govern-

ment, grain to Ramooses, Havildar, Gosawees, and Meeras tax, tax for sugar, &c.: other taxes which originally fell upon trades people, such as those for skins, shoes, wool, blankets, and oil, are no longer derived from their legitimate sources, but fall upon the cultivator. Milch cattle, fowls, mango trees, and pumpkin beds respectively continue to supply the means to pay the taxes for Ghee, thickened sour milk, fowls, and fruits. Some of the Puttees involved personal labour, such as those for grass cut and furnished gratis to government, for firewood, for dinner plates composed of leaves sewn together, for monsoon great coats made of wicker work and leaves, and for sticks to pound rice with. The Rabta Mahr, spoken of under "tenures," is in lieu of personal services. Some of them in their name indicate their professedly temporary character, such as the Eksalee, or for one year, and yet they have been perpetuated. The Shadee or marriage cess at Angur, Pergunnah Mohol, and Ashtee Pergunnah Oondurgaon, amounted to nearly 12 per cent. of the whole revenue of the towns, and could only have been for a passing event. The Wurgut at Wangee and Ashtee, which was raised by the village authorities for village expenses, is one of these unjustifiable taxes. At Ashtee, the scene of the battle of Ashtee and capture of the Sattarah princes, in 1818, the Wurgut was 1405 rupees, in a revenue of 6386 rupees, or 22 per cent.; of this sum government took 900 rupees, leaving 505 rupees to the villagers for their expenses. This Puttee at the town of Kurjut, Pergunnah Kurreh Wullet, is 6 annas per rupee, or 37½ per cent. on the land and Sahyer assessments, and Burgoojur or tax on betel gardens. At Rawgaon, the Wurgut amounted to 14½ annas per rupee on the land assessments and taxes, or more than 90 per cent. The Kaateh Mornawul, or pecuniary punishment, inflicted on a village for a Mamlehdar's running thorns into his feet on perambulating its lands, should have had some limits in its duration. The Puttees for sturdy Gosawees, Havildars, Ramooses, Naikwarees, should have ceased when there were no longer Gosawees to beg with arms in their hands, or Havildars, Naiks, and Ramooses to exercise respectively certain functions.

The fractional apportioning the above taxes to the cultivators, involving also the compound operation of providing reduced shares for the privileged classes, the fractional deductions, in a certain ratio in case of remissions, the fluctuating amount of the individual shares dependent on the fixed commutation cesses, being yearly divisible amongst a variable number of cultivators, the mutable character of the Seerusteh Butta, which necessarily changes with the yearly varying total assessments of the village, and which Seerusteh Butta is not determinable until all other assessments be fixed, combine great

evils, and, unless to the most practised, patient, and persevering investigator, present an inextricable mass of confusion. The evils are, that a cultivator, be he lettered or not, cannot by possibility know what he will have to pay the ensuing or even the present year, because fixed sums, payable by the village, are divisible amongst a varying number of cultivators. Even if fixed sums were divisible amongst a fixed number of cultivators, the limited progress in arithmetic of the poor people would utterly disable them from determining their respective fractional shares; for instance, of 4 rupees for skins and shoes, 1 rupee for beit,[a] 4¼ for ghee, and 1 $\frac{5}{16}$ for leaf plates, &c. &c. In the whole course of my personal inquiries amongst this class for more than six years, I never met with one Koonbee who could or would give me a detail of his assessments or their amount; the constant reply was, "The Koolkurnee knows." This very uncertainty of their means and liabilities makes men improvident and careless.

The next evil is, that the Koolkurnee, in apportioning the fixed sums, and the Seerusteh Butta, the commutation money for grain, for ghee, sugar, pumpkins, &c. &c. is assured of impunity in defrauding the cultivators, from their want of ability in their accounts, even if they were aware of the value and amount of the cesses and the number of persons they were to bear upon. It is almost waste of labour to give the cultivator a note from government of what he will have to pay, as in nine instances out of ten he cannot read it; his expounder is the Koolkurnee, or the Koolkurnee's relations, and they read it agreeably to their own calculations.

The above is an exposition of the assessments as they now bear on the land, which produces 82·30 per cent. of the whole revenue. The remaining portions of the revenue, which appear in village papers are usually classed under the term Sahyer, and are in fact taxes. The two principal heads of Sahyer are Mohturfa, properly "Arhan," or taxes on shops, houses, and professions; and Bullooteh.

Operation of Sahyer Taxes.—An idea of the operation of these taxes will be formed by the following details from Wangee, Pergunnah Wangee.

Wanees, or sellers of grain and groceries, from 4 to 6 rupees a shop; oilman, for one oil-mill in work..... 6 rupees.
Weavers, per loom..... 3 do.
Other tradesmen pay proportional taxes. The threshold tax is called

[a] Beit, "a present."

Oombraputtee, from Oombra, threshold: it is generally a rupee per house.

At Tellegaon, Pergunnah Paubul, Poona collectorate, the taxes on trades are fixed on a scale of annas relatively to the visible means and profits of the tradespeople. The anna is considered equivalent to 3¼ rupees. The trades are taxed from ¼th anna to 2 annas, or 7 rupees, which is the highest sum for one shop.

The highest tax on one weaver is half an anna, or 1¾ rupee; oilman, highest rate one anna, or 3½ rupees; the saddler, dyer, and butcher, at half an anna each, or 1¾ rupee; fishermen, dealers in sweet potatoes, and makers of bridles, 1 rupee each; the *community* of braziers, 10 rupees. All the Momeens who are Moosulmans and weavers of turbands taxed in the lump at 25 rupees; shepherds at 14 rupees. These taxes are not raised on any systematic principles of application.

Bullooteh Tax.—The Bullooteh is a tax levied on the persons called the Bara Bullooteh, or artizans and functionaries twelve in number, who are important personages in the village constitution.

The taxes on the Bullooteh are generally deemed to be on the exercise of their profession; but this is a mistake, as the astrologer and Guruw, or sweeper of the village temple, pay Bullooteh tax, although not artizans; and I have known individuals of a trade (in one instance a boy the survivor of a family) paying from 20 to 25 rupees per annum, which they could not possibly do from the gain of their handicrafts.

The fact is, the Bara Bullooteeh have annual grain fees from the cultivators; and government, in former times, deeming these fees more than commensurate with the value of the labours performed, took a part of them in money. The taxes on the Bullootehdar, are therefore indirectly derived from the land; some of these taxes fall very heavily. At Wangee three carpenters pay 36 rupees Bullooteh tax, Wurgut 9 rupees, and house tax 3 rupees for three houses. At Tellegaon, Turruff, Paubul, the Bullooteh taxes are yet higher: carpenter 50 rupees, shoe-makers 60 rupees, Guruw or sweeper of the temple 30 rupees, barber 24 rupees, washerman 8 rupees, Moolana, or Moosulman priest, who also gets Bullooteh, 8 rupees; but the cultivators are numerous, and the lands of Tellegaon under cultivation extensive. The Bullootehdar on the whole therefore reaps a rich harvest, in spite of government participating in his fees, from the cultivators. It is unnecessary to multiply instances of the bearing of the Sahyer taxes. Taxes for the sale of spirituous liquors, and the amount of customs or transit duties, rarely appear in village papers, as those branches of the revenue are mostly farmed.

My limits do not permit me to give a detailed statement of the manner in which village accounts are kept under a native government. It would much assist to illustrate the internal œconomy of a village and many local usages, but I have not space. I can only say that the whole accounts of a village are kept on a ribbon of paper, about five inches wide and some yards long, not rolled up but folded in lengths of twelve inches or more: one of these is required for each year. At Wangee it is called *Gao Jarah*, or village search; at Kurmulla *Jhartee Akaar*, or figures or signs of search; at Barlonee it has the compound term of *Lownee Putruck*, (detail of cultivation,) and *Zumeen Jarha*, (land search); at Rawgaon it is called *Wussool Jarka*, or search of collections: occasionally it is *Akaarbund*, or roll of signs, items, figures. These varying names result from the union of two papers which are usually kept separate; namely the *Thul Jarha*, or roll of lands by family estates; and the *Lownee Putruck*, or roll of cultivation and assessments.

In closing the notice of assessments, a few words are necessary to explain the method of keeping village accounts. At the head of the paper called *Gao Jarha* is the name of the village, the Pergunnah and Soobeh it is in, the year and the name of the government it is under; this is followed by the Tunkha or Moghul money assignment upon the village, the Moosulmans having fixed each village to pay a definite sum, leaving the whole details of assessment and distribution to the Pateel and villagers; then follows the total quantity of land belonging to the village: deductions are made for land in boundary disputes, for Eenams of all kinds, whether to the temples, to the village officers, to the Deshmook or Deshpandeh, or to individuals, the quantity to each being carefully marked; all these being deducted, the remainder is distinguished into garden and field-land; then follows a roll of the cultivators, with a number of columns to record the quantity of land held upon each tenure, and the amount payable for each; a column for the share of the extra assessments, previously noticed, including the share of village expenses, which is always considerable; also columns for totals of the different heads. Then follow rolls of the Bullooteh, shopkeepers, trades, and others subject to fixed taxes, with columns for the proportion of tax upon the particular trade; the Bullooteh, the house-tax, and share of extra assessments, which these people pay although they are not landholders.

An abstract of the preceding details is now made, called the *Ekunder Tereej*. The contract for the transit duties, if not farmed, is added; and the *Kumall*, which means "total," "all," "whole," is put at the bottom. Then follow the deductions under the heads of money—Eenams, Hukdars, village, and other expenses, every item of which is detailed.

Amongst the expenses are village festivals, dinners to government officers, donations to brahmans, feeding pilgrims, interest on money borrowed, expenses of the Pateel and village officers when attending the governor of the district, oil in the temples, the Moosulman saint's tomb (if there be one) coming in for its share of donation or annual allowance, strange as it may appear, from Hindoo cultivators. I regret much that my limits do not permit me to detail the expenses, many of which are very curious, and illustrate habits and customs. The expenses being deducted from the collections, a balance is struck, which, under native governments, *left* the Tunkha, or government original assignment, together with any extra assessment, if levied, such as Sur Deshmookee, Chouth, &c. &c. To show how large a proportion of the village collections did not go to goverment, in one village, whose accounts I translated, the Tunkha, or government share, was 5500 rupees: and the Kumall, or total collections, 8522 rupees; so that 3022 rupees, or more than 35 per cent. of the whole, went in village expenses, Hukdars, (Deshmooks and Deshpandehs,) and other claims.

Wages.

The amount of wages of agricultural labourers is of so much importance to the class constituting the major part of the community, and it assists the judgment so materially in estimating the condition of the people, that I shall offer all the details I was able to collect in the Dukhun bearing on the question.

Farmers' Artificers' Work executed for Fees in Kind.—The trifling artificers' and mechanics' work required by the farmer being performed by the village artisans, in virtue of their offices and for fees in kind, it will not be necessary to enlarge on the remuneration for their labour: but to afford distinct ideas of its value, at the end of this paper I shall put into juxtaposition the rates paid by the Peshwah's government and the British government to artificers, mechanics, and others.

I made my inquiries on the subject of wages in towns and villages, the most distant from each other, to prevent the mistake of the adoption of local rates for those of general operation.

Wages of Husbandmen and other Labourers at Nandoor.—At Nandoor, a British town in the Ahmednuggur collectorate, in March, 1827, I found that yearly husbandry servants got from 12 to 20 rupees[a] per annum and their food; a smart active man got about 15 rupees per annum and supplied himself with clothes.

a From 24 to 40 shillings.

Day labourers, when paid in cash, get 1½ anna per day, or $\frac{3}{32}$ of two shillings, (about two pence farthing,) supplying themselves with every thing: but day labourers are never paid in money unles when grain is very dear.

Quantity given.—The most usual plan in harvesting crops is to give each labourer three sheaves of whatever grain he is cutting down; and provided he ties up the sheaves and stacks them, he gets five sheaves a day.

Value of Wages in Kind, converted into Money.—The grain in five sheaves, in ordinary seasons, amounts to about two seers. At the price of Bajree*, in March 1827, at Nandoor, namely 42 seers per rupee, the value of the labour was one penny and $\frac{14}{100}$ths per day. Joaree†, at 56 seers per rupee, was $\frac{9}{100}$ths of a penny per day, or rather more than three farthings. Wheat, at 18 seers per rupee, would have been two pence $\frac{66}{100}$, or something less than two pence three farthings per day. Allowing the grain in five bundles to be double the quantity stated, which is rather possible than probable, the highest wages in harvesting wheat would not have been five pence halfpenny per diem. When men are employed in ploughing or harrowing, nine times out of ten, they are paid two seers of Bajree for their day's work, from daylight to night, allowing one hour for dinner.

At Kanoor.—At Kanoor, a town in Jagheer, Ahmednuggur collectorate, in March 1827, I found that the two Pateels had each a permanent domestic servant in his employ; one paid his man 15 rupees per annum and his food; the other gave 15 rupees per annum, food, and five articles of wearing apparel, the value of which was 3½ rupees.

Wages at Dywuree.—At Dywuree, Nuggur collectorate, in November 1826, the cultivators did not pay their day-labourers in money, but gave them five sheaves of grain for every hundred cut down; a very able man indeed might cut down two hundred sheaves in a day, which would give him four seers of grain, the value of which (Bajree) in November, 1826, was about $\frac{2}{100}$ths of a rupee, or three pence English.

Wages at Dytna.—At Dytna, Nuggur collectorate, in February 1827, I found a man getting 25 rupees per annum, his food and a blanket, his son being also in employ at six rupees a year, food and clothes; but this was looked upon as high, and the individuals getting such wages fortunate: the village belonged to a Gosawee ‡ who paid his people well.

Wages of Women Day Labourers.—At Chambergoondeh, a large town belonging to Seendeh, Nuggur collectorate, in November 1827, women

* Properly, Sujgoorch, *Panicum spicatum.*

† Properly, Jondleh, *Andropogon Sorghum.*

‡ Gosawee, *a religieux.*

weeding in fields got $\frac{1}{10}$th of a rupee per day, or one penny halfpenny, and worked from sunrise to sunset.

Wages at Kurkumb.—At Kurkumb, a Jagheer town in the Poona collectorate, in December 1827, I found a husbandry servant getting only twelve rupees per annum, and food twice a day: no clothes. A man watching a field of grain was a monthly servant at three rupees a month, without food or clothes.

Highest Wages at Kurkumb.—From the authorities of the town I learned that the highest rate paid for the cleverest gardener's assistant or ploughman was 25 rupees per annum and daily food, but without clothes. The monthly rates for agricultural servants were from 2¾ to 3 rupees, without food, or clothes, fee, or advantage.

Pay of Seypoys at Angur.—At Angur, a British town in the Poona collectorate, on the 9th of January, 1828, in looking over the village accounts, I found two village seypoys charged respectively three rupees and two rupees for a month's pay.

Wages of Women Labourers at Poona.—On the 21st July, 1827, I found a great number of women weeding in gardens in the neighbourhood of the city of Poona; they received each six pice in money, or $\frac{6}{64}$ths of two shillings, (two pence one-third per day,) and worked from daylight until dark. This may be considered high wages, and its amount is to be attributed to the paucity of field labourers in a great city.

Wages at Pait.—At Pait, a Jagheer town in Pergunnah Kheir, in the Poona collectorate, on the 16th February, 1829, in my evening excursion, I overtook twelve or fourteen men and women with bundles of wheat in the straw on their heads; on inquiry I found they had been employed as labourers in *pulling up* a field of wheat at Pait. Their wages had been five sheaves for every hundred gathered: two or three of the men only had got five sheaves each, the majority of them only four, and the women none more than three. Five sheaves they said would yield about four seers of wheat, and as wheat was selling in Pait at 28 seers per rupee, each man with five sheaves received for his labour nine pice, or 3¼*d.* English. These poor people belonged to the town of Owsuree, five miles distant from Pait; they had therefore a march of ten miles to make besides their day's labour.

Wages at Joonur.—At the city of Joonur, at the end of February 1829, I found a brahman cultivating the Hubbus Baugh (about 80 beegahs of land); he employed numerous labourers. While I was encamped near his garden, fields of wheat, and gram, and Booee Moong*, &c. were harvest-

* Earth-nut, *Arachis hypogea.*

ed. For the wheat and gram and bread-grains the men got five sheaves per cent. In the field of Booee Moong there were between fifty and sixty women employed; and I learned that, in this particular product, from the labour and tediousness of digging it up, and the cheapness of the produce, the labourers were allowed one-fourth of the whole. In cutting down sugar-cane, gathering fruits or vegetables, and indeed where the produce was too valuable to give the labourer a share of it, the Brahman paid a man eight pice a day (little more than 2½*d.*) and a woman four, and they worked from daylight until dark, with an allowance of one hour for dinner.

The above data are gathered from places widely separated in the Poona and Ahmednuggur collectorates; and although in different years, are remarkable in their uniformity; they supply therefore just estimates for the general rates of wages, and it may be fairly stated that the highest money wages paid by the natives to any husbandry or domestic servant is four rupees per month, with which he finds his own food and clothes, and $2\frac{1}{2}$ rupees per month is the pay when the master supplies food and clothes; and the most favourable wages to a man day-labourer are eight pice per diem*, and to a woman five pice†.

Artificers' and servants' wages, and price of Bread-grains under the Peshwa's and British Governments.

Rates of hire for a month of thirty days of artificers, servants, and labourers in Dukhun, under the British government in 1828, and Peshwa's government in A. D. 1814.			Prices of grains, pulses, and other articles, the ordinary consumption of artificers, servants, labourers, &c. at Poona in Dukhun, under the Peshwa's government, being a mean of five years from 1811 to 1815, and under the British in 1828.		
Denomination of artificers, servants, &c.	Monthly Pay.		Grains, pulses, and other articles	Seers per Rupee	
	Under the British.	Under the Peshwa		Under the British, 1828.	Under the Peshwa, 1814.
	Rupees.	Rupees.		Seers.	Seers.
Maistry, or head carpenter.....	25, 35, 40	15	Rice, Putnee	16	12
			Do. Ambemor ..	13	9½
Second or under do.	23 & 25	12	Do. Rajawul....	14	12
Maistry, or head carpenter, finest worker.....	30, 35, & 45	15, 20, 40	Wheat, Buckshee	18	14 14/24
			Do. Potee	20	..
			Joaree (*Andropogon Sorghum*):	32	21⅓

* About 2¼d.

† About 1¾*d.*

Table continued.

Denomination of artificers, servants, &c.	Monthly Pay.		Grains, pulses, and other articles.	Seers per Rupee.	
	Under the British.	Under the Peshwa.		Under the British, 1828.	Under the Peshwa, 1814.
	Rupees.	Rupees.		Srs	Seers.
Carpenter, common worker ..	15 & 22½	12	Bajree (*Panicum spicatum*)	28	$17\frac{64}{100}$
Two Sawyers	15 & 22	8	Dhall (*Cytisus cajan*).....	16	$11\frac{86}{100}$
Maistry, or head smith....	25 & 30	20	Ghee (clarified butter)	2	1½ to 1¾
Smith	15 & 22½	12			
Head armourer....	30	20			
Armourer	15	12			
Fileman..... ..	15	12			
Hammerman	6, 8, & 13½	7½			
Maistry, or head leather worker	15	12			
Leather worker, harness maker	9¼	9			
Puckalee, or waterman	15	9			
Bricklayer	9¼, 12	10			
Head bricklayer, maistry	25 & 35	15 & 20			
Maistry, or head tailor, fine worker	15	14			
Tailor	9¼	6			
Man labourer	5 & 7	5			
Woman do.	3¾ to 7	3 to 4			
Boy do.	3¾	3			
Muccadum, or chief of Dooly bearers.	15 & 20	8			
Dooly bearers	7 to 9	6			
Horse keepers	8	5	Served two horses	under Peshwa.	
Camel men	7 to 9	5	Served two camels	Do.	
Tattoo, or pack pony per month, with driver	12	15			
Camel with driver.	30	30			
Puturwut stone-mason	..	12			
Bhooee Hamalls..	7, 8, & 9	6, 7, & 8			
Muccadum, or chief of Hamalls	15	10			

The above table shows a marked enhancement in the wages c classes of handicrafts and servants, although grain became from 20 per cent. cheaper under the British than under the Peshwa. I wages of the numerous servants of European gentlemen the sam vance has taken place. The superior cheapness in some grai extended to more than 100 per cent.

In the above notices the rupee has been considered equal to two shillings; the seer of weight equal to 1 lb. 15 oz. 8 drs. 18¾ grs. avoirdupois, or 2 lbs. 4 oz. 6 grs. troy; and the seer of capacity to 2lbs. 6 oz. 3 drs. 24 grs. 92 dec. avoirdupois of Jerwail rice; its cubic contents, 72 in. 2 dec. of water at a temperature of 75° Fahrenheit, at a temperature of 60° therefore being equal to 48 per cent. less than two imperial quarts, or very nearly one quart. Rigidly, the seer is 4·17 dec. per cent. larger than an imperial quart.

Manufactures.

Celebrated as was India for its costly and ingenious cotton fabrics, little more than the memory of them now remains. The machinery of England has enabled her manufacturers to take the raw material out of the hands of the grower, and return it to the continent of India, worked up in various ways, without even affording an opportunity for the application of a prop or stay to the sinking industry of its once flourishing manufacturing classes. As far as relates to Dukhun, its cotton and silk fabrics are confined to coarse dresses for women, tent-cloths, some silk handkerchiefs, and trifling pieces of silk for bosom cloths for women. From an examination of the cotton and silk goods for sale in the markets of Poona, in July 1829, it appeared that every product of the loom, without any exception, with any claim to notice from texture, costliness of material, or ingenuity in the design or workmanship, was an import into the collectorates from native states not under the British government. Turband cloths, varying in length from 24 to 60 cubits, in breadth from three-quarters to 1¼ cubits, and in price from one rupee up to sixty rupees each, were from Peytun, Bheer, Narrainpait, Tahr Putruh, Wuswunt, Nanderguon, and Shaghur, in the Nizam's dominions; Boorhanpoor and Jehanabad, in Seendeh's (Scindiah's) dominions, and Chundaree in Malwa, while those made in the city of Poona did not exceed three rupees each in value. The only valuable *Dotruhs* or loin cloths, in length from 20 to 22 cubits, breadth 2¼ to 2¾ cubits, and in price from 10 to 40 rupees, were from Muheshwur, in Malwa; the rest were from the Nizam's, Holkar's, and the Rajah of Berar's (Nagpoor) territories. Shahpoor and Belgaon, in the Dharwar collectorate, produced some loin cloths of the value of 25 rupees; those from Poona did not exceed three rupees in value. The *Dooputtehs* or *Shelehs*, cloths for throwing over the shoulder and enfolding the body, in value from 10 to 200 rupees, were from Peytun, Jehanabad, and Boorhanpoor; those from Poona were of the value of five rupees only.

Loogreh or Sarhehs*, varying in length from 13 to 20 cubits, in breadth from 1¼ to 2¼ cubits, and in price from 1½ rupee to 80 rupees, had a wider field of production, even Poona producing these dresses, from one or two looms only I believe, of the value of 80 rupees. New Hooblee, and Shahpoor, in the Dharwar collectorate, produced some dresses of the value of 30 rupees. *Cholkun* or bosom cloths are manufactured at the above places: the highest value of one would appear to be 10 rupees, and the lowest about three-pence. The silk handkerchiefs were chiefly from the Carnatic.

The price of the above articles is influenced partly by the colours, partly by the fineness of the fabric, but chiefly by the quantity of gold and silver thread worked up in them.

Some cotton carpets are manufactured at Ahmednuggur, and in the Jail at Poona, but do not call for notice.

Turbands are dyed of twenty-one colours, but I have not space to give the names; few or none of them are fast colours, with the exception of black and red.

The only woollen manufacture in the collectorates is that of a black smooth blanket, *(Kumlee)* the colour being that of the wool. In general the blanket is coarse, but there is a very fine fabric from Bijapoor. The low state of manufactures is otherwise attested by the fact that, in the Poona collectorate, in the population returns sent to me, the weavers only amounted to 0·35 per cent. of the people, or one weaver for every 280 souls; in Khandesh 0·57 per cent., or one to every 173 inhabitants; and in Dharwar 1·80 per cent., or one in 55 inhabitants, which is prodigiously above the other collectorates. I *estimate* the proportion in the Ahmednuggur collectorate to be the same as that in Poona.

Transit Duties.

The transit duties are farmed; the stations for collecting them are numerous; the rates, although fixed, are unjust, as they are not levied on uniform principles with respect to definite tracts of country. The Carrier is not only interrupted at irregular intervals by British stations, but the alienated towns, so numerously interspersed in the British territories, endeavour to levy duties; moreover, he is perplexed by the money claims of hereditary district officers upon the duties, independently of the customs-farmer's dues. How the conflicting interests are arranged I do not know; but they are so various and troublesome, that the merchant is commonly driven to the expensive necessity of contracting with

* Women's dresses.

a class of people, called *Hoondeekuree*, who undertake for a *fixed sum* to pass all the merchandize through a country to its destination, paying all duties; constant practice, adroitness, and bullying, enabling them to arrange with the collectors better than the merchant could.

All transit duties should be abolished; their amount in the interior of a country materially affects consumption, and is therefore injurious to trade.

Coins.

The only coins in use in Dukhun are silver rupees, half rupees, and copper pice. The rupees are of many mints, and have a different value in relation to the copper coin, resulting from the age of the rupee, and the number of punches or marks it may have on it made by the Shroofs or money-changers in passing through their hands*; the same rupee, of the same standard, and same mint, has not the same value *in copper* in neighbouring districts; this value fluctuates at the pleasure of the money-changers. On what principles they regulate the relative values I do not know. The multiplicity of coins of different mints, and the gradations of coins of the same mint, are great evils. It is unnecessary to enumerate these coins, as they are in the Bombay Almanac.

Weights and Measures.

A very considerable diversity prevails in every district, and often in neighbouring villages, in the weights and measures in use, whether of weight, length, or capacity; this diversity goes so far, that the subdivisions are often found not to be in a determinate proportion to each other. All this confusion is referrible to the want of an ancient permanent standard: to the abrasion or decay of the weights and measures tolerated by government, the knavery of the owners of the weights, and the apathy or connivance of the district authorities †. Everywhere the apparatus of metrology is characterized by clumsiness in construction: rough stones are commonly substituted for stamped metal weights, and joints of the hollow bamboo for authorized definite measures of capacity. The seer of weight was directed by the authorities at Poona and Ahmednuggur to be of eighty Ankoosee rupees, and such a weight may be in use where the district officers are located, but in very few other places. With respect to measures of capacity, not only has each village its own, but I might almost say that each shopkeeper has his own, for it is rare that the weights and measures of any two shopkeep-

* These marks occasion a depreciation of one or more per cent.

† So great are the discrepancies, that they range from 41 per cent. below to 100 per cent. above the Poona standard.

ers are identical; and when it does occur it must be referred to accident. Even the stamping of weights and measures by government officers has not been effectual to insure uniformity; for in a table that I drew up of the discrepancy between the weights and measures of some scores of places all over the country, very many of the weights and measures had the government stamp upon them.

One feature of the measures of capacity is, that, with some exceptions, those of villages are always larger than those of towns and cities. The extent to which this fraud has been carried in military cantonments and large bazaars immediately under British control, is shown in the fact of the reduction of the Serroor cantonment seer, one-twentieth below the standard of Poona city, one-fourth below the standard of Ahmednuggur city, and two-elevenths below the measures of neighbouring districts. But in Bombay it is still more glaring, the origin of whose weights and measures is unquestionably referrible to the Dukhun and Konkun; and yet the Bombay measure of capacity is 41 per cent. less than that of Poona, and about 33 per cent. less than that at Panwell in the Konkun, the nearest great mart to Bombay on the continent The diminution in the seer of weight in Bombay is even more striking. I found the standard seer of weight in the collector's office in Bombay to weigh 4970 grains troy only, while the Panwell seer weighed 13,110 grains, and the Poona seer weighed 13,800 grains, troy. The Panwell seer therefore was 163 per cent. and the Poona seer 177 per cent. larger than the Bombay seer. The knowledge of these facts is of importance to the European and native merchant, as well as to the general consumer.

The evil of a progressive diminution in the weights and measures of Dukhun is arrested in the cities of Poona and Ahmednuggur and the neighbouring cantonments, by standards being kept in the collectors' offices; but as they are not founded on any scientific principles by which they could be restored if lost or *lessened*, their safe custody is of great moment. The seer of weight is directed to be made of a certain number of pieces of the current silver coin, and can therefore be tested without difficulty; but there is not any test, saving the solitary standard in the collector's office, for the measure of capacity. It will be seen that I have given the weight of water of a certain temperature these measures contain, and this determination may be of use at a future period.

Grain measures.—The largest measure of capacity in use is the *Adholee*, of two seers; its name means "the half," it being the half of the *Puheelee*, of four seers, which is not in use. This measure is in the form of an hour-glass. I found the *Poona city* standard to contain 36,400 grains troy, of water, at a temperature of 75° Fahr., or 5 lbs. 3 oz. 3 dr. 5½ grs., or 144·4 cubic inches; and at a temperature of 60.

Fahr. it contained 36,462 grains troy, being 48 per cent. less than an imperial gallon, or very nearly two quarts; rigidly, the seer is 4·17 per cent. larger than an imperial quart. It is curious that the first subdivision of the *Adholee* is not one-half but one-fourth, or half a seer, a seer measure being very rarely in use; then a quarter of a seer, and finally, one-eighth.* In some places there are what are called male and female *Adholees*, one being a little larger than the other; retail traders buy with the largest and sell by the smallest. The multiples are 2 *Adholees* 1 *Puheelee* or 4 seers, 12 *Puheelees* 1 *Mun* (Maund), and 20 *Muns* 1 *Kundee* (Candy); but in some places there are 16 *Puheelees* to the *Mun*: and along the Ghâts, and in the Konkun, there are only 3½ seers to the *Puheelee*. Determined by the weight of the contents of the *Adholee* of well-dried Jerwail rice, the *Kundee* would be 20 cwt. 1 qr. 26 lbs. 10 oz. 12 drs. 16 grs. avoirdupois.

It is necessary to mention that the *flour* of *all grains* is sold by weight and not by measure.

Oil, spirits, and milk, are sold by different measures of capacity. These are all professedly founded on the seer of weight; but their discrepancies may well render it doubtful. At one place I found the seer of oil measure to contain 26 rupees' weight of water, at others, 66 rupees', 80 rupees', &c. The forms of these measures are various. The same observations apply to spirit measures. The seer of milk in one place contained 88 rupees' weight of water, in another 93, and elsewhere up to 109 rupees' weight.

Weights.—The standard seer of weight in Poona weighs 80 Ankoosee rupees or 13,800 grains troy, or 1 lb. 15 oz. 8 dwts. 18¾ grs. avoirdupois; but the most common seer in use in Dukhun is one of 76 rupees; the divisions are *Adh seer* (half), *Pao seer* (quarter), *Adh pao* or *Nowtank* (one-eighth), and *Chettank* (one-sixteenth). For the convenience of calculation, the seer is divided into 72 *tanks* or *tollahs*, and one-eighth, of course, is *Nowtank* or nine tanks, and one-sixteenth is *Sarhee chartank* or 4½ tanks, which is corrupted into *Chettank*. The multiples are *Panch seer* (five seers), the *mun* of 40 seers equal to 78 lbs. 13 oz. 11 drs. 11 grs. avoirdupois, or 95 lb. 10 oz. troy exactly; the *Pullah* of 3 *muns*, and the *Kundee* of 20 *muns*. But I have shown how far the weights really in use differed from the above, and in the tract lying between the Seena and Beema rivers, the weight called the *Bureedee* had not even the same constituents or multiples as the Poona weights.

* Sellers of sweetmeats have 1-16th of a seer.

Goldsmiths' weights.—The lowest goldsmiths' weight is nominally the mustard seed, but the lowest I met with was the *Goonj*, a seed of the *Abrus precatorius*, the mean weight of which was 1·91410 grains troy: 96 *goonj* make a *tollah*, which should therefore weigh 183·7536 grains troy; but as the *tollah* is the 72d part of a seer of 13,800 grains, it should weigh 191,666 grains troy; the goldsmiths' weights in use consequently are below the nominal standard. Eight *goonj* or four *waals** make one *massah*, and twelve *massah* one *tollah* I put the goldsmith's weights to the same test in different parts of the country, I did those of capacity, and found that two weights of the same denomination in different shops were seldom uniform. The scales used by goldsmiths are called *Kantah*, and are of metal; those used by dealers generally are called *Tajwa* or *Tagree*, and are made of leather or parchment.

Itinerary and Long Measures.—Distances between places are *estimated* by the *Kohs* (coss), I cannot say *measured*, for I believe the actual determination of distances between places was as little attended to by the native governments, as the facilitating communications through the country by the construction of roads and bridges. I *think* the *Kohs* averages about two miles English, varying, however, from 1½ to 2½ miles. In Mahratta writings long measure is raised from the barleycorn: 8 *Juw* or barleycorns make a *Boht* or finger, 24 fingers a *Haht* or cubit, (18 inches), 4 cubits a *Dunoosh* (a bow) or fathom, measured by a man's outspread arms, and 8000 cubits or 2000 fathoms a *Kohs*. The *Kohs* therefore would equal 2½ English miles and 40 yards. In Sanscrit 2 *Kohs* make a *Guwyotee*, and 2 of the latter make a *Yojun* or 9 miles and 160 yards: but these terms are unknown to the common people. In fact, however, the measure of length originates in the well-known *Haht* or cubit, determined by the *mean length* of five men's arms, measured from the elbow-joint to the end of the middle finger: the *Haht* or cubit so determined, is a little more than 18 inches in length; this is divided into 2 *Weets* or spans, into 6 *Mooshtees* or fists, and each fist into 4 *Bohts* or fingers, and the latter into 8 barleycorns each. Tailors and sellers of cloth use a *Guj*, which is divided into 16 *Ghirra*, each of 1¼ *Tussoo*, each *Tussoo* of 2 *Bohts*, and as each *Boht* is equal to a fraction more than ¾ of an inch, the *Guj* would be a little more than an English yard.

Superficial Measure.—The only land measure of any exact and appreciable extent is the Beegah, which is of Moosulman derivation, but by some referred to the Sanscrit word *Weegruhuh*, although this word is not applied to land measurements; and as all genuine Mahratta terms

* Waal is the seed of the Cæsalpinia sappan.

applied to the capacity, extent, or capabilities of land, are not referrible to the Beegah or its multiples, I must consider the Beegah of Moosulman introduction. Like itinerary measures, it is raised from the *Haht* or cubit of a fraction more than 18 inches in length; 5 *Hahts* and 5 *Mooshtees* (fists or palms) make 1 *Kattee* or stick, 20 square *Kattees* or sticks make 1 *Paand*, and 20 *Paands* a *Beegah*; reduced to English measurements, the 5 *Hahts* and 5 *Mooshtees* will be equal to 105 inches in length, and the square of this sum will be 11,025 inches in a square *Kattee* or stick, and 20 *Kattees* a *Paand* equal to 220,500 inches, and 20 *Paands* a Beegah or 4,410,000 square inches; and as the English statute acre contains 43,560 square feet, the Beegah is to the acre as 70½ is to 100, or as 211 to 300, being a trifle more than seven-tenths of an acre. But as the *Haht* or cubit is a fraction more than 18 inches, the Beegah may fairly be considered equal to three-fourths of an acre: but I very much doubt whether any other than garden lands were actually measured by the Moosulmans; and in converting the Hindoo terms *Kuncee*, *Mun*, *Doree*, and fifty other denominations, into Beegahs, it was done by *estimate*; and this explanation will account for the variable size of the Beegah in different parts of the country, which the British survey has discovered. The only multiples of the Beegah, to my knowledge, are the *Rookeh* of 6 Beegahs or 4½ acres, and the *Chahoor* of 120 Beegahs or 90 acres: these terms are of Moosulman origin.

Adverting to the past and present state of the knowledge of native governments in politics, political economy and science, it would be idle to refer the origin of their weights and measures to scientific principles, immutable standards, or even to any uniform, although arbitrary system. Their long measure is derived from the human arm, and their weights from a seed. In these derivations they have not been a whit more irrational than the good people of England, whose standard measure of length, the *Ulna* or *Ell*, is derived from the arm of one of their kings, (Henry the First), and their weights from grains of wheat. There is a great coincidence between the native weights and measures and those of antiquity. The first five subdivisions of the scripture measures of length are identical in their derivation, and nearly so in their length, with those of Dukhun; namely, the finger, fist or palm, span, *Haht* or cubit, and fathom; both also have the coincidence of being destitute of a measure equivalent to a foot. The foot was a constituent of the ancient Greek and Roman measures; but in *practice* these nations used the finger, palm, and cubit; and the *Pecus* or great cubit of the Greeks was precisely of the length of the Dukhun cubit, namely, a fraction more than 18 inches.

The ancient grain and liquid measures of England were raised from weight from a pound troy. For a very long period I had believed the measures of capacity in Dukhun to be entirely arbitrary: but in the southern part of the country between the Seena and the Beema rivers, I met with *Adholees* with *stamps* on them, directing that they should contain a *certain weight* of grain: for instance, at Punderpoor the *Adholee* was to contain as much *Johr Guhoon* (wheat), as would weigh 200 Ankoosee rupees, at Mohol 160 rupees' weight of Joaree (*Andropogon Sorghum*), at Taimbournee 131 rupees' weight of Joaree, and at Kothool, near to Ahmednuggur, 200 Ankoosee rupees' weight of Bajree (*Panicum spicatum*). I know not whether this slight indication of systematic deduction of measures of capacity from those of weight is attributable to the Moosulmans or to the Hindoos. The places where they were met with, with one exception, had until recently, been for ages under a Moosulman government (the Nizam's), but it might have been practised before the arrival of the Moosulmans. It does not appear to have occurred to the natives to use the weight of water, as the least changeable standard by which to fix the capacity of a measure.

Army.—The army consists of some of the royal troops paid by the India Company; of European regiments of artillery and infantry belonging to the Company, and of native regiments of cavalry, infantry, and pioneers, armed, clothed and disciplined in the same manner as the European troops. The army is separated into divisions commanded by General Officers and Brigadiers-General, and the divisions are divided into brigades, which are so stationed as to co-operate in the readiest and most efficient manner in emergencies, for the protection of the country and the maintenance of the civil power.

Justice.—Not having been able to get blank forms filled up at the India-House with the necessary data respecting crimes and punishments, I abstain from any notice of judicial matters.—*Report of the Seventh Meeting of the British Association for the advancement of Science.*

X.—Literary and Scientific Intelligence.

Our meteorological correspondents will be glad to learn that their observations are valued and will be turned to account by Sir John Herschel, who thus writes to us from Hanover, under date 24th July 1838.

"When I left the Cape, I desisted from the further prosecution of the solsticial and equinoxial observations, but my best thanks are due to all those gentlemen who have supplied me with corresponding observations, and it will be one of my first objects, so soon as I shall be returned to England and in possession of *a fixed residence*, as well as of all my papers, and of some degree of leisure, to enter upon the task of their arrangement and reduction—to do justice, in so far as in me lies, to the great zeal and ability manifested in the communications of the observations which have reached me from various quarters.

"I regret to say, however, that the stations at which these observations have been made have neither been sufficiently numerous, nor (except in some few cases) the observations at each sufficiently continuous, to enable me to draw any *general* conclusions from them. Beyond the latitudes +40 and — 40, indeed, as I have already taken occasion to state in a circular addressed to all my meteorological correspondents, the *epochs* themselves are not sufficiently numerous; and to be of service the observations would require to be prosecuted monthly instead of quarterly, and pursued for many successive years, in stations systematically distributed.

"In India, where the meteorology is more simple and determinate, even a single year's series, is capable of affording interesting information, and I shall therefore be very glad to see the observations to which you allude, as being made at three stations* in Southern India. In all cases I would recommend that such observations should be published in the scientific Journals most accessible at the points where they are made. The transmission of MSS. is hazardous and circuitous, and there is a great advantage in placing the data on which theories are to be grounded as early and extensively as possible before *the public*."

* Madras—Trevandrum—and Hoonsoor. We regret that we have not received them from the latter station since March 1838.—Editor.

The Reverend William Taylor, Collator and Examiner of the Mackenzie MSS. has sent in his 5th report, the 6th and 7th being under preparation. He concluded his labours in January last, which have been carried on with industry and ability highly creditable to him. He has furnished five magnificent folio volumes of restored manuscripts, indicated in the course of his reports; each of them consisting of between 7 and 800 pages, which are really beautiful specimens of native caligraphy, in various languages, on the best English paper, and handsomely and substantially bound in green Morocco leather. The style of getting these volumes up, is entirely the spontaneous offspring of Mr. Taylor's liberal mode of executing his task, which pledged him to nothing but a simple transcript of the injured MSS. We hope to be able to introduce at a future period a more elaborate notice of Mr. Taylor's labours; with some critical examination into the intrinsic value of these far-famed and costly (though, we believe, much over-rated), oriental manuscripts.

XI.—*Horary Meteorological Observations made agreeably with the suggestions of Sir* John Herschel.

1st.—At the Madras Observatory.—By T. G. Taylor, Esq. *H. E. I. C. Astronomer.*

1839	Time.	Barometer.	Thermometer.		Wind.	Remarks.
			Dry.	Wet.		
		In.	°	°		
Mar. 21	6 A.M.	30.054	82.0	77.6	N. W.	Gentle wind, thick haze.
	7 ,,	.078	80.4	77.5	W.	do. do.
	8 ,,	.100	82.3	78.1	N. W.	do. do.
	9 ,,	.116	83.4	78.5	do.	do. breeze, flyg. clds.
	10 ,,	.100	84.7	76.8	do.	do. do.
	11 ,,	.068	86.3	78 0	S. E.	Moderate wind, flyg. clds.
	12 ,,	.034	87.8	76.4	S. E.	do. flyg. clds.
	1 P.M.	.004	88.0	77.5	S. E.	do. do.
	2 ,,	.000	87.9	77.9	S. E.	Strong wind, clear.
	3 ,,	29.984	87.7	79.0	E. by S.	do. do.
	4 ,,	.966	87.8	78.9	E. N. E.	do. do.
	5 ,,	.960	86.0	77.5	E. N. E.	do. do.
	6 ,,	974	84.2	77.4	N. E.	do. do.
	7 ,,	30.002	83.6	77.0	S. E.	do. haze.
	8 ,,	.036	83.0	77.0	S. E.	do. cloudy lightning to the west.
	9 ,,	.028	82.8	77.0	E.	do. do. do do.
	10 ,,	.050	82.8	77.0	E.	Gentle wind do. do.
	11 ,,	.038	82.0	77.0	S. E. E.	do. clear.
	12 ,,	.026	81.5	76.7	E.	do. flyg. clouds
	1 A.M.	.002	81.8	77.5	——	Calm, cloudy.
	2 ,,	.002	80.5	76.5	——	do. do.
	3 ,,	.000	79.8	76.2	N. W.	Gentle wind—clear.
	4 ,,	29.980	79 8	75 5	W.	do. do.
	5 ,,	.960	79.6	75.2	W.	do. do.
	6 ,,	.976	76.7	74.6	W.	do. do.
	7 ,,	30.002	77.5	75.7	——	Calm do.
	8 ,,	.010	81.3	77.1	S. W.	Gentle wind, do.
	9 ,,	.054	83.5	77.3	W.	do. flyg. clouds
	10 ,,	.066	85.0	76.9	N. E.	Breeze do.
	11 ,,	.054	86.7	77.6	E.	Gentle wind, do.
	12 ,,	.032	87.6	77.1	E.	Strong wind, clear.
	1 P.M.	.000	88.3	75.9	E.	Moderate wind, do.
	2 ,,	29.985	89.0	74.5	E.	do. do.
	3 ,,	.964	88.0	76.5	S. E. by E.	do. do.
	4 ,,	.950	86.5	77.5	do.	do. do.
	5 ,,	.952	85 5	77.0	do.	do. do.
	6 ,,	.954	84.0	76.5	do.	do. do.

2d.—*Horary Meteorological Observations made at the Vernal Equinox* 1838, *at the Trevandrum Observatory.*—*By* G. SPRESCHNEIDER, *Superintendent.*

Date.	Hour.	Newmann's Standard bar. corrected (sufficiently) for capillarity.	Standard ther.	Depress. of wet bulb thermometer.	Temp. of dew point.	Direction of wind.	Velocity of the wind.	Solar radiation.	Clouds, aspect of the sky, and remarks.
March									
21	6 A. M.	29.725	73.5	3.7	68.22	s s by s	3		Sky covered with thick haze—gentle wind.
	7	.747	73.6	3.2	7 .45	do		0.8	Light clouds in the sea. cum. in the N. E. horizon calm.
	8	.756	79.6	5.5	71.24	do		2.0	Zen. clear cum. strata in ho. ho.
	9	.75	83.7	9.6	69.76	do		1.5	do. do. do.
	10	.77	86.0	12.9	69.33	s w	3	5.5	do. do. gentle wind.
	11	.756	90.3	14.2	69.96	do	3	6.0	do. do. do.
	Noon.	.72	90.0	12.9	71.79	do	3	10.0	do. do. pleasant Breeze
	1 P. M.	.70	90.0	14.3	69.38	do	3	6.3	do. cum. about hor. thunder in the E. do.
	2	.63	86.5	14.6	68.06	s s w	6	11.3	do. do. pleasant wind
	3	.65	86.2	13.6	69.61	s w	6	11.3	do. do. do. decreasing
	4	.65	86.1	12.7	69.66	do	4	3.3	do. do. gentle wind.
	5	.65	86.5	10.9	70.92	do	2	1.0	Zen. rather clear, rest cumuly—wind just perceptible.
	6	.69	84.7	9.6	70.94	do	2		do. thick cum. about hor. do.
	7	.76	84.2	9.6	71.56	do	2		Sky very cumuly, lightning continued.—halo round the moon.
	8	.73	83.7	7.6	72.09	do			do. drizzling calm.
	9	.73	83.7	7.9	72.01	s w	1		do. do. light air.
	10	.74	82.6	6.9	73.05	do	—		do. calm.
	11	.76	81.3	5.1	73.62	do	—		Sky becoming clear sheet lightning in the S. S. E. calm.
	Mid.	.73	79.4	4.6	72.46	s s e	1		Zenith pretty clear. cum. about horizon. nearly calm.
22	1 A. M.	.69	79.4	3.9	74.06	do	—	No observation.	Sky in general clear. sheet lightning in the S. calm.
	2	.69	79.2	3.9	73.79	do	—		do do. continued do.
	3	.69	79.2	3.4	73.89	do	—		Sky getting cloudy do.
	4	.67	77.4	3.1	74.42	s s by e	1		Sky rather clear do.
	5	.66	76.1	2.3	74.86	do	—		Overcast and threatening do.
	6	.72	76.5	2.4	75.06	do	—		Zen. rather clear rest cloudy do.
	7	.75	77.9	3.1	74.86	do	—	3.0	do. do do.
	8	.75	81.5	3.4	75.22	do	—	—	do. do. do.
	9	.77	84.1	4	74.9	do	—	—	Sky very cloudy do. do.
	10	.77	86.5	4	74	s by e	—	2.0	do light air
	11	.75	87.5	4.5	72.86	s w by w	3	5.0	Cirrus dispersed gentle wind.
	Noon.	.74	86.9	12.2	73	w	3	—	Cloudy do.
	1 P. M.	.68	86.1	13.5	71.56	w s w	4	3.0	do. pleasant wind.
	2	.68	87.0	13.5	72.46	s w	4	3.3	Zen. clear, rest becoming cloudy do.
	3	.70	86.7	13.7	72.41	do	3	4.3	do. gentle wind.
	4	.65	86.5	14.4	72.59	do	4	4.0	do. do. do. thunder in the N. E. pleasant wind.
	5	.65	84.9	5.9	72.5	do	3	—	Sky covered with thick clouds, and threatening, gentle wind.
	6	.65	84.0	5.3	72.26	do	3	—	do. do. do

METEOROLOGICAL REGISTER KEPT AT THE MADRAS OBSERVATORY, FOR THE MONTH OF JANUARY, 1839.

Days.	Barometer at			Ther. at			Wet Bulb.			Rain.		Evaporation.	Direction of Wind.			Weather.			Remarks.
	10 A. M.	4 P. M.	10 P. M.	10 A. M.	4 P. M.	10 P. M.	10 A. M.	4 P. M.	10 P. M.	Sun-rise.	Sun-set.		10 A. M.	4 P. M.	10 P. M.	10 A. M.	4 P. M.	10 P. M.	
1839	Inch.	Inch.	Inch.	o	o	o	o	o	o										
Jan. 1	30,126	30,036	30,086	78,2	78,6	78,2	4,7	5,6	5,2	.....	.....	.....	N	N E	N E	Clear	Fl. cl.	Fl. cl.	
2	,100	,032	,082	77,7	79,6	76,2	5,3	5,9	5,3	.....	.....	1,794	E	S E	E	Clear	Fl. cl.	Fl. cl.	
3	,108	,038	,122	76,9	78,8	76,0	7,7	6,8	5,7	.....	.....	.....	N E	E	E	Fl. cl.	Fl. cl.	Fl. cl.	
4	,124	,054	,130	76,8	80,0	76,7	4,4	7,0	5,0	.....	.....	.....	N	N E	N E	Fl. cl.	Fl. cl.	Clear	Dew.
5	,142	,058	,108	78,9	80,5	76,3	6,0	7,0	4,5	.....	.....	.....	E S E	E N E	N E	Clear	Clear	Clear	Dew.
6	,120	——	,092	77,8	—	76,0	4,8	—	4,9	.....	.....	.....	N	——	N	Fl. cl.	——-	Fl. cl.	Dew.
7	,127	,040	,090	76,5	79,7	76,5	4,5	8,2	5,1	.....	.....	.....	N	N E	N E	Fl. cl.	Clear	Fl. cl.	——
8	,126	,044	,110	77,4	79,4	76,9	5,0	7,9	7,0	.....	.....	.....	N N E	N N E	N E	Fl. cl.	Fl. cl.	Fl. cl.	Dew.
9	,114	,014	,078	77,0	79,0	76,7	5,0	7,5	5,2	.....	.....	2,114	N E	N E	N E	Th. hz.	Th. hz.	Fl. cl.	——
10	,078	,004	,082	77,2	80,0	76,6	5,9	8,3	6,6	.....	.....	.....	E	E	E	Fl. cl.	Clear	Clear	Dew.
11	,106	,006	,068	76,7	80,0	75,7	5,8	8,8	6,7	.....	.....	.....	E	E	E	Haze	Clear	Fl. cl.	——
12	,074	29,950	,022	76,8	80,5	75,7	6,5	8,8	5,4	.....	.....	.....	N W	E	S E	Clear	Clear	Clear	Dew.
13	,056	——	,044	77,7	—	77,6	5,7	——	5,7	.....	.....	.....	S	——	S E	Fl. cl.	——-	Clear	Dew.
14	,100	30,010	,082	77,7	81,0	78,3	8,4	6,0	3,6	.....	.....	.....	N E	E	S E	Fl. cl.	Clear	Fl. cl.	Dew.
15	,120	,018	,094	80,2	81,8	78,7	3,7	5,8	3,3	0,087	.....	.....	E S E	E S E	S E	Fl. cl.	Fl. cl.	Fl. cl.	Dew.
16	,110	,016	,056	80,5	82,8	79,5	3,7	5,8	3,4	.....	.....	1,896	S E	S S E	S E	Fl. cl.	Clear	Clear	Dew.
17	,096	,018	,072	80,9	82,8	80,0	3,8	5,8	3,7	.....	.....	.....	S	S S E	S E	Fl. cl.	Clear	Fl. cl.	Dew.
18	,106	,020	,042	80,7	83,0	79,7	3,3	5,5	4,9	.....	.....	.....	S	S E E	S E	Fl. cl.	Clear	Clear.	Dew.
19	,082	29,996	,032	80,6	83,5	79,7	4,1	6,0	3,7	.....	.....	.....	S W	S	S	Clo.	Clear	Clear.	Dew.
20	,055	——	,042	81,0	—	80,0	4,5	—	2,8	0,047	.....	.....	S	——	S SE	Fl. cl.	——-	Clo. in the ho.	
21	,056	29,990	,038	81,7	83,0	80,1	4,4	5,3	3,2	.....	.....	.....	S	S S E	S S E	Fl. cl.	Clear	Fl. cl.	
22	,100	30,000	,066	81,2	83,0	81,7	3,7	5,0	4,2	.....	.....	.....	SE by S	S	S E	Fl. cl.	Clear	Fl. cl.	Lightning.
23	,100	,002	,072	81,9	83,0	79,7	6,4	6,5	4,8	.....	.....	2,134	S E	S E	E S E	Fl. cl.	Clear	Fl. cl.	Do.
24	,152	,108	,172	81,8	80,8	78,8	5,2	4,8	4,6	.....	.....	.....	E	E	E	Fl. cl.	Clo.	Rain	Do.
25	,194	,088	,148	79,4	80,8	78,7	5,4	6,6	3,6	2,981	.....	.....	N E	N E	N E	Clo.	Clear	Fl. cl.	Do.
26	,172	,068	,144	79,7	80,0	77,7	5,1	7,2	6,2	0,227	.....	.....	N E	E N E	N E	Clear	Clo.	Fl. cl.	Dew.
27	,178	——	,186	78,3	—	77,6	6,8	—	7,5	.....	.....	.....	E	——	N E	Fl. cl.	——-	Fl. cl.	Do.
28	,206	,126	,208	78,8	79,8	78,1	6,8	8,1	5,2	.....	.....	.....	N. E.	N E	N E	Fl. cl.	Fl. cl.	Fl. cl.	Do.
29	,224	,144	,202	79,3	80,8	78,5	6,8	7,9	6,9	.....	.....	.....	N N E	E N E	N E	Fl. cl.	Fl. cl.	Fl. cl.	Do.
30	,224	,106	,200	80,0	81,0	78,6	6,1	7,5	4,5	.....	.....	2,324	E N E	E N E	N E	Fl. cl.	Clo.	Fl. cl.	—
31	,196	,094	,142	80,5	81,9	78,2	5,9	6,9	5,7	.....	.....	.....	E N E	E	E	Fl. cl.	Fl. cl.	Fl. cl.	—
Mean	30,125	30,040	30,100	79,0	80,9	78,0	5,3	6,8	5,0										

METEOROLOGICAL REGISTER KEPT AT THE MADRAS OBSERVATORY FOR THE MONTH OF FEBRUARY 1839.

Days.	Barometer at 10 A. M.	Barometer at 4 P. M.	Barometer at 10 P. M.	Ther. at 10 A. M.	Ther. at 4 P. M.	Ther. at 10 P. M.	Wet Bulb. 10 A. M.	Wet Bulb. 4 P. M.	Wet Bulb. 10 P. M.	Rain. Sun-rise.	Rain. Sun-set.	Evaporation.	Direction of Wind. 10 A. M.	Direction of Wind. 4 P. M.	Direction of Wind. 10 P. M.	Weather. 10 A. M.	Weather. 4 P. M.	Weather. 10 P. M.	Remarks.
1839	Inch.	Inch.	Inch.	o	o	o	o	o	o										
Feb 1	30,160	30,072	30,136	78,8	80,0	78,2	6,0	7,5	6,1	.....	.....	.....	E. N E	N E	N E	Fl. cl.	Cloudy	Fl. cl.	Dew.
2	,144	,068	,134	78,0	80,0	77,6	5,4	7,8	6,6	.....	.....	.....	E	E. N E	N E	Fl. cl.	Fl. cl.	Fl. cl.	Do.
3	,156	—	,128	79,2	—	78,1	7,1	—	7,1	.....	.....	.....	E	——	N E	Fl. cl.	——	Haze	Do.
4	,126	,050	,092	79,7	80,6	78,2	7,1	7,1	5,8	.....	.....	.....	E	E	E	Clear	Clear	Clear	Do.
5	,112	,030	,100	78,3	80,5	78,0	4,7	7,5	4,5	.....	.....	.....	N E	E	N E	Fl. cl.	Th. hz	Fl. cl.	——
6	,128	,042	,132	79,7	81,5	79,8	6,2	7,5	5,3	.....	.....	2,283	N. N E	E	E	Haze	Haze	Fl. cl.	——
7	,158	,070	,150	79,1	79,7	79,2	4,0	5,7	5,9	.....	.....	.....	N E	N E	E	Fl. cl.	Cloudy	Fl. cl.	——
8	,150	,062	,140	79,0	80,0	78,2	5,5	6,0	5,1	.....	.....	.....	E	E. N E	E	Fl. cl.	Fl. cl.	Fl. cl.	Dew.
9	,102	,042	,062	79,7	80,8	80,0	5,2	5,8	5,4	.....	.....	.....	E	E	E	Fl. cl.	Clear	Cloudy	——
10	,102	,016	,082	81,1	82,8	79,7	5,6	7,8	4,3	.....	.....	.....	S	E	E	Fl. cl.	Clear	Clear	Dew.
11	,084	,014	,082	80,8	82,2	78,4	5,3	7,2	4,9	.....	.....	.....	S E	E	E	Fl. cl.	Clear	Clear	Heavy dew.
12	,084	29,992	,024	79,2	82,0	76,3	3,7	7,0	4,9	.....	.....	.....	S W	E	E	Fl. cl.	Clear	Clear	Do. do.
13	,028	,938	29,982	79,0	82,0	77,3	5,0	6,0	3,4	.....	.....	2,108	S	S E	S W	Clear	Clear	Clear	Do. do.
14	,010	,954	30,012	79,4	82,5	77,8	5,4	5,5	4,5	.....	.....	.....	S W	S E. E	S	Clear	Clear	Clear	Do. do.
15	,046	,955	29,976	79,1	83,0	78,1	5,9	8,0	4,6	.....	.....	.....	S	S E	S E	Clear	Clear	Clear	Do. do. *along shore,*
16	,014	,942	,994	80,5	83,8	79,1	5,5	7,8	3,0	.....	.....	.....	S E	S E	S E	Clear	Clear	Clear	Do. do. [wind com-
17	,020	,945	30,000	82,5	85,2	80,1	6,5	8,7	2,8	.....	.....	.....	S W	S	S E	Clear	Clear	Clear	[mences.
18	,070	,988	,082	83,5	84,4	80,9	6,5	6,4	3,7	.....	.....	.....	S E	S. S E	S E	Clear	Clear	Clear	Dew.
19	,110	30,020	,096	82,0	84,0	79,8	6,4	7,5	4,3	.....	.....	.....	S. S E	S E	S E	Clear	Clear	Clear	Do.
20	,146	,054	,110	79,9	82,2	78,3	4,9	7,7	5,9	.....	.....	2,434	S E	S E	S	Fl. cl.	Haze	Clear	Do.
21	,172	,068	,134	80,0	83,0	76,7	8,9	10,0	5,0	.....	.....	.....	E	S E	S	Clear	Clear	Clear	Do.
22	,178	,078	,150	80,0	82,0	78,1	7,6	9,3	6,0	.....	.....	.....	E	E	E	Fl. cl.	Fl. cl.	Fl. cl.	Do.
23	,154	,054	,130	78,6	81,0	75,8	7,1	8,0	4,3	.....	.....	.....	S E	E	E	Fl. cl.	Th. hz.	Clear	Heavy dew.
24	,150	=	,100	78,1	—	75,6	5,1	—	5,2	.....	.....	.....	S W	——	E	Clear	——	Clear	Do. do.
25	,116	,022	,086	78,2	83,0	76,0	4,0	7,5	4,1	.....	.....	.....	E	N E. E	E	Clear	Clear	Clear	Do.
26	,090	22,996	,030	77,7	82,2	79,1	4,8	6,6	4,8	.....	.....	.....	W	E	E	Fl. cl.	Clear	Clear	Do.
27	,036	,954	,000	80,3	83,8	79,1	5,8	8,3	5,6	.....	.....	2,147	S	E. S E	E	Clear	Clear	Clear	
28	,072	,968	,054	80,0	83,6	80,1	5,9	8,1	5,1	.....	.....	.....	S E	E. S E	E	Clear	Clear	Clear	
Mean	30,104	30,016	30,077	79,7	82,1	78,3	5,8	7,0	4,9										

METEOROLOGICAL REGISTER KEPT AT THE MADRAS OBSERVATORY, FOR THE MONTH OF MARCH, 1839.

Days.	Barometer at 10 A. M.	Barometer at 4 P. M.	Barometer at 10 P. M.	Ther. at 10 A. M.	Ther. at 4 P. M.	Ther. at 10 P. M.	Wet Bulb. 10 A. M.	Wet Bulb. 4 P. M.	Wet Bulb. 10 P. M.	Rain. Sun-rise.	Rain. Sun-set.	Evaporation.	Direction of Wind. 10 A. M.	Direction of Wind. 4 P. M.	Direction of Wind. 10 P. M.	Weather. 10 A. M.	Weather. 4 P. M.	Weather. 10 P. M.	Remarks.
1839	Inch.	Inch.	Inch.	o	o	o	o	o	o										
Mar. 1	30,108	29,984	30,082	81,8	84,0	80,2	7,3	9,0	6,5	.....	.....	.....	SE	SE	E	Clear	Clear	Clear	Dew.
2	,034	30,009	,078	81,2	83,7	80,2	6,7	8,0	5,6	.....	.....	.....	NW	E	E	Clear	Haze	Clear	Dew.
3	,124	——	,068	81,8	——	80,3	6,4	——	4,7	.....	.....	.....	NE	——	E	Fl. cl.	——	Fl. cl.	Dew.
4	,118	30,004	,068	80,1	82,5	81,3	3,5	5,5	3,8	.....	.....	.....	N	NE	NE	Cloudy	Cloudy	Cloudy	
5	,106	29,990	,078	82,2	84,5	81,6	3,5	5,0	3,5	.....	.....	.....	NE	E	E. NE	Cloudy	Cloudy	Fl. cl.	Few drops of rain.
6	,092	,982	,070	82,7	84,6	81,7	4,7	6,1	5,3	.....	.....	1,949	E	E. SE	SE	Fl. cl.	Fl. cl.	Clear	Dew.
7	,070	,958	,016	82,6	84,7	80,7	5,2	6,2	4,2	.....	.....	.....	E	E. SE	SE	Fl. cl.	Clear	Clear	Dew.
8	,086	,970	,034	82,0	85,0	80,9	6,1	7,5	4,5	.....	.....	.....	SE	S	S	Fl. cl.	Clear	Haze	Dew.
9	,098	,950	,004	82,5	86,0	82,0	5,5	7,0	3,5	.....	.....	.....	SW	S	SE	Clear	Clear	Clear	Thick fog.
10	,032	——	29,952	83,4	——	81,8	5,4	——	4,6	.....	.....	.....	SW	——	SE	Clear	——	Clear	Dew.
11	,012	,918	,972	83,6	87,4	82,4	7,0	9,1	7,3	.....	.....	.....	SW	S. SE	S	Clear	Clear	Clear	Dew.
12	,028	,934	30,000	84,1	87,0	82,1	7,5	9,0	3,4	.....	.....	.....	SW	SE	S. SE	Clear	Clear	Clear	Dew.
13	,054	,956	,038	84,3	86,0	82,0	6,8	8,1	5,1	.....	.....	2,701	SW	S. SE	S	Clear	Clear	Fl. cl.	Dew.
14	,080	,974	,056	84,9	85,0	80,8	7,9	7,0	5,6	.....	.....	.....	SW	SE	SE	Clear	Clear	Clear	Dew.
15	,110	30,008	,100	83,3	84,2	80,3	7,3	6,2	5,0	.....	.....	.....	SW	E. NE	SE	Clear	Clear	Clear	Dew.
16	,160	,050	,108	82,3	84,6	80,2	7,4	7,6	6,5	.....	.....	.....	E	E. SE	SE	Fl. cl.	Clear	Clear	Dew.
17	,106	——	,070	82,7	——	81,4	7,1	——	5,0	.....	.....	.....	SE	——	E	Clear	——	Fl. cl.	Dew.
18	,128	29,988	,074	83,2	85,8	82,5	7,8	5,8	4,1	.....	.....	.....	SE	E. SE	SE	Clear	Fl. cl.	Clear	Lightning to the S. E.
19	,106	30,024	,070	85,2	85,0	84,0	5,7	5,0	4,5	.....	.....	.....	E	SE	SE	Cloudy	Cloudy	Fl. cl.	Do. do.
20	,124	,020	,088	85,6	84,6	84,1	6,8	5,1	5,1	.....	.....	2,741	SE	E. NE	SE	Fl. cl.	Cloudy	Fl. cl.	Do. do.
21	,100	29,963	,050	84,7	87,8	82,8	7,9	8,9	5,8	.....	.....	.....	NW	E. NE	E	Fl. cl.	Clear	Cloudy	Do.
22	,036	,950	,022	85,0	86,5	83,6	8,1	9,0	8,0	.....	.....	.....	NE	SE by E	SE	Fl. cl.	Clear	Clear	Dew.
23	,058	,980	,062	84,3	86,5	83,7	7,1	8,2	6,1	.....	.....	.....	S	SE	SE	Clear	Clear	Clear	Dew.
24	,032	——	,072	84,1	——	84,5	7,9	6,5	6,8	.....	.....	.....	SW	——	SE	Clear	——	Clear	Dew.
25	,082	,972	,013	84,0	89,0	84,1	7,0	9,6	8,0	.....	.....	.....	SW	E. SE	SE	Clear	Clear	Clear	Dew.
26	,032	,940	29,994	84,5	87,8	83,0	12,0	9,6	6,5	.....	.....	.....	SW	S. SE	SE	Clear	Clear	Clear	Dew.
27	,020	,918	,972	84,1	86,0	78,2	9,1	8,0	5,8	.....	.....	3,288	SW	S. SE	SW	Clear	Clear	Clear	Dew.
28	29,992	,914	,988	82,8	87,0	82,2	10,2	7,5	4,2	.....	.....	.....	SW	S. SE	SW	Clear	Clear	Clear	Dew.
29	,994	,910	,968	84,0	86,5	82,2	7,5	7,5	3,2	.....	.....	.....	S	S. SE	S	Clear	Clear	Clear	Dew.
30	,978	,894	,950	83,8	87,0	82,1	8,7	7,8	3,9	.....	.....	.....	SW	S	SE	Clear	Clear	Clear	
31	30,012	——	30,000	84,0	——	82,2	7,8	——	4,6	.....	.....	.....	SW	——	S. SE	Clear	——	Clear	
Mean	30,072	29,967	30,036	83,3	85,7	81,9	7,1	7,8	5,2										

The Instruments with which the foregoing observations are made, are placed in the Western Verandah of the Honourable Company's Observatory; are about 5 feet above the surface of the ground, and 27 feet above the level of the Sea.

The barometer employed is No. 1, one of two Standards which I had constructed at the end of the year 1836, to supply the place of those broken during the storm: the indications set down are those immediately read off from the instrument, and consequently require in addition to the ordinary correction for temperature, the correction +,051 for capillarity: from a late comparison of these with a magnificent standard by Newman which had been constructed with all the advantages of modern improvement for the Trevandrum Obsesvatory, it appeared that when *corrected for capillarity*, the

Trevandrum Standard stood at.....30,000 inches.
the Madras..... .....No. 1.....30,001 do.
No. 2.....29,993 do.

The thermometer was made on purpose for the Observatory, and at 72° (the only point at which a comparison has been made) it was found to differ insensibly from the Royal Society's Standard:

	h.	*m.*	*s.*	
Longitude.....	5	21	8	E.
Latitude.....	13°	4′	8″,5	N.

T. G. TAYLOR,
H. C. Astronomer.

THE

MADRAS JOURNAL

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LITERATURE AND SCIENCE,

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OF THE

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EDITED BY

ROBERT COLE, Esq.

MADRAS MEDICAL ESTABLISHMENT,

AND

C. P. BROWN, Esq.

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CONTENTS.

MADRAS JOURNAL

OF

LITERATURE AND SCIENCE.

No. 24—*July* 1839.

I.—*Fifth Report of progress made in the Examination of the* MACKENZIE MSS., *with an Abstract Account of the Works examined.—By the Rev.* WILLIAM TAYLOR, *Member of the Madras Literary Society, &c. (Continued from our last No.)*

B.—TELUGU.

a. Palm-leaf manuscripts.

1. *Váni-vilása*, a miscellany, No. 76—Countermark 458.

This is a large, and rather closely written, manuscript, containing a poem on multifarious topics by *Rangha-sayi* of *Tiruvallur*. The literal rendering of the title is "the sport, or pastime, of *Sarasvati*;" the said *Sarasvati*, as consort of *Brahma*, being regarded as the patroness of poetry, and eloquence. There are seventy-seven chapters in this poem, each on a distinct subject; to abstract which fully seems in no wise requisite; a brief indication, of the contents of each chapter, will suffice, in order to give a general idea of the work. It is narrated by *Suta-rishi* to *Sonaca-rishi*.

1. Discourse between *Varuna* and *Brighu*, on beneficence, or charitable donations to *Brahmans*.

2. Discourse between *Siva* and *Parvati*, on the duties and deportment of females.

3. The perfections of the deity, discoursed of by *Suta*.

4. Some geographical details, as to the four quarters of the world; the seas; and similar topics.

5. The merit, and usefulness, of the three-lined horizontal *Saiva* mark, on the forehead with *Vib'háti*, or ashes of cow-dung.

6. Concerning the age of *Brahma*.

7. Relates to the formation of mundane eggs, or various rudiments of worlds, or systems of worlds, within the body of *Brahma*; that is the universe.

8. *Bhulóca-pramánam*, or statement concerning the earth, and the seven upper worlds; *Satya-lòca*, or the world of *Brahma*, being the highest.

9. Concerning the celestial sphere, or the region of the stars.

10. The conformation of the human body.

11. Relating to the origin of water, in general; and seas, or rivers, in particular.

12. The legend of *Gaya*. The excellency of the place, and fane, at *Gaya*, and merit of pilgrimage thereto.

13. The legend of *Calinda*, a river at *Gaya*.

14. The legend of the *Godaveri* river, its virtue, or excellency.

15. The legend of *Bhadràchalam*, a hill so called in *Telingana*.

16. The legend of *D'herma-puri*, a town or village.

17. The legend of *Vencatachala*, or *Tripeti*.

18. The legend of *Canchi-puram*, or Conjeveram.

19. The excellency of *Saiva* fanes in general.

20. The merit or power, of the *Pravara-c'handa*, a formulary of prayer concerning family lineage; used at morning, noon, and evening.

21. The superiority of the *Brahmanical* tribe, or caste.

22. The importance, and value, of friendly patronage.

23. Concerning the *Annìcam*, a formulary of evening devotion.

24. The formation of the human species by *Brahma*.

25. The three-fold homage of *Brahma* to the Supreme Being.

26. The splendour, or variously-coloured brilliancy, of the stars.

27. The beneficent art of medicine.

28. The different kinds of presents, or donations, suitable to be made by females, to others of their own sex.

29. Rules, or previous observances, in the proper conduct of war in general.

30. The attributes, marks, qualities, of the ten kinds of *Brahmans*, as the *Niyogis*, *Vaishtavas*, *Vaitugis*, *&c.*

31. Observance of feeding *Brahmans*, on the recurrence of the anniversary of the death of a parent, or other near relative.

32. Rule for the *Brahman* partaking of such food, as to time and quantity; fulness, even to repletion, being allowed.

33. The origin of the *Tulasi* plant, or basil.

34. The merit, or excellency, of the *Tulasi* plant.

35. The merit of maintaining a lamp, in a fane, near an image.

36. The merit of presenting food to the image, in a fane.

37. The merit of presenting a cow, or cows, to a *Brahman*.

38. The merit of giving food to *Brahmans*, or other persons in need.

39. The merit of presenting a female in marriage, to any person, defraying the attendant expenses.

40. The merit of giving water to thirsty travellers, in water-booths, or otherwise.

41. The duty of repaying loans, or clearing off debts, and the crime of not doing so.

42. The merit of fasting on the *Vécádasi*, or eleventh day of the moon's bright, and dark, fortnight.

43. The story of *Rucmana-dhara*, a king and a devotee of *Vishnu*, who would not break that fast; adduced as an example to kings.

44. Concerning the birth-day of *Rama*; a festival of nine days observance.

45. The virtue of reading; especially of the *Vedas*.

46. The virtue of meditation on the *Vedas*.

47. Relates to astrology.

48. } These relate to the sexes, and their mutual intercourse.
49. }

50. Consequences, good or bad, of journeying on different days of the week.

51. Concerning the *Calpa*, or great period of time so called; the *Manuvanteras*, and *Yugas*, or included ages.

52. Concerning the ages, or duration of life, of mankind.

53. Relates to dreaming, and the particular import of dreams.

54. Account of the *Gandharbas*, or choristers of *Indra's* world, and their tendency to earthly attachments.

55. Relates to modes, places, and merit, of bathing.

56. On musical recitative, or minstrelsy.

57. On the art of archery.
58. Merit of reading the six *Sastras*.
59. Equity among relatives.
60. Rules concerning interest; crime of usury.
61. Relates to the *Sanc'hya* system, or ritual taught by *Capila*.
62. Concerning fatal sickness.
63. Relates to the meditation of a *Yogi*, or ascetic.
64. Concerning the *Mimamsa* system; the *púrva-carma*, or ritual of *Jaimini*.
65. On the *Upa-sastra*; explained as referring to the meaning of words, and proving the meaning by examples from books.
66. On the art of dancing, with its attendant music.
67. On the motions of the hands, or gestures, in dancing.
68. } These relate to the different classes, and various perfections,
69. } of the female sex.
70. Relates to palmistry, or divination by means of marks on the palm of the hands.
71. On the dignity of the mode of conveyance by riding on an elephant: proper only to kings, or persons of high rank.
72. Relates to the mode of conveyance by riding on a camel.
73. Relates to riding on horse-back.
74. On wearing jewels, as ornaments, and their value.
75. On accounts, or practical arithmetic.
76. On the medical treatment, especially by cautery, of cows, and similar animals.
77. On day-dreams: or visions seen, if sleeping, during the day.

Thus it may appear that a *mélange* has been produced, such as could not proceed from any other mind than that of a *Hindu*. As illustrative of mythology and manners, I consider the work to be of considerable value. It is complete, and quite uninjured. See a brief entry in the Des. Cat. vol. I. p. 341 art. lxi. wherein it seems to be not inaptly termed "a summary of the religious and social system of the Hindus."

2. *Cavi-carna-rasaya*. No. 111—Commentary 680.

The title on the label of this book in Telugu and English, would imply an epitome of some poetical work. It is properly a version of the *Ramayana*, in an epic poem, by *Francis Ramayya* in the *Pandyan* country, a more difficult kind of metre than the version by *Lauga-*

nat'ha, before adverted to. *Vencata Ramaiyar*, states in this book, that he epitomized in Telugu verse, not only this work but also the *Harischandra Nalópágnánam*, the *Cavyam*, and the *Raghava-panditeeyam*; and hence the term *Cavi-carna-rasaya*, is used by him as a general title of all these works; this book forming only a part. It contains the substance of the *Ramayana* of *Válmica*, herein divided into the *Bála*, *Ayódhya*, *Kishkinda*, *Sundara*, and *Yudha*, *Cándams*. The contents of the *Aránya* section are blended with that of *Kishkinda*.

The manuscript is complete, and generally in good order. The first 25 leaves have the appearance of being very much older than the remaining portion. Considered as a poem, it has probably great merit in point of versification. To the author of the *Harischandra Nalópágnanam*, if this writer were the author, the composition of any other kind of versification, must have been little more than amusement.

NOTE.—The book is briefly entered in Des. Catal. vol. I. p. 328 art. xxxi.

3. *Ballana raju charitra*, the tale of king *Ballana*, No. 55—Countermark 345.

4. The same, No. 57—Countermark 344.

This is a story, or perhaps a satire, in which the principal persons are the said king, and *Siva* under an assumed form. *Ballana-raja*, was a very liberal king, who gave to all comers what they desired: and, like the *Chæravertis* of old, on no condition swerved from a promise once given. *Parvati* is represented as discoursing with *Siva* respecting the exemplary devotedness of this votary; and it is agreed on, between them, to put the same to a severe proof. He accordingly assumed the form of a very personable *Saiva* ascetic of the *Jangama* class, causing great admiration by his appearance. On presenting himself before the king, the latter asked what he wanted: and he requested to be presented with a wife who could be certified to be virtuous. The king acceded to his request, and then had enquiry made among four castes of females, and from house to house, by his messengers. The result of the enquiry being fruitless, the king was reduced to the necessity of offering his own wife, which he preferred to breaking his word of promise. The proof of devotedness being complete, *Siva* appeared in his proper form; and, after bestowing many gifts on his follower, returned to *Cailasa*.

No. 55, is complete: the leaves are a little worn, or broken, at the edges, but not otherwise. The hand-writing is rude, and old fashioned. I think the MS. must have been copied many years since.

No. 57, is also complete, and the appearance of the palm-leaves is more recent; a little perforated here and there by insects, but not so as to injure the sense. The hand-writing is not modern; neither is it so rude, and antique as that of the other book.

NOTE.—They are entered in Des. Catal. vol. 1. p. 319 art. vi.

A third palm-leaf copy was briefly adverted to in my 3d Report; at which time I had not the advantage (now possessed), of having all the not-examined palm-leaf Telugu manuscripts in my possession.

5. *Chandrangada charitra* "the story of *Chandrangada*," No. 29—Countermark 352.

This manuscript wants thirty four palm-leaves at the beginning; thenceforward it is complete to the end: the palm-leaves are old, worn, and a little perforated by insects, at the end. The hand-writing is large, bold, and modern.

The above title written on the label both in English and Telugu, is erroneous. The contents are only a fragment of the *Sri-rangha-mahatmya* in Telugu, in the kind of versification called *Dvi-pada*. The subject of that legend is the bringing of the image to *Srirangham*, an islet of the *Caveri*, by *Vibáshana*. An abstract of the legend was given in my 2d Report, from the Tamil copy. It may be consulted.

NOTE.—This MS. is entered in Des. Cat. vol. 1. p. 321, apparently as a duplicate copy of the following MS. from which it differs wholly, in subject, and in kind of versification.

6. *Chandrangada-charitra*, No. 28—Countermark 353.

This is a poetical love story, ending in a marriage, and is a work of invention; at the same an effort of poetical talent, by *Vencatapati-raja*, at first a soldier, and afterwards one of the poets of *Crishna-rayer's* court. To abstract such a story is not required. It is divided into six *ásvásamus*, or chapters, and is written in the *Padya-cáryamu* kind of versification, in recondite language, employing classical expressions, from the best works: and being redundant in words from the Sanscrit. The copy is on palm-leaves, not very old; yet variously perforated by insects, at

present not to the injury of the sense; but requiring to be looked at, from time to time: the hand-writing is neat, and modern.

NOTE.—It is entered in Des. Catal. vol. 1. p. 321 art. xii, to which entry I refer.

7. *Narasa-bhupaliyam*, a poem, No. 36—Countermark 183.

8. The same. ibid. „ 37. „ 482.

The same. ibid. „ 38. „ 484.

The copy No. 36, is complete in sixty-six palm-leaves, of recent appearance; two or three leaves at the beginning are touched by insects: the remainder is in excellent order.

No. 37, is written on Talipat leaves: the two first are wanting, also the 4th and 9th; right thence to the 32d leaf, where it breaks off without being finished. A few of the leaves, at the beginning, are damaged by mildew, and one leaf is torn.

No. 38, is an old manuscript, wanting seven palm-leaves at the beginning, but complete thence to the end, save only four leaves. It has the same title in English, on the label, as the other two; but though on the same general topic, as a flattering tribute to *Crishna-rayer*, yet it is a different work, by a different author, and on another heroine named *Chandrica*. See the notice of the book entitled *Chandrica Parinaya*, below.

The two first manuscripts are copies of a poem by one of the *Ashta-digajas* at *Vijayanagaram*; there having been eight learned men so termed, by way of distinction. *Timma-raju*, or by title *Bhattu-murti*, from poeticaleminence, was one of these eight poets of *Crishna-rayer's* court. This work, written by him, is entitled after the father of *Crishna-rayer*; and as usual contains the genealogy of the patron. Its subject is rhetorical and poetical, on the laws of the drama and poetical composition. It is highly esteemed, and regarded as a very superior work.

The three copies are entered in Des. Catal. vol. 1. p. 352 art. i but the last MS. should have been noted as a second copy of art. xiv p. 322 vol. 1. *ut infra*.

9. *Chandrica-parinaya*, No. 66—Countermark 355.

10. Another copy (labelled *Narasa-bhupaliyam*), No. 38—Countermark 484.

The first copy is complete from the beginning to the 128th leaf, containing seven *ásvásas*, or sections; but the 8th is wanting to make the copy complete. It is apparently rather old; but, with a very slight exception, is uninjured as to condition.

The copy No. 38 wants 7 leaves at the beginning, and about four at the end. It is seemingly as old as the other one; but not being like that guarded by boards, it has suffered by breaking in the first, and last, leaves.

This work is a poem by *Mádhava-raya* of the *Rechalu* family (see account of the *Vellujotivaru*). The heroine is named *Chandrica*, with whom *Narasa-bhupaliya* (an epithet of *Crishna-rayer*), became enamoured, and took her to his court. On this foundation a poem is constructed: of course claiming no further notice.

The MS. No. 66 is entered in Des. Catal. vol. 1. p. 322 art. xiv and No. 38. at p. 352. *ut supra.*

11. *Sancara-vijayam*, the triumph of *Siva*, No. 118—Countermark 321.

12. *Svarochisha-manu-samb'havamba*, the tale of the birth of *Svarochisa*, No. 30—Countermark 456.

These are two copies, neither one complete, of the same poem; though the first is erroneously entitled on the label, both in English and Telugu, apparently by some ultra-*Saiva* devotee.

The copy No. 118 wants the 3rd leaf in the first section, and the 1st leaf in the second section: all the rest is complete, in six sections. The copy No. 30 wants the two first sections, the 3rd and 10th sections are found, and the 5th and 6th sections are wanting.

Both copies bear, within them, the title of the poem *Svarochisha-manu samb'havamba*, and the name of the author *Allasani-peddana*, son of *Chocaiya*. The writer makes the tale to proceed from an enquiry propounded by *Marcandeya* to *Vachchusa*; and the outline of the subject proceeds on the wish of a *Brahman* to visit the *Himalaya* mountains: his wish is gratified by supernatural means, and certain adventures result; when ultimately *Svarochisa-manu* was born, as the offspring of two *Gandharbas*, and became sovereign of *Jambu-dwipa*. The real object of the poem is to please, panegyrize, and flatter the poet's patron, *Crishna-rayer*, son of *Narasinha-rayer*. *Allasani-peddana* was

one of the "eight elephants" of *Crishna-rayer's* court; and of high eminence among those eight poets. He was greatly esteemed by his patron; and seems to have entertained a lively gratitude, in return for the kindness shewn. As regards fine, and harmonious, poetry these books are valuable; though one complete copy cannot be formed from them; but there is nothing of historical value in them. As such I pass them by; without minute abstract, or detail.

NOTE.—No 118 is entered in Des. Catal. vol. I. p. 314 art. xix under its erroneous title of "*Sankara Cheritra*;" and is stated to contain an account of *Sankarácharya*, and to be written by *Andhra-kalidas-venkataya*, in which entry there must be a serious oversight. *Andhra-kalidas* did translate the Sanscrit work entitled *Sancara-vijaya* into Telugu: but this MS. is not a copy of that production. According to the Catalogue there should be a copy of the *Sancara-vijaya* in the collection in the *Nan'inagari* character; but it is not in the portion of the collection transmitted to Madras; and the compiler of the Catalogue knowing the contents of the Sanscrit work, was possibly misled by the erroneous title on the label. I do not know how else to account for the mistake; which, for the rest, is not my concern. The copy No. 30 is entered in vol. I. p. 339, art. lix under its proper title; with a brief, but sufficient, and satisfactory, indication of the contents.

No. 118 is in good preservation. No. 30 is rather injured by insects; but not to any material degree.

13. *Deva-mallu-charitra*, the story of *Deva-mallu*, No. 32—Countermark 36.

This is a panegyrical poem, composed by a *Brahman* named *Vencaiya*, in praise of a district chief named *Deva-mallu*, or *Cupal-mallu*; the word *mallu* denoting the tribe, and *cupal* being an epithet applied by the eulogist, in consequence of the liberality of his patron, who gave money, not by count but by handfuls. *Deva-mallu*, had two brothers named respectively *Ramasvami* and *Vencata-ramanaiya*. The *mallu* tribe derive their name from living on hills, and are connected with the *Vánádulu*, and similar wild tribes, not aboriginally *Hindu*. The *Khonds*, I understand call themselves *Mallaru*, or hill people. This *Deva-mallu* seems to have been a mountain-chief; though the precise locality of his residence,* or rule, is not determinable; and indeed the mountaineers do not appear to form towns. As to the subject of the poem, it contains a pedigree and detail of banners, and prowess; but, for the rest, the

* Various mention of the *Mallu*-rulers occurs, in local papers concerning *Telingana*.

Brahman seems to have drawn largely on his own inventive powers, in the first instance, and then largely on the patron's eulogised munificence. The work is of no serious moment, as to history; yet otherwise not without use. Though in Telugu, as to basis, it is full, to affectation, of Sanscrit terms, in the usual manner of Brahmanical composition. There is some error in numbering the palm-leaves, by the copyist, but the work is complete. It is entered in the Des. Catal. vol. 1 p. 324, art. xx.

14. *Harischandra-cadha*, the tale of *Harischandra*, No. 33—Countermark 368.

15. Another copy No. 34—Countermark 365.

The substance of the narrative, contained in this poem, is derived from an episode in the *Mahabharata*. It is put into the mouth of *Vasishta*, as narrated by him to *Visvamitra*, in a dispute which occurred between them. *Harischandra* was a great prince, of extreme liberality, and being a *Chacraverti* it was not permitted him either to degrade himself as to caste, or to tell a lie. One day a mendicant *Brahman* obtained from him a promise, which involved a very large gift of money. The *Brahman* did not then take the money; but went away, and returned after many years: claiming his money with the interest due thereon. The king, unable to liquidate the debt, sold his kingdom, and still there was a balance due. The *Brahman* said that if he would tell a lie, or marry an out-caste woman, the whole of the money should be restored; but the king preferred abandoning his kingdom, and selling himself, his wife, and son, as slaves in order to pay the debt. In pursuance of this design he came, so this book says, to *Casi*; where his wife and child were purchased by a *Brahman*, and he himself by a *Chandála*, whose office was to attend burning-grounds. The *Brahman*, sent the boy out one day to gather wood, where being bitten by a snake the child died, and was by the mother taken to the burning-ground, at which her husband was, by this time, stationed to perform the work of a *Chandála*. He refused to do what was customary, without fees; and the mother had nothing to pay. He said that if she would give him the marriage token (synonymous in effect with a ring) it would suffice. She refused; but conjectured, from this demand, that the man must be her husband, as no one else knew that she possessed any such thing. At this juncture officers of the king of the country came, and took away the child, on suspicion of its being the king's own child that was missing;

and, the likeness being great, the king sent instructions that the man at the burning-ground should put the woman to death with a sword. *Harischandra* struck one blow, when flowers burst forth; he was about striking a second, when *Bhagavan* (or god) appeared; praised his exemplary virtues; and restored him to the possession of his former prosperity.

REMARK.—This work, of the *Upa-jnána* class, of course bears evident marks of artificial structure; and the source, whence it is taken, being poetical it deals in the *ornamental*. The Telugu poem is *Dvi-pada*, or in two-lined stanzas, by *Yellana*, brother of the distinguished poet named *Allasani Peddana*, who was also entitled *Gaura-mantri*.

NOTE.—Both MSS. are entered in the Des. Catal. vol. I. p. 326, art. xxiv and xxv.

As to condition No. 33 is in good order, though old; but wanting some leaves at the end. No. 34 is old, and considerably damaged, at the edges; it also wants four leaves at the beginning, and the 45th leaf in the middle.

16. *Harischandra Nalópágnánam*, No. 32—Countermark 369.

This is a manuscript containing five chapters, with two leaves left blank, towards the end of the first chapter; the same having been deficient in the one copied from. What remains is thenceforward complete, and in tolerably good order, being only touched by insects, in one or two places, without serious damage. It is an unusually beautiful, and modern, hand-writing.

It is a production of a peculiarly difficult kind; being read one way it contains the story of *Harischandra*, and in another sense it gives the story of *Nala*. There are according to the Des. Catalogue two other copies on paper, hence the deficiency in this one is not of consequence.

It is entered in Des. Catal. vol. I. p. 326 art. xxiii.

17. *Dasaratha-raja-nandana-charitra*, the narrative of king *Dasaratha*, No. 95—Countermark 558.

This manuscript is complete in four sections; and remains in tolerably good preservation. It is a version in Telugu metre, of peculiar difficulty, concerning the father of *Rama-chandra*, that is *Dasaratha*; his sacrifice; of the services of *Visvamitra*; the birth and early adventures of *Rama*, down to his marriage with *Sita*, the daughter of *Janaca-jaya-*

raja. It is the production of *Bassavapa-cavi*, a *Vaishnava* and votary of *Rama*, whose taste for poetry was formed by the early study of the Sanscrit *Ramayana;* a part of which he transfused into Telugu, in this production, which is held in high esteem.

NOTE.—It is entered in the Des. Catal. vol. I. p. 322 art. xvii.

18. *Cavi-carna-rasaya*, No. 54—Countermark 376.

This book, with the same title as No. 101, before adverted to, is by a different author, and more varied in subject. Like that it is in the *Padya-cávyam* measure, and in five *ásvásas*, or sections. The author's name is *Narasimha* who was patronized by a *Chola* king, but from the MS. being defective in the place, where that circumstance is mentioned, the king's name cannot be made out. The king is introduced as asking questions, on various subjects, and the poet replies. Hence the subjects of the five sections relate to the name and worship of God—the *Vedanta*-system—the customs, rights, and privileges of the *Brahmanical* order—the legend of the image and fane at *Sri-rangham* (near Trichinopoly)—and the subject, in brief, of the *Ramayanam.* As being an epitome, on these subjects, extracted from different books, the title is suitable; intimating a poetical abridgment recited in the ear of another.

NOTE.—There is only one copy under this title entered in the Des. Catal.; and from the No. of the label I apprehend this to be the copy, though the indication of contents in that entry agrees with the MS. No. 101. This book had not come under my notice, when the other one was abstracted.

This MS. is old; only slightly damaged by insects; there is one leaf broken, and the half lost, in the middle; and, at the beginning, the tops of the leaves are broken off, through wear and usage; so as sometimes to destroy the connexion, and sense, of the versification.

19. *Cambhoja-raja-charitra*, a tale of a king of Camboge, No. 87—Countermark 373.

The foundation, or introductory matter, of this work is made to be the pilgrimage of *Mahudu*, a king of Camboge, who was afflicted with leprosy; and, who after relinquishing his kingdom to his son, visited different rivers and sacred pools, for the purpose of bathing therein; but without obtaining a cure. In consequence he directed his footsteps to-

wards the *Vriddha-ganga* (or ancient *Ganges*), and by the way met a woman, who enquired his object; and, on hearing it, directed him to another place, to obtain a cure; teaching him a *mantra*, or formule proper to be used. In consequence of this instruction, he went to a river where the sage *Dáttatreya* was employed in teaching disciples. He bathed in that river, and was cured. He then attended to the sage's instructions, and the substance of these is given in the following portion of the work; which, as announced, should contain six sections. These instructions are of the *Vaishnáva* kind; and, in the earlier part, relate to the floating of *Vishnu*, as *Nardyana*, on a leaf, on the surface of the waters: the birth of *Brahma* from a lotus flower, proceeding from the naval of *Vishnu;* the creation, and destruction of worlds; some account of the *Matsya*, and other *avatáras*, of *Vishnu;* and thenceforward is a series of minor narratives, in which the legend of the shrine at *Srirangha*, has a precedence to the other tales. These relate chiefly to immunities proper to *Brahmans*; and tend to enforce respect to that order, and obedience to their directions, by examples of benefit derived from obedience, and of injury arising from an opposite course. Out of the six sections there are only three complete; the fourth breaks off abruptly, evidently owing to the copyist not having completed his task. The document is very slightly touched by insects; and may be considered in good order.

Note.—It is entered in Des. Catal. vol. 1. p. 327 art. xxix with a brief indication of the contents.

b. Manuscript books.

Manuscript book, No. 37—Countermark 374, *Cambhoja-raja-charitra*, a tale of a king of Camboge.

This is an imperfect copy of the same production as the preceding one. The book contains only the two first sections, with the title page of the third; and the appearance of the book would seem to intimate that some portion has been taken out, or lost. The paper is somewhat injured by insects; but the fragment does not claim restoration. It may be mentioned that both copies are in ordinary Telugu prose.

Note.—The book is entered in the Des. Catal. as above.

Manuscript book, No. 8—Countermark 698.

Section 1. Account of the village of *Sarpavaram* in the district of *Pit'hapur*, in the province of *Rajamahendri*.

The commencement is quite legendary. A brief reference is subsequently made to the *Dwápara-yuga;* to *Janamejaya*, and to kings of his posterity, down to the cessation of the *Chandra-vamsa*. Many kings subsequently ruled; being the *Chalukiya* race; commencing with *Vijayáditya*, whose son was *Vishnu-verddhana*, and his son was *Vijayáditya*. *Kulakesi*, *Kirti-verma*, and other names, follow; down to a supercession by the ruler of Cuttack, and then by a *Jaina* king. Afterwards the *Yádava* race governed; several names are specified. As usual, grants to fanes, and other buildings are alluded to; and the first date that occurs is Sal. Sac. 1017 (A. D. 1095): others follow down to S. S. 1430; and they relate respectively to different periods of the rulers, as above mentioned. The latter part of the document adverts to Mahomedan influence, and interference.

REMARK.—Though very briefly abstracted, yet the reading over of this document leaves the impression that its contents are of considerable value; meriting to be developed in full translation.

Section 2. Account of *Jallur*, in the before mentioned district, and province.

The *Jainas* ruled at a very early period, in this district. After the mention of that rule, in general terms, the document adverts to the race of *Janamajeya*, and thence deduces the line of *Vijayaditya*, the first of the *Chalukiyas*, who took their name from a fort on a hill named *Chalukiya-giri*. The names of the *Chalukiyas* are given, as in the last paper. The tale of *Sarangadhara* and *Chitrangi*, is narrated, in substance, as a matter of fact, occurring in the race of the *Rajahmendri* rulers. The date of Sal. Sac. 1124 subsequently occurs, as that of the installation of *Mallapa-deva Chacraverti*. The race of *Kâkati-prolaya* is given; one distinguished among them being *Pratapa-rudra*: these are usually termed the *Ganapati* dynasty. The power of the *Reddis* followed, who ruled in *Conda-viti*. The account subsequently narrates various details, relative to the Mahomedans; and, after giving the names of some zemindars, adverts to the government of the Honourable Company.

REMARK.—This document also appears to be of value; to be used in comparison with similar ones.

Section 3. Account of *Corukondu* village in the zillah of *Sarpavaram in the Rajamahendri* province.

The commencement is legendary, and relates chiefly to the foundation of *Saiva* fanes; of which one hundred and one, are said to have been constructed. The foundation of *Corukondu* is ascribed to an ascetic. The names of *Pratapa-rudra*, and of *Mallapa-raja* occur, in reference to the fortification of the place. A marriage alliance with the Cuttack sovereign is mentioned; and various consequent details. An account is given of the siege of the fort, and its betrayal by treachery. It was taken by *Govinda-raja* of the *Gajapati* race, and its defences destroyed. The power of the *Reddis* succeeded. Details concerning fanes, with their endowments, and images; and inscriptions commemorating grants. One of the later chiefs named *Raghunat'ha-raja* died without posterity; and subsequently the district came under the control of the Honourable Company.

Section 4. Account of *Chamurla-cota* or *Bhima-varam*, in the *Pithapur* district of the *Rajahmendri* province.

Mention of certain shrines, and images. Subsequently *Rama-bhimeswara*, son of *Bhima-raja* of the *Chalukiyas* founded a town, and established festivals, and other usual observances. When the fane had gone to decay, the *Gajapatis* and *Reddis*, had it re-edified. In Sal. Sac. 1438 *Crishna-rayer* subdued this, and surrounding towns. Subsequent details relate to English, and French, ascendancy; and alternations of power. *Nizam-ali-khan* interfered; and, after wounding three local chiefs in battle, conquered the country. This indication of contents of course is little more than an index. There follow some minor details as to rivers, and lands fertilized thereby; of no consequence; not complete; and not copied.

Section 5. Account of the village of *Kimmuru* in the district of *Pithapur*.

The foundation is ascribed to a *Kirata-raja*, or a barbarian chief, near to the *Vindhya* mountain. Some details are added concerning his descendants: forest lands were cleared, and towns, built by them. At a later period some of the *Conda-vandlu* peopled portions of the neighbourhood. In Sal. Sac. 1124 *Mallapa-deva* ruled in this country; and made grants of land to a fane which is specified. Traces of the *Chalukiya* rule appear, in the matter of grants made to village fanes. The power of *Pratapa-rudra*, at a later time, succeeded. He was the

most celebrated of the chiefs of *Warankal*. After him came the *Reddis*. *Crishna-rayer* afterwards conquered this district. When the *Gajapati* power reverted to its former state, the *Reddis* again ruled. *Timma-raja*, and afterwards *Narayana*, a *Ganapati* prince, governed. Subsequently one named *Sitapi-khan* acquired authority. The ascendancy of *Bala bhadra-raja*, of the *Pusa-pati* race, followed. *A sirdar* from Golconda subdued the country. Some fighting, in which the Mahomedans were concerned — — — — (here the remaining two, or perhaps three, leaves of the book are lost).

GENERAL REMARK.—This book was found to be very much damaged; by reason of damp, and destruction of large portions of paper, near the outward edges, by insects. One cover was wanting; as also a few sheets on that side of the book: the remaining leaves are loose, and separated from the front cover. The hand-writing, being bold and large, facilitated the restoration; which has been, upon the whole, accomplished, though not without some unavoidable breaks in the connexion. The contents, it may appear, are of average interest. The writer seems to have had most at heart a record of matters connected with fanes, and images: but the dates and names of rulers, given in connexion therewith, are of some value; certainly more than I had at first anticipated.

Manuscript book, No. 1—Countermark 894.

This book is marked Malayalam, but probably as relating to that country: the language is Telugu.

Section 1. Account of ancient matters relative to the *Vainàd* (or Wynaad) district.

The earliest rulers of this district were of the *Vedar* tribe; concerning whom the same general outline is given, in this paper, as in sect. 11, MS. book No. 3 (B. Malayalam 2d Report); to which, by consequence, I refer. *Curumba* chiefs subsequently ruled. The boundaries, and divisions, of the district are stated; and some detail is added as to one village, in the proximity of which a species of earth yielded a proportion of gold ore, worked by three zemindars. A notice is given of *Bonâsura-cola*, a steep, and remarkable, mountain; traditionally said never to have been ascended by any human being: with some legendary adjuncts. Details follow of vegetable productions of Wynaad, and some reference to traders, as also to a few scattered *Vaishnava*, and *Saiva*, fanes, and a small proportion of Brahmans found therein.

Section 2. Legend of *Tirunelli-eshetram*, in the Malayala country.

It derives its name from a *Nelli* tree (phyllanthus emblica) under which *Brahma* paid homage to *Siva*. Many *Brahmas*, to the number of seventy-two, worshipped *Siva* there. In a cleft some petrified *Nelli* fruits, and an emblem of *Siva*, are traditionally said to have been found by a *Brahman*. A specification of *tirt'has*, or sacred pools, belonging to the place is given.

Section 3. Notice of the buildings at the fane of *Rama-svami* at *Talacheri* (or Tellicherry).

The details of this brief paper are not adapted for abstracting; nor are they required for any useful purpose.

Section 4. Account of the principal fanes, and shrines, in the Travancore country.

These are situated at *Canya-cumari*, or Cape Comorin; at *Susèndram*; at *Padmanába-puram*; at *Tiru-vitan-kádu*, of which the *Saiva* image is called *Keralésvara* (from having been established by a *Kerala* king); at *Tiruvattaru*, a *Vaishnava* shrine; and some subordinate places at *Colattur*; also at *Chenganur*, dated as far back as the time of *Parasu-rama*. The details of these shrines are of no great importance; except only as they yield faint traces respecting rulers, by whom they were founded.

General Remark.—This book being damaged, written in pale ink, and injured by insects, was re-copied; though the contents, are not of great consequence.

Manuscript book, No. 54—Countermark 744.

The contents are four journals from *Narrayan-rao*; the first from January to July 1815, in the *Venkatagiri*, and *Udiyagiri*, districts of *Telingana*, the other three are relative to the Hyderabad country, and extend from December 1815 to the end of March 1818. One or two leaves are loose owing to careless binding: the ink is good; the country paper in the middle is touched by insects; but the leaves having been *unglued*, and separated, the progress of injury has been arrested. The book will last, as it is, for several years.

Manuscript book, No. 55—Countermark 745.

It contains three journals of *Vencata-rao* for 1818-19-20, in the Hyderabad country; is written on various descriptions of country paper, some

free from injury others touched by insects; though but slightly; the ink is good; the whole perfectly legible, and calculated to last for a considerable period.

Manuscript book, No 56—Countermark 746.

A paper or journal of *Vencata-rao* for March, and April 1818, in the Hyderabad country, and three journals of *Ananta-rao* for 1817 18-19, in various parts of *Te'ingana;* chiefly in the Bunder district, or neighbourhood of Masulipatam. The first document is in perfect preservation: the others, in various degrees, touched by insects. The leaves have been separated, and exposed to the air. The whole is legible; and, with common care, will last some time.

REMARK.—I have no doubt that, making allowance for the limited view which a native usually takes, as much of interesting incident, and description, might be gleaned from these as from other ordinary books of travels. But this gleaning, if ever attempted, must be an after work to my present introductory examination, and report. As heretofore observed, in similar cases, I pass these journals by, without minute attention.

Manuscript book, No. 32—Countermark 722.

Account of the rulers of *Anumacondu* and *Oragalu*, otherwise called *Ekasilà-nagara*, with their conquests in *Telingana*.

Geographical site of *Anumacondu* defined. Legendary statement concerning the marriage of *Sira*, as accounting for the formation of the shrine. Subsequently a *Vedar-raja* named *Veruka-deva raja* laid the foundation of a village, at *Anumaconda;* locating his family and relatives there. His sons were *Anumadu* and *Condadu*. A small fort was built. The latter of the two formed another village, called after his own name; his relatives followed the same example, by forming other villages. About this time the *Jainas* prevailed; and a *Jaina* fane was formed, on the top of the hill. *Bhima-razu*, a chief, ruled: but whether as a subordinate, or head, cannot be determined; as a Mahomedan had built a stone, containing an inscription, into the wall of his house; so that only one side of it was legible. *Bhima-razu* is supposed to have been a *Jaina*. The account is commenced with the mention of one of the *Kakati* race, who built the large fortress: and what follows relates to that race. The lunar-race is specified down to *Cshemaca*. From that line

are deduced *Vijayáditya* and *Sómêndra*. The son of the first was *Vishnu-verddhana*: of the other, the son was *Uttunga-bhuja*. These two latter divided the country between them. *Vishnu verddhana* settled at *Dherma-puri* on the western bank of the Godavery river. Four hundred villages, or towns, became subject to him. His son was *Nanda* who built a town called *Nanda-giri*, in which the four castes of *Hindus*, were located. His minister was named *Danda Sassi-nayaca*. *Nanda* formed a marriage alliance with the daughter of a *Chola* king, at Conjeveram; and on returning, equitably governed his kingdom. His son was *Vijaya-pala*, who was munificent. The son of the latter was *Sóma-deva-raja*, who formed extensive, and numerous establishments for *Brahmans*. He assembled various herds of cows, altogether amounting to 3100, which were placed under the care of various herdsmen; from *Bhalrâchala*, even to the banks of the Godavery. *Bala-hodu*, ruler of *Cattaca-puri* (Cuttack), hearing of this circumstance, made a foray, and took away some cattle. A war followed, in which *Sóma-dera* lost his life. His widow took refuge in the house of a *Brahman*, where she had a son named *Mâdhaverma* who conquered his father's enemy, and installed the son of the latter, on the throne at Cuttack. Hearing of which the aforementioned *Veraka-deva-raju* fled, and *Madhava-verma* took possession of his district. The date of *Madhava-verma* is carried as far back as Sal. Sac. 390 (A. D. 468); and his reign is extended to 160 years. His son was *Padma-sena*, who ruled 74 years: down to Sal. Sac. 461. He overcame the Cuttack ruler, that had assaulted him; and levied tribute from that country. The son of *Padma-sena* was *Venama-raja*, who ruled 73 years, down to Sal. Sac. 537. His son was *Oranga-venna*, who conquered the invading Cuttack ruler, and put his son in the father's place. He conquered other chiefs, and ruled 73 years, down to Sal. Sac. 610. The son of *Oranga-venna* was named *Bendi-gundama-raja*. He took some villages from the Mahomedans, and levied on them eight lakhs of gold coins. He fought for 3 months with the Cuttack ruler; and, having conquered him, took thence fifty-five lakhs of gold coins. He was liberal. He ruled 78 years, down to Sal. Sac. 688. His son was *Yeruca-deva-raju*; who being a child, the mother exercised authority as regent. She levied extensive tribute on surrounding countries, and fighting six months with the Cuttack ruler, overcame him, and put his son in the father's stead; at the same time taking tribute. The young man *Yeruca-deva-raju* was by her caused to be crowned. This queen, whose name was *Kôntala-devi*, governed 19 years, down to S. S. 702. *Yeruca-deva* conquered the ruler of *Dera-giri* (Deo-ghur or Dowlatabad?) and took eighty lakhs of gold coins from him as tribute. He also

overcame and took tribute from *Vijaya-narasinha-vijaya-rayalu*, the ruler of *Vijayanagaram*. He made suitable largesses to the Brahmans; and ruled 79 years, down to Sal. Sac. 786. His son was *Bhuvanaica-malla*, who conquered the Cuttack king, taking away banners; and, as before, installed the son in the father's place. Not being satisfied with the tribute paid by the ruler at *Vijayanagarum*, he again levied war, and received further villages and presents together with five superior women, as wives; to whom he made grants in free tenure of lands, extending even as far as Conjeveram, to find them betel and areca (or pin-money). He also gave an agreement, engraven on gold, to the chief at *Vijayanagarum*, certifying that he would not again levy war. He largely built, and endowed, various fanes and shrines. He ruled 86 years down to Sal. Sac. 872. His son was *Tribhuvana-malla*, who as before, fought with the Cuttack prince, and installed his son. He governed 86 years, down to Sal. Sac. 956. The son of *Tribhuvana-malla*, was *Kakati-prôl-raju* who being a minor, his ministers disagreed among themselves; which *Balla-hundu* the *Gajapati* of Cuttack hearing, besieged *Anumacondu*, during twelve years, by troops under the orders of a general named *Visvanat'ha-dera*; who was in the end repulsed by *Kakati-prol-raju*. The latter formed a residence at some distance, at *Gangâ-puram*, and the people of *Anumacondu* were accustomed to send thither presents, on a small cart. One day the axle of the cart broke; and, being left on the spot, the next day the iron was found to be transmuted into gold. The king, going to the place, found there a golden symbol of *Siva*; and iron, brought thither, being changed into gold, he thence acquired the means of extensive building. The said symbol was removed, and established on a small hill, consisting of a single rock (whence the name *eka-sila* in Sanscrit, and *orangal* in Telugu). A fane was built, and also a town around it; in which there were 500 *Saiva* fanes and 300 *Vaishnava* fanes, ten shrines of *Ganesa* and ten of *Virabhadra*; to which festivals, and all customary appurtenances were appropriated. As iron, being brought into contact with the aforesaid image, was uniformly transmuted into gold, he in consequence had a vast quantity of golden utensils formed, so that he acquired great celebrity; and, in his time, the custom of weighing gold was first introduced. He had two sons: the eldest, being born in a *muhurtam*, or astrological time, unpropitious to the father, the said child was taken and lodged in a fane; the officiating hierophant in which gave to the boy the name of *Rudra*. His father one night went alone to the fane, and *Rudra* mistaking his father for a thief, mortally wounded him with a sword. The king made known to all around, that the child was his son; and, causing him to be installed, died eight days after receiving the wound. *Kakati-prol-raju*

ruled 73 years, down to Sal. Sac. 1031. The aforesaid *Rudra* added to the number of fanes; among others those of *Ganapati* (or Ganesa) and made war against the Cuttack *raja*, whom he killed; put his son in the father's stead; and levied tribute on the country. He also subdued other countries; and ruled 78 years, down to Sal Sac. 1109. The son of *Kakati-rudra-raju* was *Ganapati-raju*. His uncle *Maha-deva-raju*, the younger son of *Kakati-prol*, and younger brother of *Rudra*, was instituted as second in authority (in the same relation as Cæsar stood to Imperator at Rome); and, going on an expedition against *Devagiri*, was therein slain. His secondary rule lasted three years, down to Sal. Sac. 1112. The minister of *Ganapati* was named *Siva-devaiya*; and the said *Ganapati* making war against the *Dera-giri* ruler, who had killed his uncle aforesaid, conquered that chief, and took his daughter, named *Rudrama-devi*, to be his wife. This prince was munificent to *Brahmans*. He made war on *Valla-nadu*, and took tribute from it: returning thence to Nellore, he had a dispute with *Ancana-bhuja* from whom he took some banners, and re-instated there the former ruler, whose name was *Manna ha-siddhi*. He had a reservoir formed at that place; and twenty-four forts constructed. He subdued 68 towns. He had many other works accomplished: among which the building a town near *Gunga puram* (named after himself *Ganapati-puram*) was one. He conquered the *Odriya* (Orissa), and *Pandiya*, kings: took many countries; and levied tribute. He constructed, at *Sri Sailam*, four *Saiva* fanes; some *Vais'nava* fanes; and had four reservoirs excavated. To his spiritual preceptors he gave eleven villages. A daughter born to him, named *Umaca*, he gave in marriage to *Vira-bhadra-raja*, and relinquishing his own kingdom to *Siva-devaiyan*, his minister, he died in Sal. Sac. 1180, after ruling 68 years. His widow *Rudrama-devi* ruled with celebrity, for some years; and then transferred the crown to *Pratapa-vira rudra*, a son of her daughter, *Umaca*, by *Vira-bhadra-raja*, at a time when he was sixteen years of age. She exercised the regency during 38 years, down to Sal. Sac. 1216. *Pratapa-vira-rudra* patronised the Brahmans, descendants of those first settled in the country, and provided for them proper employments. It is said that he was taken prisoner by the Mahomedans. He reigned, as supposed, about 76 years; and after that, he and his wife died. The manuscript contains a minute account of the receipts and expenditure of this prince; needless to be detailed. His minister, and his younger brother, fled into the woods, and wilds. His son, who succeeded him, was named *Vira bhadra-raju*, who carried on war, for twelve years, against the *Narapati-rayalu* of *Vijayanagarum*. But the Mahomedans coming to the assistance of the *Rayalu* overcame *Vira-bhadra*, and relinquished to him, only a small portion of his former

dominions. Afterwards *Mulla-deva*, of the *Raghava* race, ruled; as appears by an inscription. But *Sitapi-khan*, a Mohomedan, coming from Delhi took *Orangal*; and, as the descendants of the *Kakati* family were within the fort, he gave them just enough, for their subsistence; while he himself conducted the government. A Sanscrit inscription, in his time, is dated Sal. Sac. 1425. Subsequently when *Crishna-rayalu* ruled at *Vijayanagarum*, he took *Condavidi*, *Condapalli*, *Inama-conda*, *Balapaconda*, *Nagarjuna-conda*, and other forts; he also overcame the Mahomedans at *Orangal*, and assumed the place. He gave to the *Kakatiya* race a sufficient subsistence. In the time of *Achyuta-rayalu*, *Orangal* was under his rule. *Rama-rayalu* was second in power to *Sada-siva rayalu*; but, fighting against five *Pad hahs*, confederated against him, he was killed by them; and they assumed the government of *Orangal*. The Shah, ruling at Golconda, had authority over *Oranjal*, and *Anumacconda*. The *Nizam* of Hyderabad, named *Asuph-sah*, ruled over *Orangal*. His son *Nizam ali khan*, inspecting the fort of *Orangal*, had some of the guns, which were placed there by the *Kakati* race, transmitted to Hyderabad. He gave the said fort, as a jaghire, to *Nuran-mulk*: it remained with the same in the time of *Sicandar*, son of *Nizam-ali*. *Orangal* was plundered by *Pindarri Mahrattas* in Sal. Sac. 1738 (A. D. 1816). The descendants of the *Kakatiya* race had, by this time, retired altogether to some patrimonial estates, at *Bassanava*, and other places, whither the Nizam sent to demand from them tribute, or taxation; when they transmitted to him, in return, cowries, or small shells, current in some places for small sums of money. The Nizam, understanding thereby that they were very poor people, remitted thenceforward all tax or tribute from them; and they continued, when the account was written, to reside at *Bassanava*, and other villages.

REMARK.—The preceding is a very important manuscript. Its authenticity, in some places, may be matter of question, particularly in the dates; but all deductions being made, this will remain one of the valuable documents in the collection.

There follows, in the book, another document; being an account of *Calyana patnam*.

The contents: the legend of *Nandi*, the vehicle of *Siva* coming down to earth—the origin of the *Vira-saiva* sect—and an account of circumstances which occurred at Madura. Any fuller notice of this document is referred to the abstract of the Telugu palm-leaf manuscript No. 128. 332 entitled *Basavesvara Calagnana*.

Manuscript book, No. 7.—Countermark 697.

Section 1. Account of *Bandar-machlipatnam* (or Masulipatam).

Local situation with reference to the *Crishna* river; its fanes specified. Its roads are frequented by shipping. Fishermen reside in neighbouring villages. A new town named *Inamu-kuthuru* now called *Ina-kuthuru* was built not far off. A town was also built by the *Mukundi* kings called after their own name. A *Mukundi* king, according to an inscription in a neighbouring fane, removed the *Bauddhas* and *Jangamas* and established the *Brahmans* in their room. The name of *Machli-bander* is said to have arisen from a very large fish being caught by a *Baunddha*, so that he was called *Matsya-baunddha*, the name devolving on the place, where he lived; and becoming corrupted in Dekhini to *Machli-bandar*, or *Machli-patnam* (whence also the European corruption into Masulipatam).

The *Mukundi rajas; Pratupa-rudra;* the *Gajapatis*; the *Reddis; Crishna-rayer;* and others; are stated to have successively ruled over this place, and neighbourhood. A list is given of suburban-villages, founded, or enlarged, by various persons, from S. S. 1480, down to S. S. 1739 (A. D. 1558—1817). It was under the Hyderabad govenment, down to Fusly 1178 (A. D. 1770). For seven years afterwards it was under Monsieur Bussy, and the French. It came into the hands of the English, as a jaghire from the Nizam Ali Khan. A total of village districts is given; several of which manufacture salt. Some further particulars are added as to fanes, and their festivals, at *Inamu-kuthuru*.

Section 2. Account of *Mavunje-mutlur*.

The account of this place commences with S. S. 1606 (A. D. 1684). Some time after *Anarema-reddi* instituted a Brahman, named *Mritanjiyar*, to the charge of the fane, whose son was *Somayajin;* and the line of Brahmans downwards is given. The Mahomedans, under Sultan Abdalla Hassein, continued the privileges of the fane. Various details of Mahomedan interference. Aurengzebe took tribute thence. There are also revenue details of proceeds, and expenditure, connected with the village, or town, and its adjuncts.

Section 3. Catalogue of books in the possession of *Lingaya-chetti*, son of *Mamiddi-vencaiya chetti*.

The catalogue was made at the request of Col. Mackenzie, and given in to him. It exhibits the names of Sanscrit and Telugu manuscripts, to the total amount of 282 books, or volumes, on various subjects of ritual observance—mythology—poetry—fictitious romance—some little history—law—and miscellaneous subjects. Several of the titles are

those of manuscripts now in this collection; rendering it probable that these were purchased from the person above mentioned.

Section 4. Account of the village district of *Amritalur.*

A herdsman of old cut down the forest-wood and established a small fane; called by the name of *Amritesvara.* After the introduction of the era of *Salivahana,* the *Gajapatis,* and others, ruled. The first date is Sal. Sac. 1607 (A. D. 1685) in the time of *Gana-pati-deva*; who coming to bathe in the river *Crishna,* at the time of an eclipse, made over this district to certain *Niyogi-Brahmans.* Various traders had settled in the village: these all left it, after the supercession of the former rule by the Mahomedans. In the time of *Nazir-jung-bahader* this village district was made over to the French. In Fusly 1168, it came under the Honourable Company; who continued all customary observances.

Section 5. A connected account of seven village districts, in the Ellore Circar.

Narasimha-rayer ruled over the whole of these villages in Sal. Sac. 1166 (wrong date). His successor *Rama-rayalu* introduced a colony of Brahmans to *Gudlapalli.* The Mahomedans subsequently plundered, pillaged, and burnt, in these districts, during two months; giving over the management on their account to *Raganatha-pantalu,* a *Brahman.* Subsequent *Amils,* and a war connected with the administration of one of them, are specified. All other details relate to land-holders, and their respective rights and tenures.

Section 6. Account of *Gokarna-mat'ham* of *Mavunjè.*

In early times a person of eminence had the waste lands cleared, and a fane built, bearing the name of *Gokarna-svami.* Details of the pupils of the hierophant, and their respective successions. Other details chiefly relate to revenue proceeds.

Section 7. Account of *Mavunjè-modukúr,* in the district of *Satenapalli.*

A merchant had the district cleared, and a fane, and village, built. In Sal. Sac. 1556, the district was made over to the *Niyogi* Brahmans, by the *Ganapati-raja.* In the time of *Kulottunga-chola,* some additions were made in the matters of fanes and festivals. *Ganapati-raja,* son of *Kakati-raja,* subsequently made other like additions. After the Mahomedan supercession, the district was given over to *Brahman* managers, on their account. About 1225, Fusly, the Government of the Honourable Company succeeded.

Section 8. Account of *Mavunje-chanduvolu* village.

Legendary statement of its names, in the three first ages. It was called *Chanduvolu* in the *Cali-yugam*. After the commencement of the era of *Salivahana*, several fanes were constructed, with various appurtenances, by *Kulottunga-chola*. In S. S. 903* there was a Jaina ruler. In S. S. 1215, *Pratàpa-rudra* ordered some additional matters, for the advantage of the fane, to be constructed. The rule of the *Reddis* followed. In S. S. 1250 they had erected a fort; and they ruled from S. S. 1300 down to S. S. 1486. The Mahomedan authority followed, under the Nizam Ali Mulk. The district was made over to the French. The mention of *Satyanat'han*, and his successor, as Roman Catholic ministers of religion occurs. On the defeat of the French, the English power succeeded. Some new fanes were constructed. A few details on this latter point conclude the paper.

Section 9. Account of the village of *Chébrolu*.

Other names in previous *Yugas*: called *Chébrolu* in the *Cali-yugam*. *Tribhuvana-deva-malla-raja* of the *Chalukiyas*, coming to bathe in the Godavery river, made, at the instance of his minister, a donation to the fane, commemorated by an inscription. The *Jainas* were numerous, in those days: and this village was sometimes called *Jainabrolu*. *Rudra-deva* of the *Kalati* race, added much to the fane, in reference to *Saiva* emblems. Nothing further particular occurs, down to the Mahomedan rule.

Remark.—The condition of this book was so bad, by reason of injury from damp and insects, that I doubted the practicability of its restoration. It has however, on the whole, been successfully effected; and though the details are but of minor interest; yet the investigation will assist in estimating the value of similar books. From the specimens that have been given, it is found that there is a prevailing uniformity, as to the indicated succession of leading powers in the north: the outlines being the same in all.

Manuscript book, No. 15—Countermark 705.

Section 1. Account of the zemindar of the *Saroda* district in the Northern Circars.

Anciently this was a wild country under a *Cóthu* raja, who ruled over savages. Subsequently one named *Savayi-Singh* came from *Gocula*

* This date is uncertain.

Brindhavanam, and colonized the neighbourhood; forming a town, with various appurtenances.

Section 2. Account of the *Purushoʻttama-deras*, and rajas of former ages.

A Sanscrit title. Reference to the *Satya-yuga*, with its character; and mention of *Maha-bali*, and *Vishnu*, in the *Vamana* avatar. Reference to other *Yugas*, to *Parasu-rama*, and his destruction of the *Cshetriyas*. Reference to *Manus*, and periods of their rule. Some kings of the solar-line. Excessive periods of time ascribed to them. Some kings loosely mentioned in the *Cali-yuga;* who ruled, as we know, in different and distant countries; but are herein brought together in one successive line. There is rather a more connected list of *Gajapati* princes; but with incredible dates ascribed to the several periods of reign. Some other loose details follow, down to the accession of the English Government.

REMARK.—The first part of this paper is merely a crude extract, from the substance of old *puránas;* and resembles very much what is termed *Bhugola-pramánam* in a distinct Tamil manuscript. The account, so far, is of no value; and the remainder partakes very much of the same character: disappointing the expectation that might be founded on the English heading prefixed to the section.

Section 3. Account of *Naráyan-suru-harischandra*, zemindar of the *Tarlà* district.

The founder of the district came originally from Nagpore; and served one of the *Gajapati* princes of Orissa. "By favour of *Jaganat'ha*," the idol so called, he acquired this district; and there are added some details concerning the successors in the zemindary.

Section 4. Account of four villages, of the said district.

Merely a list of small districts; and of towns, or villages, contained in them.

Section 5. Account of *Cari-cala-cholan.*

This paper contains an account of two *Chola-rajas:* the first name that occurs is *Vira-vicrama-cholan*, with some details concerning him; such, for example, as his fixing pillars of victory, as far north as Himalaya. *Cari-cala-cholan* is next mentioned; and an extravagant account of the extent of his power, being puerile exaggeration, is given. In the embankment of the *Cáveri* the god *Israra*, it is said, assisted. The *Chola* king put out one of the three eyes of the *Mukant'hi* kings. Many

kings were summoned to assist in the embankment of the *Cáveri*; and those who refused to come were punished. The whole of the remainder relates to *Cari-cala-cholan's* acts of government. The wife of the *Ballála* king was of great assistance to his kingdom, [it is supposed that the wife of *Vishnu-verddhana* is intended]. According to this paper *Cari-cala-cholan* exercised an extensive influence; but the marks of exaggeration contained render the authenticity of the document doubtful; at all events, great deductions are requisite.

General Remark.—In point of condition, this book is in tolerably good order and preservation. There is nothing of value, unless the last paper may be considered to possess that character. This may merit reference and further consideration; and with ordinary care will last many years, for that purpose, without urgent need of restoration.

Manuscript book, No. 2—Countermark 692.

In this small octavo book, divided into thirty sections, are brief accounts of thirty-six villages, and six *agraharams*, or Brahmanical establishments. The details are minute, and trifling; frequently being little more than a list of different places: the whole not requiring any abstract. The book is at present in very good preservation.

Manuscript book, No. 8—Countermark 892.

This small, and thin, quarto contains a journal of *Crishna-rao*, during his journey through the *Sunda* district from August 1813 to May 1814. It is labelled "Canarese," but is in the Telugu language; the said label, as in similar cases, referring rather to the district than to the language. It is written with indelible ink; injured only as regards compactness of binding; but for the rest in good preservation.

Manuscript book, No. 9—Countermark 893.

This is a continuation of the same person's journal, down to August 1814. It is in very nearly as good preservation as the last mentioned book, and the binding in better order. Both are passed, as usual in the case of such journals.

Manuscript book, No. 5—Countermark 802.

This book is endorsed as relating to the Ceded Districts; and the contents refer to seventeen villages, with their districts, containing details similar to those heretofore given in similar cases. Whenever such books have been found to be damaged, and in danger of speedily perishing, and have been restored, I have then, in reading over the restored copy in collation, at the same time abstracted the contents. This book is in perfect condition; and will last a long time. In such a case the minute labour of abstracting does not seem to me to be called for; unless the contents were of commanding importance, which is not the case in this instance. This book is complete.

Manuscript book, No. 6—Countermark 803.

This book relates to twenty villages of the Ceded Districts. A part of the leaves, in one place, has been torn out, and lost. The remainder of the book is in perfect preservation; and the same remark, as in the last instance, is applicable.

Manuscript book, No. 10—Countermark 807.

Account of the Cusbah, or revenue district of *Tanda-patti* in the Ceded Districts.

This is also a local account; with the usual legendary, and minute, details. It is in perfect preservation; and, for the present, needs no further attention.

Manuscript book, No. 12—Countermark 809.

In this book are contained local details of fourteen villages in the Ceded Districts. The paper is quite uninjured, and the ink indelible. Two leaves were loose, and the back of the cover, having been merely pasted on, was loose. These little defects being amended, the book remains in perfect preservation, and is subject to the same remark as No. 5. The four books from that No. are labelled as pertaining to the Ceded Districts: hence it may be as well to note, that the language in which they are written is not Canarese, but Telugu.

Manuscript book, No. 7—Countermark 900.

Section 4.—Genealogical account of the *Nayar* of *Cavalapa-nad* in Malayalam.

The introductory matter is legendary, and has been before adverted to (See 3rd Report).

A woman was delivered of a female child near the hermitage of a *rishi*, who took compassion on it, though it was of outcaste origin. But in consequence of some oracular communication that this child would become his wife, the *rishi* indignantly flung it into a river; down which it floated; until it attracted the compassion of a Brahman woman, who took it and reared it as her own. After some time, when her *protegée* was drying her hair, after bathing, the Brahman woman discovered that her *élevée* was of an outcaste tribe, and drove her away. The banished-one wandered about; and, in process of time, had twelve children by different persons, each of which children was abandoned, and reared by foster parents: the several children being adopted into the tribe of the persons bringing them up. Among these children were *Cumaren*, and *Raman*; who became headmen of a district, and the ancestors of the *Nayars* of *Cavalapa-nad*. Their line of descendants, divided into four lineages, is given. In some cases where children failed, others were adopted. The rule of the four lines seems to have been over an extensive tract of country. A few details are given; but it is stated that in times of foreign invasion, some records were lost. Account of expenses incurred at the installation of a *Nayar*. A list of towns, or villages, forming a district. Several inhabitants, as settlers, were allowed for a time to clear, and cultivate ground, rent-free; but afterwards paying a tax. An account of interference from the Cochin, and Travancore, *rajas* appears. Afterwards Hyder Ali gave trouble. The English are mentioned; and especially the name of Governor Duncan, of Bombay. The English opposed Hyder Ali. From the time of Tippu Sultan, the district came into the possession of the Honourable Company. The situation of the district is, I understand, midway between the former possessions of the Cochin, and Calicut, rajas.

Remark.—The other papers in this book are noticed, in the preceding Tamil portion of this report (which see). In point of condition this paper is in better order than any other one in the book. With ordinary care it will continue legible for several years; and, since such is the case, the contents do not seem to be of such importance as to require restoration at the present time.

Manuscript book, No. 21—Countermark 366 and No. 22—Countermark 367.

These are two thin quartos, containing the two copies of the poem entitled *Harischandra Nalopákyanam*, referred to in the foregoing portion of this report. Both copies are complete, in five *asvásas*, or sections. The ink is good; the country paper slightly touched by worms; but, with a little care, both copies will last for many years.

Manuscript book, No. 32—Countermark 320.

Velugotiváru-vamsavali, or account of the local chiefs who ruled at *Vencatagiri*.

An abstract of MS. book, No 49, section 8, was given in my second report, being the same subject. This copy had not then met my eye; not having, at that time, the collection entirely at my control. It forms of itself a neat small quarto, strongly bound in leather, and in very good preservation. It is also complete, and fills a larger document than the section above referred to, from being written in a bolder hand, with spaces left between divisions of the general narrative.

C.—MAHRATTI.

Manuscript book, No. 1—Countermark 641.
Ibid. No. 2—Countermark 645.

Cadha-ca'pa-taru, or an abridgement of various *Hindu* writings in the *Bharatam*, *Bhagavatam*, *Ramayanam*, *Puranas*, &c.

This title, written in English at the beginning, tolerably well defines the contents. The term *Calpa-taru*, is however, rather more ingenious than therein appears. In the paradise of *Vishnu* there is said to be a tree of plenty, called *Calpa-vriksha*, which offers whatever is wished for, by the person approaching it. Even so, this book gives variously, and plentifully, to the reader. The work is in two volumes, written on French paper, with good ink; and continues in perfectly good preservation.

The *Balband* character is employed, being only a slight variation from *Deva-nagari*: the language is a *Pracrit*, having so large an admixture of Sanscrit words, and derivatives, mingled with the Mahratta idiom, as to make it a sort of high dialect. The work is entered in Des. Cat. vol. 2 p. 98, art. v with so full, and good, an index of contents, as to render any similar minute specification, in this place, not requisite.

Manuscript book, No. 64—Countermark 861.

A journal of *Narayan-rao*, in his journey through the Ceded Districts, from August 1809, to July 1810. The ink is good; the paper only very slightly injured. The book, as it is, will last for many years.

Manuscript book, No. 66—Countermark 863.

Two journals of *Ananta-rao*, in his progress through the Ceded Districts, from January to September 1811; and from October 1811, to August 1813. The paper very little injured where written on, and the ink durable.

Manuscript book, No. 69—Countermark 866.

Journal of *Ananta-rao* for 1811: letters sent by him in 1810: letters sent by *Narayana-rao* in 1811. Journal of *Narayana-rao* from January to June 1813, in progress through the Ceded Districts.

Letters sent by him in the years 1812, and 1813, and journal for the year 1811, when travelling in the above districts. A rather large book, closely written with durable ink, on country paper, but very slightly damaged.

Such journals I pass without minute remarks. They may possess some details, not wholly destitute of interest; but the voluminous nature of the collection forbids any loss of time, where the field of research has little promise. All such journals ought notwithstanding to be read over at some future period.

Manuscript book, No. 36—Countermark 790.

Section 1. Account of *Narayan-jiyar*, one of the managers of the fane at *Sri-rangham*.

The account commences by giving a reason for the name, which it may be sufficient for us to know, is dated backwards only twenty-eight *Maha-yugas* since. At a much later period the place was under the charge of fourteen persons; the names of some of whom, with their panegyrics, are stated. The management downwards is mentioned; with the number of years during which each manager held authority.

REMARK.—The document is in verse, with a very large proportion of Sanscrit words. It is very greatly injured, being eaten away at the edges, and to a considerable extent within the pages, so as to destroy the connexion of the sense; and, on that account, a successful, or connected, restoration of the writing is impracticable. The loss is perhaps not of much consequence. From the titular name of *jiyar*, I recognize this line of managers to be the antagonists of the *Anuranga* line before adverted to, in a preceding statement. See 3rd Report.

There is pasted into the book, and not properly belonging to it, six pages octavo size, of defective Tamil writing, relating to the *Cattata-jati*, and *Congala-jati*, two very rude kinds of savages, who live in the mountains near *Collan-kotai*, and *Cannapatti*; their modes of life, customs, kind of religion, and similar matters. The want of completeness, in these pages, is to be regretted. Several years since I was apprized of the existence of such a people, in the mountains of the Dindigul district, scarcely raised above animal existence. From other papers, we find remnants of them, in various low stages of civilization, scattered over the peninsula; usually in mountain retreats. Having already, more than once, adverted to the conclusions indicated by the extensive existence of such rude tribes, I need not add more, in this place; except the hope of finding some connected account of these *Cattatas* and *Congalas* elsewhere in the collection.

Section 2. History of *Chengi* kings in the *Dravida* country.

This paper which is promised in the table of contents, appears to be wanting. Either the foregoing document may have been erroneously so designated, or else the paper in question may have been mislaid, and those loose leaves pasted into the book, in its room.

Section 3. Account of the eighteen *Chola-rajas*, &c.

The writer professes to extract from the *Bhavishotriya-puranam*, and makes *Parvati* to enquire of *Siva* at *Cailasa*, concerning the place where beatification may be obtained. *Siva* then is made to narrate what follows.—In the wilderness there was a man, and his wife, of the *Cunumbi* tribe, to whom *Siva* appeared; and they asked him permission

to become rulers of the country. Their request was accorded; on condition of building a great many *Saiva* temples. The said man ruled ninety years; and specially distinguished himself by killing *Surasuran*, who had greatly molested the peaceful inhabitants of the country. From this circumstance, his power would appear to originate. He transmitted his rule to his descendants. [Here unhappily a chasm in the manuscript occurs]. Mention of *Kulottunga Chola*; and of *Siva-linga-Chola*, afflicted with leprosy: and of other transactions. The entire period of the *Chola* rule was 1153 years. The account was written at Tanjore in the *Crodhana* cycle year by *Venroji agoja*, who states in the conclusion, that if the learned shall discover in his production any mistakes, or errors, they are requested to extend to these their indulgence, and pardon.

Remark.—On the document is an English endorsement as follows: "Account of 16 *Chola rajas*, procured at *Capistalum*, in which three pages are lost." The apology of the author, at the close, must, be weighed: for it implies his own consciousness of possible errors, or deficiencies. It is, however, to be noted that the passage about the killing *Surasuran* illustrates a section of the *Seventhi st'hala-puranam*, wherein the first founder of *Uriyur*, and Trichinopoly, is termed *Sura-vathittan*, or "the slayer of *Sura*;" and is therein described as the first ruler. The term of 1159 years, for the *Chola* dynasty, is too great: divided among 18 it would give about 65 years to each; and we otherwise know the term to be too great. As regards the *Cunumbi* tribe, I understand that *Cunumbi* is a common Mahratti term to express a tribe, or caste, which is not of *Hindu* extraction.

This document besides being incomplete, wanting a leaf in the midst, and some others at the end, is also greatly damaged, by insects eating away portions near the outer margin. It is only not quite so far gone, as the first section in the book; and a complete, or connected, restoration of what remains of the document is not practicable. Nevertheless as all versions of the *Chola* dynasty, are, desirable; as this document throws a ray of light on the *St'hala-purana* of Trichinopoly; and is needful to support, on reference, the abstract herein given; I have had its restoration attempted: which, upon the whole, has been successful.

Section 4. Account of the establishment of *Tonda-mandalam*.

According to this paper, there were only four or five huts of *Kirata* people (wild savages) previous to its subjugation by the *Chola* king. He, is

herein said to have been long childless, and at length to have had a legitimate son whom he established in a separate palace. A vision of the god is introduced as appearing to the *Chacraverti* who first ruled the *Tonda-mandalam* (i. e. *Adondai*, name herein not mentioned) directing him to a certain place, whence he was to invite and introduce the *Gó-Brahmans*, and he did so. He went on a pilgrimage to *Sri-sailam*; and died soon after his return.

The document then adverts to *Sri-rencha-yádava-rayalu*, and after him to *Vira-nárayana-rayalu*, *Dera-rayalu*, and others, as rulers of great power; the whole being 18 in number (the *Rayer* dynasty). The *Góbùr* people, from the north, are next said to have come, and acquired power. Afterwards the Mahomedans from *Hastiná-puri*, or Delhi, fought with the *Góbùr* people, conquered them, and extended their dominion over the *Dacshin*, or south country.

REMARK.—This document is complete, and has escaped destruction, by having a large outer margin, partly destroyed, but leaving the writing within only slightly injured. The paper varies, at the outset, from Tamil documents, concerning *Adondai*: but agrees in the general outline. The pilgrimage of *Adondai* to *Sri-Sailam* has not before appeared, in previous documents. The mention of the *Góbùr* people seemed to point to the *Mahrattas*; and, on enquiry, I am told, that there is a class of Mahrattas, at Poonah, who bear that appellation.

NOTE.—As the document, though now recoverable, would very soon cease to be so: and as it has some value, taken in comparison with other papers, I have had it restored.

Section 5. Chronological account of the former *rajas* with dates, &c.

This document is a collection of matters gathered from the *Puránas*, of the *Vaishnava* kind; but put together very much at random, and making the site of all early transactions to be Ougein, which we otherwise know to have arisen from obscurity, only towards the decline of the *Magadha* kingdom. There are, I think, gleanings to be gathered, concerning times subsequent to *Vicramáditya*: but the authority of the document seems to me very low, and the writer, at the close, says he had gathered the materials from old books, to the best of his ability. The writing is very legible: but the paper much injured by insects. On the whole it has seemed expedient to rescue it from destruction, by re-copying it; leaving its measure of value, as an authority, to be adjusted at some other time.

Section 6. Account of *Chola-s'mha-puram*.

Legend of a shrine, on a hill, named *Gádakáchala;* offering nothing, that I can perceive of consequence.

There is a deficiency in the book: and the correspondence of the papers, with the table of contents, is henceforward doubtful.

Section 7. Account of grants.

Corresponding with this section, as I suppose, is the mention of nine village districts, said to have been made over by the Honourble Company for the support of the fane, adverted to in the preceding article.

Section 8. Account of rajas.

There follows a list of some kings, and afterwards a list of towns; but after sect. 5 the correspondence of papers, with the index of contents is obscure, and doubtful. With the exception of sect. 10, promising "an account of the war of Chengi kings with the Moguls," which is not to be found in the book, I do not perceive any other loss to occasion much regret. Generally speaking, however, it is a pity that the collection has suffered so much injury.

Manuscript book, No. 6—Countermark 872.

Section 1. Account of *Syed-yakub* of *Muttur-Chennapatnam*, in Mysore.

A reference to some Mahomedan affairs 150 years since, in the time of Aurungzebe, or Alemguir, and minor paltry details of inter-marriages, subsequently: the whole entirely worthless.

Section 2. Details of merchandize in the *Ekri-sagur*, district of Bidanur.

Money; weights; measures; provisions; ordinary commodities, &c. without any utility, as regards the present enquiry.

Section 3. Account of agriculture in the district of *Chandra-gudi*.

This, in an agricultural point of view, is a document that might be deemed curious, or interesting; but irrelevant to my object.

Four other sections follow, concerning betel and areca nut gardens, weights, coins, &c. In the English heading, a notice of *Vedars*, or hunters, is mentioned; but is not to be found in the book itself. At

the close the writer states that some things, which he had forwarded, were erroneous; promising to send a better account another day.

Upon the whole, the entire contents of this book No. 6, seem to be destitute of any permanent value, it is therefore left as it was found.

Manuscript book, No. 8—Countermark 874.

(Some sections in the Canarese language).

Section 5. Account of *Chitra-durga* (or Chittledroog) with the genealogy of its feudal chieftains.

Legendary origin, co-eval with the times of *Crishna*, and the five *Pandavas*. Subsequently it was a waste, or wilderness, for 1724 years. In Sal. Sac. 1272 (A. D. 1350), *Timma-sara-nayak*, paid homage here. In the time of *Narasinha*, there was war with the *Rayer* of *Vijayanagaram*. A thousand *Jonacas* (here meaning Arabs) were engaged as stipendiaries in the war. There follow details of subsequent chiefs, and their wars. At length a Mahomedan, named Cazim Khan, took the fort. A Mahratta chief drove away the Mahomedan: and, after re-instating the *Hindu* chieftain, returned to Poonah. Various minor details follow, down to the time of Hyder Nayak, who took the fort; together with other places; the doing which brought on a war with the Mahrattas, and an invasion of Seringapatam. In the various affairs, connected with the Mahrattas, mention of the English occurs. The paper comes down to the assault of Seringapatam, by the Mahrattas; and then abruptly breaks off.

NOTE.—The preceding document as regards the writing, and the material written on, which is very inferior French paper, might be allowed to remain; but several of the leaves are loose and the preservation of the whole, in this state, cannot be depended upon. On the whole therefore I have judged it my duty to have the document restored; seeing that most of the details are historical.

Section 6. Account of Seringapatam.

A legend of the formation of a fane, on the site of the town. *Rama* subsequently visited it, and *Jamadagni*, the *rishi*, resided there; who was much annoyed, by the flooding of the river taking away his hermitage. *Rama* removed the unpleasantness, by commanding the river to continue restricted within certain bounds. *Sica-sancara* was a ruler at this place; concerning whom, and some wars with his neighbours, there are some details. The foundation of *Talcad* is mentioned. The

Peishwa of the Mahrattas drove away the chief of this place, who escaped on horseback, and retreated to the woods. Subsequently the rule of *Srirangha rayalu* (brother of *Timma-raju* of *Pennaconda*) is stated. The name of *Srirangham* seems to have originated from him. He went to *Tulcad*, and died there. The rule of a lord, without specification of proper name, is adverted to, who founded the *Chamunla* fane. The subsequent dynasty of native kings. The Mahomedan usurpation was set aside by the English; who re-established the former dynasty.

Remark.—The commencement of the document is mere legend; but afterwards there is matter of more value. As the paper on which it is written is loose, and the ink pale, I have had it restored. From the intervention of the Mahrattas, down to the close, there would seem to be matter that might merit translation.

Section 7. List of kings of the *Surya-vamsa.*

The legend of *Sacara-capila-muni*, and *Bhagirat'ha*, is given, with a few names of the solar line, for the purpose of connecting therewith the Mahratta dynasty of Poonah. A few names of kings of other, comparatively modern, races are unconnectedly added. The document is brief, and very roughly written, with pale ink. On the whole I have judged it expedient to preserve a fair copy.

Section 8. Legend of the fane at *Harikara* in Mysore.

Narrated by *Isvara*, to *Dherma-raja*. It relates to a special bathing place, in the *Tungabhadra* river; and a legendary tale is connected therewith. The language is partly Mahratti, and partly Sanscrit *slocas*, in the Mahratti character. Both as regards writing, and paper, it is in good preservation.

Section 9. Genealogy of the chieftains of *Valaha-nàd* in Mysore.

Seven persons, being relatives, emigrated from the *Canchi* district and located themselves in Mysore, in places specified. The foundation of the fane of *Vira-bhadra* in Sal. Sac. 1380, is ascribed to a vision. The chief, ruling over a district yielding ten thousand rupees revenue, went and fought against *Juni-bangalùr*, and took the country. Being troubled in mind, he rode out on horseback for exercise; and, coming to a wild place, saw a hare and dog playing together; induced by which favourable omen, he had a fort built on that place, to which the name o *Bangalùr* was given. He fought with *Sanca-nayak* and took his country. His successor built several fanes. A list of descendants appears. The Mahomedans made an irruption, and captured the country; but re-

established this chief. Some other fluctuations of power are narrated. Marriage relations with Mysore. The usurpation of Hyder. This chief thereupon retreated to *Punjanùr.*

REMARK.—This document seems to be locally of some historical value. It is in good preservation.

Section 10. Account of the fane at *Mallùr*, in the Mysore country.

Reference to ascetics, and their hermitages; in the midst of *Curumbar* people. One of the ascetics discovered treasure in the earth, and made known his discovery to a chief, who came and saw it. The result was the building of a fane. At a subsequent period the *Rayers* of *Vijayanagaram* built many other sacred edifices; especially an *agraharam* for Brahmans at *Sringeri.*

REMARK.—This paper has a mixture of fact and legend. It is in moderately good preservation.

Section 11. Narrative of *Venasiti*, a *Lingadhari.*

This is merely an account given, by the said person, of his family origin from *Anajundi*; emigration thence to the Mysore country; practice of medicine; support derived from Hyder Ali; and subsequent loss of livelihood. It is contained in two pages, of very rough hand-writing; and is of no value.

Section 12. Account of *Balla-baktapur.*

Reference to an emigration of brothers from *Canchi*, to the neighbourhood of *Talcad*, in fusly 948. Three boxes came down the stream, containing images; and a vision of these gods pointed to hidden treasure, with which a fane, a fort, &c. were constructed. An incursion of Mahomedans, who captured the fort. Intervention of Mahrattas. Affairs of Tippu Sultan. His treaty with the Mahrattas. Details of the war of the English against Tippu; ending in his overthrow, and the re-establishment of the former Mysore sovereignty.

REMARK.—A former paper occurred on this same subject; but not quite so full. This document being written on thin China paper, of which the sheets are become loose, and one lost, it seemed expedient to copy out the whole in a more permanent form.

Section 13. Account of the *Carnies* of *Balla-baktapur.*

This statement of revenue districts is connected with the foregoing; and, being in like condition, has been added to the restored copy;

though were it found alone and unconnected, it would not have been deemed of importance.

Section 14. Account of the kings of *Kaladi* metropolis in *Bidanur*, (*hodie* Killudee).

Copy of a record in the hands of a person mentioned. Anciently the country was a wilderness. The founder of the dynasty was a local chief, ruling in a town called *At'hiyar-nagara*, which the ruler at *Anagundi* hearing of, sent for him in Sal. Sal. 1422. (A. D. 1500) and formally installed him, as a feudatory chief. He built a fort in the place where he had before dwelt; and governed for 13 years, and seven months. His son was *Sada-siva-na-ak*, who ruled 13 years; and his son, *Dada-sarapa-nayak*, ruled seven years and one month. In all sixteen descents are specified; occupying 263 years. Some mention occurs of their proceedings, in reference to their neighbours, and their benefactions to fanes and Brahmans. (The above period would come down to 1763 A. D.). It is added that Hyder Ali, acting under the orders of *Crishna-raja-udiyar*, king of Mysore, about that time captured this fort; together with others, which are mentioned in the neighbourhood.

So much is contained in one part of the document: another part is to the following purport.

The place was anciently a wilderness. One *Basavapa*, a merchant, laid the foundations of the family; and, together with his wife, was very munificent. They had two sons. A sort of power was exercised by him, and his sons. A vision, in the shape of a Brahman, directed them to a place where a symbol of *Siva* fixed by *Rama*, was to be found. Subsequently a serpent, under a tree, directed them to buried treasure, instructing them to build therewith, a town and residence.

A reference is also made to the foundation of the *Rayer* dynasty: the means of doing which is ascribed to a momentary shower of gold, sent down by *Virupacsha*, a form of *Siva*. By that means the celebrated monasterium of *Sringeri* was founded; and other munificent donatives were bestowed. The Mahomedans afterwards conquered the country; and placed therein a descendant of the former family, as their tributary.

Section 15. Account of Seringapatam.

Legendary matter as to the formation of a shrine. Mention of some local chiefs, and periods of their reign; and statement of their donatives given. Interference of the Peishwa power; of Hyder Ali; Tippu Sultan. These matters are intermingled with panegyrics of the rulers, at different periods.

Section 16. Account of *Ráni-raya-gata.*

The situation is about 12 coss westward of *Chitra-durga* (or Chittledroog) and was the site of a local chieftain's power. Some details of his family, and their proceedings are given; but the paper is a fragment of only four pages, and what is contained is only of moderate importance.

NOTE.—The three papers from section 14 to 16 inclusive, are written on strong Europe paper not damaged: with ink only a little faded. It is my intention to attach these to a Canarese document, in like preservation, at the beginning of the book; and then all the loose papers following will be of no further consequence: having been, with only one slight exception, restored in a permanent form.

Incident at *Anagundi.*

A writing of two pages, on damaged and fragile paper, not noticed in the table of contents prefixed to the book, was found prefixed to section 12. It contains the same narrative as that in MS. book, No. 9 Countermark 875, sec. 2 (Vide 4th Report) but somewhat fuller, and as bringing connected circumstances down to the period of a reference to Madras. It has been re-copied, immediately after the document in section 13. The Mahratti portion of this book has now been abstracted; and, for the greater part of it (as was urgently needed), permanently restored.

Manuscript book, No. 37—Countermark 791.

Ancient record of the *Chacravertis* and *Yadava rajas.*

The contents of this book resemble those of MS. B. No. 45 (Vide 2d Report). It is a distinct statement on the same subject; that is chiefly the *Yádava* line of princes. It should, I think, be also fully translated. The volume is a thin quarto with very little written on each page. It is well bound, and otherwise in perfect preservation.

D.—SANSCRIT.

Palm-leaf manuscripts.

1. *Silpi-sastram* No. 94—Countermark 256, *Grant'ha* character.

This is a treatise generally on every branch of the art termed *Silpi-sastram.* It refers to the plans, and arrangement, of fanes for idol wor-

ship; to the construction of towns, & included buildings; to the formation of images of every kind, intended for the purposes of homage, or worship. With these matters much of astrology is mingled: as to the configurations of planets; their effects on particular days, and the proper times to be chosen for commencing, and carrying forward, any work: if these directions are not observed, loss and damage will follow. There are also formularies prescribed to be used, on the above several occasions.

This manuscript of 63 palm-leaves is of recent appearance; slightly touched by insects; but, on the whole, in good preservation.

2. *Silpi-sastram*, No. 95—Countermark 257 (*Grant'ha* character).

In this manuscript two different works are contained.

1. The first is a little old, in appearance: and treats of the workmanship of images, whether made of earth, of wood, of stone, or brass, &c. Particular directions are given, as to the choice of wood; if that material be employed. Astrological times, and observances, are connected with these formations. The work then proceeds to treat of the formation of towns, and villages; and states the eight kind of substances which are required towards the formation of images, in fixing them aright; these are termed *ashta-bandanam*. This last subject is contained in a single leaf.

2. The other work is of recent appearance; and contains various meditations on the qualities, or attributes, of different ideal deities. These are *Brahma*, *Vishnu*, *Rudra*, *Mahesvara*, *Siva*, *Mahesvari*, *Caumari*, *Varahi*, *Mahendri*, *Chamundi*, *Astra-deva* (a form of *Siva*), *Chocapa*, *Vikenesvara*. These meditations consist of reflections on the visible attributes, hands, arms, weapons, &c., with which the images of those idealities are usually represented; and which have an allegorical meaning, though not usually known, or attended to.

There are further some details of attributes of *Brahm*, or the Supreme; these being properly what are termed perfections, and without visible symbols.

The meditation of *Nandi*, the vehicle of *Siva* and his *Sacti*; of *Maha-Cali-Sacti*; and of *Bhairava*. Meditation concerning the door of the fane; its security; and its porters, or warders; its steps; its bolt. The *mantra* on opening the said door, and similar details:

These matters are curious, and give an idea of the minutiæ connected with idol service, not usually met with, in other kinds of books.

3. *Silpi-sastra* (*Grant'ha* character), No. 96—Countermark 258.

This is a very small book, in twelve half sized palm-leaves; complete, and in good order. Its subject is the observation of the *nacshetra*, and other astrological formula, requisite to be observed, before beginning the architectural construction of fanes, towers, images, cars, and any large buildings. The different aspects of the planets; the rulers of special times, and seasons; their friendship,or enmity: these, and similar things, are all to be carefully observed, and compared, before the commencement of any work; so that bad times may be avoided, and good ones chosen.

NOTE.—The foregoing three MSS. are entered in the Des. Catal. vol. I, p. 261 art. I, as Tamil works; but they also seem to have an entry under the head of Sanscrit works in p. 131 and 132.

4. *Silpi-sastra* (Telugu character), No. 114—Countermark 491.

This is a rather old book, and incomplete; both in the middle, and at the end. The contents are multifarious; but all relate to the one leading subject only of the formation of images. These images, whether formed of brass, wood, or clay, have different observations, astrological, and otherwise, connected with them. Certain tokens are given as to the cutting of wood; shewing what ought to be rejected, and what chosen. Different kinds of earth, and of different colours, are to be selected for images of different deities, as most suitable. The baking of earthen images in kilns, and the proper time of taking them out, are described. The whole of the details are too minute to be specified in an abstract. The author's name is *Peddanachari*. The subject is more than a mere matter of curiosity: it is however one on which it is not necessary that I should enlarge.

NOTE.—This manuscript is entered in Des. Catal. vol. I, p. 357, art. v, as a Telugu work: and it also appears as Sanscrit, Telugu character, at p. 132, art. vi.

CONCLUSION.

The fifth section of my general report here finishes.

MADRAS: *September 30th* 1838.

II.—*Essay on the Language and Literature of the Telugus.*—By Charles P. Brown, Esq. *of the Madras Civil Service.*

The morals and happiness of a people must always be primarily affected by the state of literature among them; and when we find a nation possessed, like the Telugus, of an ancient and extensive literature, constantly perused, and therefore constantly acting upon their condition, the nature and extent of that literature becomes a question of interest. For in arguing with one of another nation, we shall always find it profitable to know what has been the education pursued among those whom we perhaps wish to instruct. Happily for the Telugus a strong desire to know English is daily gaining strength among them, though it is hitherto studied not by one in a thousand. But the works honoured among them, as written by their favourite bards, are as likely to last, as those of Shakspeare and Milton among ourselves. An outline of their most popular poems may be useful to the foreigner, as guiding his judgment: often liable to error on account of the crude and partial statements orally given us by Telugus regarding their own literature. It will be perceived that I have been led to form a low opinion of some favourite works, particularly in the philological class: and have pointed out a path which I hope will prove more short and agreeable than that which many learned Bramins may advise.

1. Telugu or Tenugu, also called A'ndhra (and by Musulmans Telinga or Tailinga), is the language of a Hindu nation filling a semi-circle, of which Rajahmundry may be assumed as the centre, while the radius extends to Madras. Trilinga and Trailinga are modern pedantic names unknown to the ancient authors.

2. The Telugu language borrows largely from Sanscrit and, in colloquial use, from Hindustani—yet it is an original tongue, and he that is already acquainted with Sanscrit, with Hindustani, or any other language, may yet find himself unable to understand poetry, correspondence or conversation in Telugu.

3. The alphabet used shews that Telugu originated in the Carnātaca (Cannada or Canarese) language, spoken in the centre of the peninsula: the ancient Telugu princes are spoken of as *Carnataca Doralu*: but in modern days the two languages are as different as Welsh and English. The Telugu alphabet resembles that of no language except Carnataca.

4. All Sanscrit literature in this part of India is preserved in the Telugu character: in which as in the other alphabets of Southern India, Sanscrit is written with perfect ease. Indeed we here rarely meet with any Sanscrit volume in any other character. The pronunciation of San-

scrit among the Telugus corresponds with the purest pronunciation used at Benares.

5. The Telugus frequently advert to the idea that Sanscrit is the mother of their language, just as in older times we used to look upon Latin as the source of English. This notion very naturally arises from their ancient grammars being written in Sanscrit, and constructed on Sanscrit principles. Yet Sanscrit is far from being generally cultivated: perhaps among the educated classes one third of the Telugus can read the vernacular poets: and of that third not one in twenty has ever been instructed in the Sanscrit literature. Indeed Telugu poetry though thickly interspersed with Sanscrit words is *unintelligible* (as is Telugu conversation also), to many a foreigner; as for instance, a Tamil or Canarese Bramin: notwithstanding his command of Sanscrit literature he may remain unable to read or even to pronounce Telugu. Others assert that at least Telugu *poetry* originates in Sanscrit. This is easily disproved. In orthography all the laws of permutation and elision are widely different: and every law of the Telugu prosody is totally dissimilar to Sanscrit, although five or six metres (out of some hundreds) have been imitated from that language.

6. The circle which has been mentioned does not include all those parts of the Indian peninsula where the language is spoken: for the Telugus have emigrated to various parts of Southern India. thus a knowledge of this language will be available in the Tamil districts, and particularly in the neighbourhood of Madras. We find however no signs of emigration into the Telugu districts: the tyranny of the Musulman rulers of Telingana in former days is generally referred to as accounting for this fact.

7. Christianity has hitherto made a scarcely perceptible beginning among the Telugus: the bulk of whom are Hindus, of the two braminical sects called Vaishnavite and Saivite; and of the Jangamas who look upon the others as mere idolators: while they themselves worship the symbol of I'swara suspended in a reliquary on their breasts. These three sects are perhaps equal in numerical strength, if among the Saivites we reckon the Smartas who are a sort of free-thinkers.

8. The Musulmans are widely spread through the country but are in a degraded state; they continue to talk Hindustani, but few can write it; indeed they are so illiterate that their accounts and correspondence generally are in the Telugu writing of a Bramin: they have sunk into a menial condition and their language has disappeared from the records even of Government, excepting a few departments wherein the law requires the Persian character.

9. But under their dominion which lasted about a century and a half Telugu literature fell very low, and has only gradually revived under the British Government. Yet no part of the ancient and favourite volumes has perished, and a great fondness for their popular poems has been in recent days the motive of continual publications that issue from the presses at Madras.

10. When we first read their poems we are led to suppose that the dialect used is entirely different from that we daily speak and write. But a little advance in knowledge will shew us that the polished dialect of Telugu used in the poets deviates no more from the spoken dialect, than the language of Milton, Pope, and Byron differs from the English we speak and write. My attention was first called to this fact from observing, many years ago, that a well educated Telugu, fluent in colloquial English, was wholly unable to read a page of Marmion. Now the Bhascara Satacam, a common school book, written in flowing verse, and easily understood by boys and girls is parallel in style to the writings of Walter Scott, or Sadi in Persian; yet perhaps the reader of this page never met with three Englishmen who had read that easy school book. Let us not then call poetical Telugu difficult merely because we have not studied it.

11. From the harmony of this language some have called it the Italian of India; doubtless in the poems, and in the pronunciation of retired villages, it is very melodious; but like Italian it has many a rough and coarse dialect: and the Telugu used in our courts of justice is a strange jargon in which English and Persian phrases are thickly interspersed, forming a jumble that may be difficult to an Englishman who otherwise may be a good proficient in the language. In another very important respect it resembles Italian; for no part of the language, not even in the oldest poems, has become obsolete. And to a beginner we could not recommend an easier volume than the Prabhu Linga Lila, which is supposed to be about seven hundred years old. Some attribute it to a more remote age: but it certainly was written before the Musulmans invaded the country.

12. The Telugus themselves think that the dialect used in the northern (or what they themselves call the eastern) part of the country, is remarkably elegant; and the worst dialect is that spoken at Madras. A foreigner may be excused for perceiving little difference: it appears to be everywhere equally corrupted with Hindustani and English phrases. Nay some of the modern poets (witness the tale of Bobbili, and the Bhalira Cari Velpa Satacam) are full of foreign words. Indeed the

colloquial Telugu is just as corrupt as English was in 1700 when every speech was interlarded with French or Spanish.

Yet I am far from denying the *utility* of the *Hindustani dialect:* as we may denominate the mixed Telugu. There are many convenient English and Hindustani words in every-day use, which do not admit of *intelligible* translation into Telugu. The number of these doubtless will increase (not unprofitably) in time: I would only deprecate the excessive use of this slipshod jargon.

13. If we wish to learn the language completely, to have any degree of ease in speaking or accuracy in writing, we must devote some time and labour to reading a *few* of the *easiest* and most popular poems.* Indeed common consideration will shew us that foreigners who study a language must of necessity learn it in the poets: because this is the easiest as well as the securest path. What should we think of the English acquirements of a foreigner who could read neither Goldsmith nor Cowper? should we condemn him for wasting his hours, if he devoted himself to studying those authors (though popularity may have rendered them vulgar) who among us have attained classical rank ?

14. In the literature of the Andhras three bright æras are generally pointed out: the first, that of Nannaya Bhatta and Bhimana; coeval with the writers of the three earliest Jangama poems. The next (assigned to A. D. 1200) is that of Ticcana Somayaji and about two centuries later was the brightest noon of learning, illuminated by Bhattu Murti and other bards who are emphatically called the "gems." From the want of dates in Telugu literature it is impossible to ascertain precisely the æra at which these writers flourished; but it would seem that their illustrious patron Krishna Rayalu died in the year 1458, of the Christian æra: corresponding with year 1387 of the æra of Salivahana.†

* Such as Vemana, the Saranga Dhara Dwipada, the Vijaya Vilasam and the Aniruddha Charitra, which one will be able to read after perusing a few common trials such as he can borrow from any criminal court. He may then proceed to the Mahabharat. Yet I look upon the Lila as sufficient: it is not more difficult in style than the Lady of the Lake: in sweetness and purity of diction it equals Theocritus: but its popularity among the Jangamas is looked upon with an evil eye by the Vaishnavites and Saivites who hold it heretical. In point of morals it is far purer than the works which they consider sacred, and I know no Telugu book so agreeable or profitable to a beginner. An edition and translation of this will I hope soon be prepared. The Nala Catha Dwipada is also an excellent book for a beginner.

† This date is preserved in the following couplet:—

Araya Sālivahāna sac ābdamul, ADRI GAJ AGNI SOMU lan
Tārana vatsarambuna ni dāgha dinambuna, Chaitra sucla sash
Thī, Ravi vāsarambuna, Nri— simhani Krishnudu chēre swargam. A'
Dwāracan unna Krishn'a yava tara Samāptamu chendu caivad'in·

15. Before proceeding to further details it may be worth while to describe the state of the national taste, among the learned and the less literate. The few Bramins who cultivate Sanscrit learning generally study grammar, a few of the works on divinity, metaphysics, law and logic: also some portion of the poetical and theatrical writers. To read through a poem is thought quite superfluous, and those who assert their complete mastery of the Magha, the Ramayan, and other leading classics, seldom can prove that they have perused more than a few chapters in each.

16. Another class devote their attention to Telugu learning and acquire a good mastery of the Vasu Charitra, Manu Charitra, Vishnu Chittiyam, and other poems of celebrity. Even among these scholars the *grammar* of their language is as little cared for as English grammar is among the English. They talk of their native philologists with enthusiasm; but the celebrated grammar written by Nannaya Bhatta, has, with all his commentators nearly fallen into oblivion: perhaps not twenty men can at the present day be produced throughout Telingana who can prove their acquaintance with it.

17. The pedantry of their treatises on prosody has led to similar disuse. The Siva Andhra is, like its Sanscrit model the Amara Cosha, very widely taught:—about one quarter of the Cosha is taught to nearly every school-boy. He also commits a few moral stanzas to memory, and is taught writing and arithmetic. This usually terminates his education, and hundreds even of clerks in our public offices have but this limited instruction.

18. We often hear the Puranas and the Ramayan spoken of along with the Vedas as being the scriptures of India; but they are very little studied. I may here mention that *only three Vedas exist*; each Bramin's progenitors professed *one* of these three; and no man would even admit the other two into his house; as mutual hatred is the only remaining trace of braminical zeal. The Jangamas alone profess to obey the *Vedas* and *Calpas* (or systems), and even these sectarians have entirely renounced the *ritual* portion of these laws. They reject *all* the puranas and the Ramayan itself, and are therefore held in theological hatred by the Bramins.

In this it is distinctly stated that king Krishna Rayal died in the Salivahana year 1387: the year being denoted in the usual ingenious mode by four words "mountains, elephants, fires and Moon—i. e., seven, eight, three and one, which figures being reversed give the æra. This mode of numerical notation has been fully explained in an essay on the subject, written, if I recollect right, by Mr. Prinsep of Calcutta. The date assigned in the table framed by Colonel Mackenzie (which is printed in the introduction to Mr. Campbell's Telugu Grammar), is six years earlier; or, A. D. 1452.

19. The Ramayan is more generally in vogue than any other sacred legend, and has been repeatedly translated into Telugu. The version written in couplets (dwipada) by Ranga Natha is an especial favourite, and when we see circles of Hindus passing the evening sitting in the moonlight to hear a volume chanted and explained for their amusement we shall generally find it is this "tale divine." But they irrationally look upon the meaning as very generally superfluous, and think with the Musulman and the Catholic that if they cannot understand a good book, they at least have the merit of reading or listening to it.

20. The version in *stanzas* (padya) bears the name of Bhascara; who was assisted by other poets. The style is very poetical, but being, like the Mahabharat, written in the Sanscrit dialect of Telugu (resembling Johnson's and Parr's Latinized English) is sometimes above the comprehension of common persons: and accordingly I think this version is much more applauded than read. All these versions are greatly abridged from the Sanscrit original.

21. Another abridged version of the Ramayan is written in very flowing Telugu verse by the poetess Molli, who was the daughter of a potter—another called the *Niroshtha* (or, non-labial) Ramayan, is a pedantic composition: a mere feat of ingenuity, and merits little notice. I mention it (as well as several other books in the present pages) to warn the reader of the real value of puerile compositions which among Bramins have attained an undeserved celebrity. In this absurd poem, the very name of the hero (Rama) is excluded because the letter M is labial, and the poet chooses to write without using (p, ph, b, bh, m) a single labial letter.

22. The Rámábhyudaya, another poem on the same popular theme (by Rama Bhadraya) belongs to an early age; it is always spoken of with high applause, but manuscripts of it are rare: in fact I never saw but one copy which I obtained from Vizagapatam. The Uttara Ramayan has been elegantly translated by Canacanti Papa Raz, who also wrote a pleasing poem called the Vishnu Maya Vilasam. The Adhyatma Ramayan again is a separate poem written in an inflated (utpréxa) style, and is little read.

23. The Telugu version of the Mahabharat also enjoys a deserved popularity as the great standard of the language: indeed the verse flows as pure and sweet as that of Pope or Dryden in their happiest translations. In this, it is contrasted with the Bhagavat, the Telugu version of which (like Pitt's version of Virgil), is more faithful but is unpopular, being considered (zabbu) mean or unpoetical in style. The Bharata, if printed in the same manner, would extend to nearly the size

of Shakspeare's plays: being about twice as long as either the Bhagavat or Ramayan.* It is considerably abridged from the Sanscrit original; many hundred verses being often condensed into a paragraph, written in prose: indeed prose is interspersed in all the Telugu legends and poems, but no where so profusely as in the Bharata. The first three parvams† or books were composed by Nannaya Bhatta and his associate Erra Pregada. The remaining fifteen parts are the composition of Ticcana Somayazi: these authors unitedly are emphatically called (Cavi Trayam) the three bards.

24. The text of the Mahabharat has unavoidably been much corrupted, in the course of years: and the Adi Parvam, or first book, being a common school book, has suffered more than the rest. The whole has now been revised and the devious readings found in different manuscripts have been recorded; on this foundation a new edition is now in progress, and the first book is in the press.

In this ancient version of the Mahabharat some episodes are omitted: being too sacred to be translated. These are, the Bhagavat Gita (a portion of the Bhishma Parva or sixth book), the Vishnu Sahasranama, the Bhishma Stava Rajam, and the Anusmriti. The first of these, the Gita, has in later times been translated into Telugu under the usual title Krishna Arjuna Samvadam.

* It contains a little more than 23,000 padyams or stanzas (the prose being reckoned as verse), of four lines in each.

† The eighteen books are in the Telugu version divided into sixty three (asvasa) cantos. The books are never mentioned in *numerical* order, but by certain names: thus the third book of Homer was originally called the Might of Diomede. The eighteen names are 1 Adi Parvam, 2 Sabha P., 3 Aranya P. or Vana P., 4 Virata P., 5 Udyoga P., 6 Bhishma P., 7 Drona P., 8 Carna P., 9 Salya P., 10 Sauptica P., 11 Stri P. 12 Santi P., 13 Anusasanica P., 14 Aswamedha P., 15 A's'ramavasa P., 16 Mosala, 17 Maha Prasthanica P., and, 18 Swarga rohana Parvam. To recollect these names it may be useful to have the following rude lines:—

Adi Sabh Aranyamque Virat Udyogaque, quinque:
Bhishmas Dro Car Salyaque Sauptica, (prælia quinque).
Stri, Saupt atque Anusas; Asv', A'srama (quindecimum fit).
Mosala Prasthanic et Swargam, Bharata complent.

The names of the divisions or books in the Ramayan are denominated *Canda*. Thus *Bala Canda* is the phrase for the first book of the Ramayan. The names may be thus recollected—the seventh being the Uttara Ramayan, or supplement.

1 Balas, 2 Ayodhya Canda, et 3 Aranyam, 4 Cishkindhaque:
5 Sundara, 6 Yuddh' atque 7 Uttara, sunt Rameide septem.

The books of the Bhagavat again are called by numerical names; so that a volume superscribed "Dasamam" would in English phrase be "the tenth book of the Sri Bhagavat:" and "Uttara Dasamam" denotes "the second part" of the same book. I notice these because (like the "Ashtamam") they often occur in lists of Sanscrit libraries, the name "Bhagavat" being omitted.

25. Next in popularity is the Telugu version of the Bhagavat:* of which the tenth book (Dasamam) describing the life of Krishna, is eagerly perused; yet even in this their knowledge is very slight. Two or three favourite legends (as the Rucmini Calyanam and Gajendra Moxam) with the (Jalacrida or Krishna Lila), sports of Krishna with the naiads, are in general use—other parts of the Bhagavat that teach a mysterious and incomprehensible sort of philosophy are likewise popular: but we rarely find any Telugu who pretends to understand what he so devoutly reads.

26. We may here remark that the Telugu translators take liberties (more than poetical) with their originals, for they consider a general outline quite sufficient to form a copy: thus they omit, transpose and insert, whatever they please. In the life of Krishna, not only has the translator (Bammera Potu Raz) amplified the passages regarding love and beauty, but has omitted and transposed, what he pleased. He has even gone further and changed the story in some places, giving statements which are not found in the Sanscrit original. Besides (possibly wishing to conceal these deviations), the Telugu translators in *all* books set aside the numerical order of the Sanscrit, melting down ten or twelve (adhyaya) chapters into one (asvasa) book or canto. Thus it is not easy to trace in the original any passage regarding which comparison may be required.

27. The Padma Puran† has been translated into beautiful Telugu verse by Vennelacanti Surapa Raz: he also translated the Vishnu Puran; wherein the seventh (aswasam) book describing the life of Krishna, certainly has much merit though it repeatedly exhibits passages stolen from the poet who wrote the Telugu Bhagavat, just as that poet evidently had stolen much from the Prabhu Linga Lila.

28. We scarcely need stop to mention the other works of this nature, which are little read; such as the Curma Puran, the Marcandeya Pu-

* The word *Bhagavat* has led to errors: used in various combinations it denotes various volumes. The Bhagavad Gita is a portion, as has now been noticed, of the Mahabharat. The history of Krishna is usually denominated Sri Bhāgavat, to discriminate it from the Dēvī Bhāgavat, a separate and heretical work, wherein Rādha (an apocryphal goddess) is exalted into the supreme power as the Bona Dea. And in its fourth sense the word denotes a comedy, regarding the deeds of Krishna; being founded on the tales recorded in the Sri Bhāgavat. Thus the Gita is on divinity: the next is the legend of Krishna or Apollo: the third is the fable of Radha or Venus, and the fourth is a miscellaneous entertainment.

† Purānam, or chronicle denotes a fable, or poem like Ovid's Metamorphoses: describing the four ages of the world, called Crita, Treta, Dwapara and Cali; or, gold, silver, brazen, and iron.

ran, and the Skanda; wherein the Kasikhand was loosely written in Telugu by Srī Natha, and various other portions are the work of inferior poets.—All these are written in the Sanscrit dialect.

29. The remaining Puranas have not been translated: indeed it will be seen that most of the poets have chosen themes in favour of the Vishnu sect; thus the puranas that honour Siva have fallen into disrepute, and those which inculcate magic are looked upon with abhorrence.

30. Some other books are denominated puranas, which are either heretical, apocryphal, or fictitious. All these are very popular—one is the Canyacā Puran, another the Visvacarma Puran, while the Basava Puran and Mari Basava Puran are ancient, and have for many ages been eagerly read among the Jangamas. In the same class (though they would rather merit the name of poems) are usually placed the Raghava Pándavyam, written by Suranna, and the Jaimini Bharata composed by Chinna Viranna: this book is sometimes called "pancha dabbu" or "mere fiction." It is greatly admired by the learned: the people however care little for poems, however beautiful, as the perusal is mere self gratification, and does not convey that religious merit which is throughout the puranas assigned to such as read their silly and disgusting legends.

31. The two books now named are, like the Puranas, braminical works: but the Basava Puran and others named with it are strongly disliked by the Bramins; nor without reason: for one great end of the pauranica legends is to exalt the Bramins into gods:* and these books deny them that pre-eminence. Every portion indeed of Hindu literature is thoroughly amalgamated with their religion, and the authors of even the most lascivious poems always begin their works with expressions extolling the particular creed to which the poet belongs. Thus we find even a dictionary dedicated to Siva and using his name as the chorus of every memorial stanza: an artifice met by a Vishnavite philologist; who stole the verses and appended the name of his patron idol.

32. We have thus completed an outline of the LEGENDS; and before proceeding to describe the popular POEMS, which are very numerous, it will be requisite to give an account of the PHILOLOGISTS: who are the guides of poets, and are guided by the authors already described. This unattractive theme may be rather tedious; but it is essential to the com-

* Philip Skelton, in his *Deism Revealed*, 1751 p. 207 observes "It was self-sufficiency made the devil aspire to independency: he thought himself too wise, too great, and glorious a being, to be any thing less than God. He said 'I will exalt my throne above the stars of God: I will be like the most high.'"

fort of the student: who is often advised by his native tutors (as I was) to study some obscure treatises which ultimately prove quite unprofitable. Indeed so absurd is the native course of tuition that I have known some docile Englishmen who have imprinted on their memories the most abstruse Sanscrit canons of the ancient Telugu grammarians; and yet remained unable to construe a common poem such as many a half educated native reads for amusement. I look back with regret to the period I passed in studying the Telugu treatises on grammar and etymology, being fully convinced that half that time and less than half that labour, had it been devoted to the Telugu classics, would have been much more profitable. The result to which experience led me being diametrically opposed to the opinions held by ordinary native teachers, it is requisite to point out the true value of the critics whom they so highly honour.—Nor is that honour undeserved. I only plead exemption from a fruitless study on behalf of the foreigner.

33. The oldest and most venerated critic (his chief predecessors having perished), is Nannaya Bhatta, already mentioned as the translator of the A'di Parvam: who is believed to have lived in the second century of the Christian æra. This celebrated author compiled a brief grammar of the language, entitled A'ndhra* Sabda Chintamani which is written in Sanscrit verse: just as Wallis composed his grammar of English in Latin, because in discussing one language it is always convenient to make use of another.

34. It would be easy to point out many important subjects which the learned author passes over in silence: and I allude to these deficiencies to caution the English reader against expecting much aid from this obscure though standard work, which native scholars who rarely examine for themselves will declare to be in all respects complete.

35. Bala Sarasvati, the oldest commentator on these dicta, wrote in Telugu; his work if printed would be about the size of Valpy's Latin Grammar. Of course he discusses no subjects beyond those given in his text. Many assert that the commentator was a pupil of the ancient grammarian himself.

36. After translating and closely examining this work some years ago I perceived that it is not a grammar; but a mere essay on disputed points. The principles of elision and permutation of letters are amply discussed: but the verb is summed up in a few obscure verses, and the

* A'ndhra is the Sanscrit name for Telugu, just as Gallia was the Roman name for France. In the Laws of Menu (chap. x. 36), the Andhras (ándhras, not ándhras) are mentioned as a savage tribe: and perhaps were the aborigines. The absurd name Gentoo, formerly used among the English for Telugu, is now pretty nearly forgotten.

syntax is scarcely noticed. Now in a grammar formed on European principles, the Telugu syntax would fill much more room than here is given to the entire grammar even including the Telugu commentary. And even in this brief treatise more than half is devoted to questions of etymology, which according to European arrangements ought to be placed not in a grammar but in a dictionary, or in a separate treatise.

37. The next philological work, in point of age, is the Telugu prosody composed by Bhimana (Andhra Chhandam) or rather in his name by his son Mallaya Rēça. This is a pedantic treatise full of magic and mysticism.

38. We may here advert to the Adharvana Carica; a work which is mentioned by Nannaya Bhatta. Of this work, entitled Vaicriti* Vivecam, only fragments remain which are found scattered through the writings of Ahobala Paudit and other critics. They are so obscure that the most sagacious grammarians of modern days look upon them as unintelligible without the aid of a commentary.

39. Some ages after these critics there lived Appa Cavi; whose writings, otherwise very valuable, are infected with the pedantry of his day. He undertook to frame a comment† *in metre* (in eight books) on the writings of Nannaya—but his style was voluminous, and he finished little more than five books; wherein he treated only of etymology and prosody. These two subjects he has entirely exhausted, but unhappily has superadded a farrago of unprofitable rules regarding magic and omens which fill more than half his work.

40. Appa Cavi is the first author who mentions the strange notion that the name "Telugu" is corrupted from "Trilinga."‡ If Nannaya, Ranga Natha, Ticcana Somayāzi, and other leading poets, were ignor-

* Vaicriti signifies *Peculiar* (vicāram) or *secondary*: a phrase used by some philologists for Telugu; distinguishing it from Sanscrit, or the *perfected* language, and Pracrit or the *uncultivated* dialects.—See Wilson's remarks on the Vayu Puran, in Asiatic Journal, 1834, page 206.

† The title is Andhra Prayoga Ratnacaram, or Ocean of Instances. The various words for "sea" are used in the titles of books just as we use the word system, or view.

‡ I am well aware that the word *Trilinga* occurs in the Amara Cosha, regarding gender, as also in the Bramhottara Khandam chapter xvi: but there it is applied not to language or country, but to the tripundracam, or triple line drawn by Saivites across the forehead. The citation from Adharvana Chari in support of the word Trilinga, as a name of the language, possibly is apocryphal: for this writer preceded Nannaya who does not mention the word Trilinga. In the citation from the Dipica (See Ellis's note in Campbell's Grammar Introduction, page 2, and also page 13) I observe that Trilinga is given as the root of Telugu and Tenugu: but to these is added Telungu: a reading that does not appear in the Dipica.

ant of this pedantic whim (equally unknown even now to the nation at large), surely we are justified in rejecting it as absurd.

41. In etymology Appa Cavi discriminates Telugu words into four classes, called I. Tatsama, II. Tadbhava, III. Desya, IV. Gramya. I omit other refinements: but these four phrases so often occur that they call for remark. I. Tatsama "equivalent" denotes, "altered" from Sanscrit: thus *carmam* an act becomes *carmamu*. *Sévaca* becomes *Sevacudu*, a servant and *Raja* a king, *Razu*. Thus in English we derive capital from capitalis, poet from poeta, nation from natio, temple from templum, circle from circulus, ration from ratio, tradition from traditio. These of course are distinct from Sanscrit words used in an *unaltered* form, such as cavi a poet, or stri a woman—like doctor, tutor, and so forth in English. II. Tadbhava "proceeding" denotes *much altered*: thus *samudrah*, the sea, becomes *sandram*, yātra, pilgrimage, becomes zātra: thus from the Pracrita word *paválo*, coral, is formed pavadam: from canso, bell metal, comes cançu. Thus in English we change ratio into reason, satio into season: traditio into treason and moneta into money. III. Desya, or primitive Telugu words, such as gurràm a horse, cannu an eye, illu a house, and so forth; which like the corresponding English words are primeval and cannot be traced to any root. A subdivision of this class is Anyadesya, or local. Thus the words polati, toyyali, melata, and many other words for woman; rautu a soldier, reddi a farmer, gidda a bullock, muduca old, bittari beauty, bittali naked, and many more; some of which are supposed to be Tamil and others are Canada: just as we consider some of our words English, others Scotch, and others Irish. IV. Gramya, or barbarisms* including all Hindustani and other corruptions.

42. Appa Cavi's work may indeed be valuable as a guide in forming accurate ideas on the themes he discusses. But it seems to have deterred many (at least such is the general belief) from poetical composition: as according to this Aristarchus it is almost impossible to write correctly. But they may observe that he is not infallible: for after defining all that is of good and evil omen to the poet, he has left his own work less than half completed.

43. The next grammarian to be spoken of is Ahobala Pandit, author of the Cavi Siro Bhushanam, a voluminous commentary written in San-

* On this subject the following observation occurs in Rees's Cyclopœdia, under this word. "Barbarism is often charged with great justice on modern writers in the learned languages: the Latin books of late ages are full of Anglicisms, Gallicisms and the like.' But what shall we say to those who accuse even Cicero himself of barbarisms in his own language?" Thus Appa Cavi declares the exordium of the Telugu Naishadham to contain (gramya) barbarisms.

scrit on the *Sutras* of Nannaya. This work is of modern date, written (as the author's descendants inform me), about the middle of the last century. It is very pedantic; strives to deduce every Telugu rule from a distorted Sanscrit rule, and after a verbose preface, on every subject that could be introduced, fails to solve real difficulties. For instance; it is well known that the great stumbling block in Telugu is regarding the classes of words denominated Cala and Druta. On this topic (quite as abstruse as the rule regarding the Greek accents), the author gives up the discussion: merely reiterating what Bala Saraswati had stated, and not even adducing a new instance in proof.

44. The treatises which have been mentioned are generally denominated after their authors. Thus the Appa Caviyam, Ahobala Panditiyam and Nannaya Bhattiyam. Those to be next mentioned have separate titles. All the more ancient of these will be disposed of in a very few words.

45. Indeed none of these books have risen to much celebrity: the Andhra Caumudi is a Telugu grammar, apparently as ancient as the Bhattiyam, but framed wholly on Sanscrit principles; just as the antiquated English grammars were on a Latin mode. There are also several vocabularies, imitated from the Amara Cosha, as has been already noticed; being the Siva Andhram; and its rival the Vishnu Andhram. The A'ndhra Ratnàcaram, the Andhra Bhash Arnavam (now about to be printed), and many more.

46. There are various treatises on Telugu prosody, such as the different *Chhandams* named after Hanumanta, after Marri, and after A'nanda Ranga Raz (also called LAXAN'A CHUDAMAN'I); the Laxan'a Dipica, LAXAN'A RAJIYAM, and several more. All these works and others on etymology have fallen into comparative oblivion: though it is possible a few may merit publication.

47. The last work to be described is one that deserves honourable mention being the Telugu dictionary compiled by Mamadi Vencaya, a learned merchant (comati) of Masulipatam; who died in 1816. This work is arranged alphabetically, in the European method, and every word found *in the ancient lexicons* (*but no more*) is briefly explained in Telugu or Sanscrit. This work will always be of value to those who study the poets. The title is ANDHRA DIPICA.

48. In one important point the arrangement is defective; and for my own use I was obliged to re-arrange the whole dictionary to remedy this evil. In Telugu the four *initials* of each *varga* or class (K, kh, G, gh; also ch, chh, J, jh: also T, th, D, dh, and P, ph, B, bh,) are changeable: so that many thousand Telugu words (Sanscrit words are

independant of this peculiarity) change the initial T into D, or P into B &c. Thus we meet with the word zoccam, elegance: and are told to search for it under çoccam: thus gá-jeyuta, to accomplish, must be sought under *ca* not gá: indeed a learned native assistant when asked will often reply that *either* initial is good. After some years I perceived that the evil lay in separating letters that were originally one. Accordingly I caused the new arrangement to be made, which at once remedied the evil: thus each of these sets of letters (k, kh, g, gh, for instance), now forms but one alphabet, just as I and J used to be mingled in the English dictionaries. The approbation it has received from sound scholars leads me to believe that the new arrangement is such as necessity called for. It certainly much facilitates the task of finding an article when required. The principle of *softening* initial consonants is found in Welsh, in Gaelic, in Irish, and in other languages of the Celtic school. Thus words beginning with K, ch, T and P may substitute G, J, D, and B. It is curious to trace the same principle in languages so far removed from each other.

49. Besides, Mamadi Vencaya has diminished the utility of his lexicon by giving into some foolish rules of spelling that are very dear to the dulness of modern days. If these doctrines be right, then *all the ancient manuscripts* of all the poets are wrong. I will briefly mention these rules, that the reader may understand their true value, when they are urged on his attention by Telugu pedants.

50. The letter R has two forms, the Telugu form and the Canarese form: which differ from one another in shape, but not perceptibly in sound; just as the small "r" in the obsolete Saxon alphabet differs in shape from the Roman letter r which we now use. Those few Telugu poets who wrote in the earliest ages used one form in some words and the other form in other words: stating that these two could not rhyme together. In sound, perhaps one differed from the other in old days, just as much as the aspirated and unaspirated *Rho* did in Greek. Or like the two sounds of R used in Hindustani. Yet even in those days usage evidently was various and it is clear that the Jangama bards coeval with Nannaya admitted no such canon. But in the third or golden age of Telugu literature (before Appa Cavi appeared), this distinction had perished: and (unless in the commentators) we find no traces of it in the Vasu Charitra, the Pārujāt Apaharanam, the Vishnu Chittiyam, the Vijaya Vilāsam, or the Manu Charitra: names which in Telugu literature rival the poems of Pope and Dryden, Goldsmith and Scott among ourselves. Now if we determine that words which the Saxons wrote with their peculiar R cannot in English rhyme to similar words bor-

rowed from Latin, we may easily frame a rule according to which Pope and Dryden should be proved illiterate. If we then proceeded to stuff the English dictionary ad libitum with the Saxon R surely we should render it unintelligible to the common reader; and this is precisely what Appa Cavi has done. Mamadi Vencaya has without good reason bowed to his decision. As I have already hinted, this rule deviates from the spelling used in all the existing manuscripts of all the poets. It cannot then deserve to be revived after falling into merited oblivion. Among the Canarese it is still in use, but among the Telugus it is so utterly forgotten that its shape is now given to the capital vowel U, and we shall rarely meet with a Telugu who can read words written with R in this obsolete form; which is called *bandi repha.*

51. This forgotten letter has not appeared in any modern editions of the Telugu poets, though a pains-taking Telugu news-paper editor occasionally treats his readers to words written in the obsolete mode.

52. A minor inconvenience of the Andhra Dipica (likewise caused by Appa Cavi's refined rules) arises from the use of the semicircle, denoting the (arddh ānuswāram) nasal sound. Thus the words *tōdēlu,* a wolf, *ēnugu* an elephant, *vādu* he, *Sivudu, Bramhanudu,* &c., are spelt tondelu, enungu, vandu, Sivundu, Bramhanundu, and so forth. Now this spelling is peculiar to poems, wherein the character used is the *circle,* not the semicircle: and in modern days, this semi-nasal has been disused. In common talking we shall often find illiterate Telugus preserve the antique nasal twang, just as the rustic English often do. But the educated classes have laid aside this disagreeable sound: and pedants blame them for this innovation.

53. Māmadi Vencaya, likewise uses the marks 1 and 2 to denote the hard and soft sounds of cha and Ja (i. e. ça and za) but this is quite superfluous: as all who have learnt the mode of reading the Telugu alphabet are already independent of these signs.

54. I have given these details regarding Mamadi Vencaya's lexicon out of a respect for the talents and diligence of the writer: which are peculiarly honourable to a man who was by birth and situation a shopkeeper at Masulipatam. He previously compiled a valuable Sanscrit and Telugu lexicon called the Sabd Artha Calpa Taru, which has been used in the admirable Sanscrit dictionary by professor Wilson. But we shall always find this unprinted dictionary useful as giving Telugu synonymes for Sanscrit expressions.

55. Its arrangement, imitated from the Médini Còsha, is inconvenient to the beginner. The words are classed according to their *final* syllable:* then according to the *number* of syllables, and lastly according to

* As is done in Hoogeveen's Greek lexicon, and in the Arabian lexicon named Kamus.

the initial: so in looking for "Vaitaliya" we must turn to letter Y, under which are the successive classes containing words of one, two, three, and four syllables. This last being traced, the rest of the arrangement is alphabetical; on the European mode.

56. The latest philological work compiled in Telugu was the unfinished treatise written by Patahbi Ramaya Sastri: an account of which is given in the Introduction to Mr. Campbell's grammar. It evidently is a work of curiosity and of value to those who take an interest in etymology and the affiliation of languages; but is of no utility to the foreigner.

57. Before proceeding to speak of the poets it is requisite to consider some other imbecilities in the modern style of "fine writing," which are conspicuous in many Telugu publications particularly in translations from English books, and in the Telugu newspapers. The ancient grammarians having defined the principles of elision and permutation, *which of course were intended for* POETICAL USAGE ALONE, these laws have been transferred into the *colloquial style of business*, and of education. If we can imagine a common newspaper, printed in modern vulgar Greek using the *ampullas et sesquipedalia verba* the oratorical elegancies of Pindar, or Æschylus it will convey some idea of an absurdity which it is hard to describe intelligibly to the English reader.

58. Indeed this folly has gone to an extent hardly credible; a version of part of the Bible itself has been prepared by a learned Bramin in a stilted style, spelt in a manner unintelligible to the common reader, and justly condemned by good scholars. Happily it has not as yet been printed; and as it possesses real merit, it should be prepared for publication by being transcribed into the *intelligible* dialect. This can be done by any sensible copyist, who will transmute its whimsical spelling into the plain Telugu used in business or in common correspondence. Unless this precaution is taken the version may indeed be published but will never be read.

59. The remedy for such delusions happily is within the reach of every one. Let the foreigner study the language in common criminal trials (civil trials being more intricate) and ordinary letters: he will soon be able to detect and shun the nonsensical refinements which are now so popular.

60. Let it not be imagined that I am peculiar in my view of these caprices. That distinguished scholar, the late Head Telugu Examiner in the College, Gurumurti Sastri, who died about three years ago, fully concurred in the opinions given in the present essay. I mention his name because his talents, learning and good sense always entitled his judgment to respect: but I could easily name other sound authorities

now living; as for instance my friends the pandits in the Court of Sudr Udalut. They are Telugu Bramins and during more than fifteen years have given me much literary assistance. Well aware that my statements will incur the reproaches of many a half educated Sastri and self-styled pandit, I am happy in mentioning men of such well known talents (I might easily adduce many others also) as disapproving these follies.

61. Again:—It is acknowledged that the regulations and acts of Government are very ably translated into Telugu—yet they are wholly free from all these elegancies of style (bandi-repha, ardha-bindu, sandi, and saral-adesam) which poor pretenders to learning timidly cultivate. If such pedants are right, then the laws of the Government are written in bad Telugu; because, according to their notions, nothing can be correct which is easy to read.

62. When it is considered that the reader's progress is greatly impeded by the refinements I have described I shall appear justified in giving so much space to remarks which cannot be generally interesting.

On re-perusing the present essay I observe with much regret how little advantage we can derive from the historians (so to call them) and popular grammarians. With a few rare exceptions in the former class, these are *all* unavailable to the Englishman. But if he wishes to read the language in its perfection, to know it as the natives know it, he must resort to the *Musarum chorus*, the "Cavyamul" or favourite bards: of whose popular works I propose to give a summary in the next essay.

In that paper some selections will be given from poets already named: but in the present pages I have endeavoured to compress all that preliminary information which the reader will most frequently require: what remains, may be of slighter moment.

SUBJECTS MENTIONED IN THE PRESENT ESSAY.

III.—*Catalogue of the Birds of the Peninsula of India, arranged according to the modern system of Classification; with brief Notes on their Habits and Geographical distribution, and description of new, doubtful and imperfectly described Species.*—*By* T. C. JERDON, *Assistant Surgeon, 2d Madras Light Cavalry.*

Until a very few years ago we did not possess a single collective account of the birds of this vast country. In 1831 a Catalogue of birds collected on the banks of the Ganges and the Vindhian range of mountains by Major Franklin, was published in that useful compendium the Proceedings of the Zoological Society of London. This comprised 156 species, of which more than 20 were described for the first time, many of them very common birds, as *Otus Bengalensis, Thimalia Chatarœa, Alauda Gulgula, Mirafra phœnicura, &c. &c.* Notwithstanding the difference of latitude in which these were collected, there are only 6 or 7 which I have not met with in Southern India, which shews the very great similarity of the ornithology of this country throughout. In 1832 a catalogue of birds collected by Colonel Sykes in the Bombay presidency was published, in the same work as the last. In this are enumerated 226 species (I omit the domestic birds included), of which above 40 are described for the first time, many of them common and abundant birds. This catalogue is undoubtedly the most valuable account of the birds of India published, and contains, in addition to the bare catalogue and descriptions, many highly interesting observations on the habits, food and structure of many of the species there mentioned. Of those enumerated by Colonel Sykes there are about 9 or 10 which I have not yet observed, most of which are probably peculiar to the more northern portion of the range of ghauts and neighbouring tableland. During the short period I have been in this country I have traversed a considerable portion of the Madras presidency, both on the eastern and western sides of the Peninsula, and have been fortunate enough to add a considerable number of species to the Indian Fauna, a few of which are apparently new to science or but imperfectly known. The total number of my catalogue is nearly 390; which, however includes those 10 of Sykes, not hitherto obtained by me, and nearly as many more observed by Walter Elliot, Esq.,* Madras Civil Service, who has kindly placed his valuable notes on the birds procured by him at my disposal; by which, in addition to the new species added, I have been enabled to elucidate several doubtful points, to add some most

* Mr. Elliot saw this catalogue previous to its submission to press; and some remarks of his will be found as foot-notes, bearing his initials, throughout the paper.—EDITOR.

interesting information on various birds, and to give the correct native names of most of the species enumerated by him.

I must here say a few words in explanation of the limits of the districts alluded to in the following catalogue as the "habitat" of the different birds. With reference then to physical features and the geographical distribution of the birds, I divide the Peninsula into four great districts or divisions—1st, The Northern Circars—2d, The Carnatic—3d, The Western Coast—4th, The great central table-land.

1st. *The Northern Circars.*—This district comprises a narrow tract of land extending (between 16° and 20° N. lat.) from the sea coast on the eastern side of the Peninsula to the eastern ghauts by which it is separated from the great table-land. It is a tolerably level district, with occasional spurs from the ghauts approaching the sea coast; has little or no natural wood, except towards the ghauts, the sides of which are in some places clad with thick jungle of bamboos and forest trees, and, with the exception of large groves of palm trees, has but little wood throughout it. This district is perhaps hardly separable from the Carnatic by its physical features alone, but the difference of latitude, causing a change in climate and a greater variation of temperature, perhaps authorize its separation, which is partly confirmed by the fact of one or two birds common in the one, being rare or not met with in the other district.

2d. *Carnatic.*—Under this head is included the whole of the country lying south of the Northern Circars, along the coast as far as Cape Comorin, and bounded on the west by the range of eastern ghauts, except in the Coimbatoor district, where the eastern as well as western range of ghauts is broken. It has but little natural wood, except partially on the sides of the ghauts and occasionally at their bottom; is a level and low lying country, with occasional isolated rocky hills, and low ranges, sometimes bare, in other places clad with low brushwood. In the immediate neighbourhood of the large towns and villages there are large topes, and many of the roads are lined with magnificent avenues of banian and other large trees.

3d. *Western Coast.*—This includes Travancore, Cochin, and Malabar, and comprises a strip of land of various width lying between the sea on the western side of India, and the range of western ghauts which it includes. It is mostly undulating or hilly, and, unlike the other three districts, is almost every where covered with jungle of every description, from low bushes to the most lofty forest trees: most of the roads here too are lined with splendid avenues of banian, cashew and various other fine trees. The climate is moist and comparatively cool.

The Wynaad district, and generally the wooded parts bordering the summit of the ghauts, may be also included in this, which they resemble in climate and productions, though more correctly they belong to the next division.

4th. *The Great Central Table Land.*—This includes Mysore, the Baramahl, the Ceded Districts (Bellary and Cuddapah), the kingdoms of Berar and Hyderabad, the Southern Mahratta country, and the Deccan (the four so called Bombay Collectorates, Colonel Sykes's district). The whole of these countries, with the exception of the parts immediately bordering on the ghauts, consists of a vast undulating plain of various height, almost entirely devoid of trees, except close to villages and towns, and with but little low jungle even. Here and there low ranges of hills appear, and isolated rocks, or droogs, mostly bare, others covered with low brushwood. Towards the north and west large steps occur, and the country is more broken by hills and ravines than in the southern part. Here too we have greater abundance of low jungle, and even stunted trees, and in many of the ravines wood abounds. Considerable tracts of long grass, or 'rumnahs' occur here and there, especially towards the more northern portion. The whole of this district was formerly named the Deccan, and accordingly in the following catalogue I shall indiscriminately mention it as the Deccan or table-land, except when a bird is peculiar to, or more abundant in, one portion of it than another. The Neilgherries are justly entitled perhaps to a separate mention, as well from their climate as their productions, and probably approaching them in these respects are the Pulny and Animally hills, both to the southward.

The classification I have adopted is that of Swainson (as recently given in his most admirable treatise on birds*, which I have ever found most natural as regards the habits of the Indian birds he has classed together, especially the *Brachypodinæ* and *Crateropodinæ*. Among other instances, where, by his acumen and discrimination, he has rightly located, from their external character alone, birds before his time most improperly and unnaturally placed, I may instance *Thamnobia* (an *Ixos* of former authors!) and *Gryllivora* among the *Stone-chats*; *Hypsepetes* among the *Bulbuls*; *Pomatorhinus* among the *Babblers*; *Coracias* in the *Fissirostres*, and *Phœnicopterus* among the *Anatinæ*; and I am happy to be able by personal observation of their

* *The Natural History and Classification of Birds.*—*By* WILLIAM SWAINSON, vols. 1st and 2d—*Lardner's Cabinet Cyclopedia.*

habits to confirm his views as to their natural situation. If in some parts his classification is deficient, it is from want of material alone, as in the *Raptores* generally, and the *Strigidæ* in particular. Here, however, fortunately important aid has been derived from another quarter, viz. from the accomplished Mr. Hodgson, Resident at the Court of Nepaul—who, in the papers he has published in the Indian periodicals, has shewn that he combines the greatest talent for minute observation of peculiarities of habits and manners with most critical skill in the more abstruse and scientific art of classifying, to whom we may hereafter confidently look for filling up many of the outlines and deficiences of Swainson's system, and whose promised work on the Fauna of Nepaul is so anxiously expected.*

It only requires for me to add that in the following catalogue the length is reckoned in all cases from the tip of the bill, and when the length of a toe is mentioned, it includes the claw also, unless the contrary is particularly mentioned.

The following abbreviations are used in reference to the native names:—

H. Hindustani.
Can. Canarese.
Mah. Mahratta.
Mal. Malyalum.

Order I. RAPTORES.

Family VULTURIDÆ.

Genus VULTUR.—Auct. *Vulture.*

The species of this genus may be speedily collected on exposing a carcass on the open plain, though none were previously in sight. They are readily distinguished in the air by their manner of soaring with wings turned obliquely upwards.

1. *V. Indicus*, Lath.—Temm. P. C. 26.—*Geedh*, H.—*Mahah-Dhok* of Mahrattas. Large brown Vulture.

2. *V. Bengalensis.*—Gmel.—Gray and Hardwicke Ill. Ind. Zool.—*V. Cinereus*, Temm. var.—V. *leuconotos*, Gray and Hardw.—Old bird ?—*Geedh*, H.—Small brown Vulture.

3. *V. Pondicerianus, Lath—Rung Geedh*, H.—Black Vulture.

* See *Literary and Scientific Intelligence*, at the end of this Journal.—Editor.

Colonel Sykes correctly says of this bird 'mostly solitary.' Two or three may however frequently be found hunting together over high rocky and bushy hills. On the Neilgherries I have seen flocks of twenty or thirty of what I conceived to be this species hunting in company over the hills, occasionally reconnoitering some spot where something unusual attracted their attention, and circling over it for some time—and then pursuing their onward course. As I did not procure a specimen, this may be a distinct species, perhaps the allied one 'auricularis' or social vulture, which is stated in some works to occur in India.

GENUS NEOPHRON, Sav.

4. *N. Percnopterus*, Sav.—*Kul-moorgh*, H.—Dung bird—Scavenger.—White Vulture.

Very common; most numerous in cantonments and large villages, where it is of the greatest utility. As Colonel Sykes remarks, 'they are most efficient scavengers.'

FAMILY FALCONIDÆ.

SUB FAMILY AQUILINÆ.—*Eagles.*

GENUS PANDION, Sav.—*Fish-Eagle, or Fish-Hawk.*

5. *P. Haliœetus*, Sav.—*A. Haliœetus*, L.—*Mucharera*, H.—Osprey.

This bird appears to have been hitherto unrecorded as Indian, for in Yarrell's 'British Birds' and Sir W. Jardine's later work in the 'Naturalist's Library' there is no mention of its occurrence here, though its geographical distribution is particularly recorded. I have seen it on the Trichoor Lake, and near Ponany on the west coast, and a short time ago obtained a specimen as far inland as Jaulnah. My specimens correspond pretty exactly with the description of British ones. The pectoral band was distinct on all—Irides bright yellow.

6. *P. lineatus* ?—*Hal. lineatus*, Gray ?—*Pand. Indicus*, Hodgs. ?

I several times observed a large Fishing Eagle on the Chilka lake, which at a short distance appeared of an uniform greyish green colour.

This may have been the species figured in Gray and Hardwicke's Illustrations, but I did not succeed in obtaining a specimen. I frequently saw it plunge completely under water (as the Osprey) and bear off a large fish in its talons to some neighbouring eminence.

Sub Genus HALIÆËTUS.—*Sea Eagle.*

7. *H. blagrus*, Less.—*F. blagrus*, Shaw.—*F. leucogaster*, Lath.—*Aiyle Oceanique*, Temm. Pl. Col. 49.—*Grey backed Sea Eagle.*

The descriptions of this bird which I possess, are not very satisfactory, but I have no doubt it is the bird named as above in Lesson and Griffith's Cuvier. It is certainly not very common. I first observed it sailing over the Chilka lake, at a considerable elevation, from whence it made an unsuccessful swoop at a duck I shot. I again saw it at Ponany, sitting sluggishly on the sandy beach close to the sea, and again, near Calicut, saw a pair skimming very closely over some low bushy ground. The stomach of the specimen I procured was empty. The fishermen at Ponany assert that it lives chiefly on fish, and frequently carries one off from their boats or nets. It doubtless, however, varies its food according to opportunity, and like its European analogue the *H. albicilla*, nothing may come amiss to it. Its flight at first after rising is heavy, but when once fairly on the wing easy and powerful, rising to a great height by large and graceful sweeps. It agrees exactly with the characters of *Haliæetus* as lately defined by Yarrell and Hodgson. This sub-genus, though not admitted by Swainson, appears necessary to join *Aquila* and *Pandion* and may perhaps be marked as a sub-genus of the latter, leaning towards it by its roughish soles, length of wings, which reach beyond the tail, and festooned upper mandible. I add a brief description of my specimen. Back and wings light blueish grey, occasionally tinted with brownish ash. Quills and tail brownish black, the latter broadly margined with white—rest of the body pure white; feathers of head and neck acuminated; bill, horn colour; cere, yellowish; legs, dirty yellowish-white; irides, brownish yellow. Length about 30 inches, wing to end of 3d quill 24 inches, tail 10 inches, tarsus 3½, middle toe and claw 4.

8. *H. Ichyœtus*, Horsf.

I have not myself observed this species of marine Eagle, but it was obtained by Mr. Elliot, in the Southern Mahratta country. It is said to live upon fish, but not solely: in one specimen there was the

skin of a bird. Its talons are rounded like those of the Osprey. Bill strongly toothed; it and cere black; legs dirty whitish; irides, brown. Length of a male bird 27½ inch, tarsus 3½ inch.

GENUS AQUILA.—*Eagle.*

9. *A. Chrysætos—Golden Eagle.—Joomiz* or *Joombiz*, H.

I several times observed birds of this species, both single and in pairs, in the more northern parts of the Deccan, many of which shewed the white mark at the base of the tail, which gained for it the name of ringtailed Eagle, and I procured a specimen near the Godavery river. I frequently also see them near Jaulnah, even close to the cantonment, and they are occasionally seen to pursue and strike at hares, florikin and other game started by sportsmen. This Eagle may generally be seen seated on the ground, or on a stone on the rocky hills, in the neighbourhood of Jaulnah, whence, after the sun has been up for some time, it takes a flight in search of prey, at no great elevation, hunting slowly over the bushy valleys and ravines, and also over the cultivated ground occasionally, after which if unsucessful in its search, it reseats itself on a stone on some eminence, or even perches on a neighbouring tree, where it patiently waits till some quarry is raised or viewed, or till hunger again prompts it to take a flight. I obtained a specimen alive some time ago, it having been slightly wounded, and it is now in my possession, in perfect health. It feeds most greedily on raw meat, preferring it to birds or animals either dead or living. It is very sluggish and inactive even when urged by hunger. It generally drinks a gulp or two of water after eating. The only cry I have heard it utter is a harsh croaking. I shall now for the sake of comparison add a brief description of this bird, which exactly corresponds in plumage with the other specimen I shot.

Upper part of head and neck, pale buff cream colour, some of the feathers on the forehead broadly streaked with dark brown, and a few other detached ones entirely of an orange buff colour. Quills nearly black, tail of a dark hoary grey, barred and clouded with blackish, and broadly terminated by the same colour. Under tail coverts pale brownish white, all the rest of the body of a rich glossy dark brown, tinged on spots with lighter brown: on the scapulars, there are one or two white feathers, and one or two more edged by the same colour. Cere and legs, yellow, with a tinge of green. Irides, brownish yellow. Length about 3 feet, wings to end of 4th quill 26 inches, tail 13, tarsus about 4, middle toe and claw 3-$\frac{6}{10}$ths. On the internal and middle toe there are 4 large scales each, and the division between the large scales and the smaller ones, is not nearly so marked as is represented in the woodcut in

Yarrell's British Birds; this, however, may depend on age. Another slight difference from the description of the European bird is, that the nostrils are almost quite transverse, and do not point so much backward as is represented both in plates and descriptions.

10.—*A. bifasciata*, Gray & Hardw.—*Double banded-Eagle.*

I have only seen this Eagle two or three times close to Jaulnah, but have hitherto failed to procure a specimen. One was lately seen to strike at a florikin.

11.—*A. Vindhiana*, Frankl.—*A. punctata*, Gray ?—*A. fusca*, Gray ?—*A. fulvescens*, Gray ?—*Wokhab*, H.—*Lesser Indian Eagle.—Mottled or variable Eagle.*

I possess a living specimen of an Eagle which corresponds as nearly as possible with the description by Franklin of *A. Vindhiana* in his catalogue; and I also possess specimens which have so great a resemblance to the three Eagles, figured as distinct in Gray and Hardwicke's *Illustrations of Indian Zoology*, as to warrant a conjecture that they are one and the same species. In this conjecture I am strengthened by finding that such is also the opinion of Mr. Elliot.

I shall here briefly describe some of my specimens to show their similarity:—1st, one resembling *A. fulvescens*, Gray, which I consider as the youngest state of this Eagle. Head and neck of a fulvous orange colour. Quills and greater coverts blackish brown, the latter edged with pale greyish. Tail greyish brown, much barred with blackish. Rest of the body of a light brownish grey, with a strong tinge of fulvous yellow throughout, the feathers of the lower parts streaked in the centre with darkish brown.

A second specimen has nearly cast off the whole of the light fulvous colour, which only appears on the feathers of the abdomen and under tail coverts, a feather sometimes being dark brown on one side of the shaft, and fulvous on the other, but specks and streaks of this yellow appear in many parts, especially on the head, back of neck, and breast, as in *A. punctata*.

A third specimen is nearly of an uniform brown colour. In the living bird, the head, throat and breast are of a very deep brown, almost black; and this, though an old bird, is yet evidently not in its perfect plumage. This bird varies in length from 25 (the male) to 28 or even 29 (the

fem.). In a female 28 inches long, the wings are 21 inches. Expansion of do. about 5 feet. Tail 11 inches. Tarsus 3 ; mid toe and claw 3. Cere deep yellow. Feet a little paler do. Irides hazel brown. The *Wokhab* is the most abundant Eagle in India. I have seen it both in the Carnatic, though more rarely, and on the table-land, where it is tolerably common. In the Carnatic it chiefly frequents hilly districts clad with low jungle. In the Deccan it frequents, by preference, the cultivated lands near villages. Till an hour or two after sunrise, it may be seen seated on the top of some tree, after which it sallies forth, sailing about at a moderate height in general (though it varies much in this respect) over the fields, valleys, and ravines, with a slow and circling flight, or in company with the kites, like which it is ever on the look out;hovers over villages,towns and cantonments. They prey upon hares, (as I have ascertained, in one or two instances, from the contents of their stomach,) and other game; also rats, lizards, snakes and insects ; occasionally also pounce on an unwary bird, and in fact feed upon almost any kind of food, living or dead, which, however, they obtain perhaps less by their own industry than by robbing other birds, kites, falcons, and other birds of prey. From Mr. Elliot's notes, I extract the following—"The *Wokhab* is very troublesome in hawking after the sun becomes hot, mistaking the jesses for some kind of prey and pouncing on the falcon to seize it. I have once or twice nearly lost *Shaheens* in consequence, they flying to great distances from fear of the *Wokhab*." The one I possess alive, is not very particular as to its food. It frequently snatches morsels from the golden Eagle kept with it, to which the latter in general quietly submits ; is a very noisy bird, frequently uttering its shrill scream, and has a great share of curiosity, walking up to, and carefully and thoroughly examining every new comer I place in the same apartment. It is apparently a very easily domesticated bird, and perhaps might be taught to hunt hares, &c.*

11 Aq. ? Neilgherry Eagle.

On the summit of the Neilgherries there is very frequently seen a black Eagle, larger than the *Wokhab*, but of which I was unable to procure a specimen. I have heard it is also often met with in Coorg.

*It is considered too slow and heavy for purposes of Falconry. I differ only with Mr. Jerdon in thinking the dark species (*Aq. fusca*, Gray), to be the young bird, which grows lighter by age, and becomes *A. flavescens* when old.—W. E.

GENUS NISAETUS, Hodgson.—*Hawk-eagle.*

12.—*N. niveus ?—F. niveus*, Temm. P. C.—127 ?—*White bellied Hawk Eagle.—Mhorungah* or *Mhorungee*, H.

I presume, from the meagre descriptions I possess, that my specimen is identical with the *Javanese* bird, named as above by M. Temminck. It appears to belong to the new genus, which Mr. Hodgson has, I think, most justly separated and named very happily.* This species is not crested, but otherwise agrees exactly with the characters given, which are (among others) short high bill, short wings, rather long but nervous tarsus and immense feet and claws. M. Lesson, I see, has ranged this bird as a *Spizaetus*, which however is remarkable for its small feet.

The *Mhorungah* is certainly a rare bird in Southern India. I have only seen it twice, once in the Baramahl, seated on the edge of a tank in the neighbourhood of a jungly district, and again a pair seated on a lofty tree, in a tope in open country in the northern part of the Deccan. I know nothing of its habits or food from personal observation. Mr. Hodgson says the habits of the genus are as follows: "Prevs on jungle fowl, partridges, hares—watches from a lofty perch, usually pouncing on its game when near it—sometimes pursues with energy on the wing." Mr. Elliot met it occasionally in the Southern Mahratta country, and from his notes I extract the following observations: "Is the noblest of the Indian Eagles, being seldom seen, and then generally at a great height in the air, in wild and savage places. It preys on the hare—I once saw a pair of them hunting in company, which nearly surprised a peacock, pouncing on him on the ground." I suppose it is more an inhabitant of jungly and wooded districts than of the open plain, as are the true Eagles. I add here, a brief description of my specimen:—Above, hair brown, most of the feathers edged with a lighter tint, and some white about the head and sides of neck. Below, pure white, feathers narrowly streaked in the centre with dark brown—feathers of leg and tarsus, thickly barred with pale fawn brown. Bill of a greenish horn colour. Cere and legs greenish yellow. Irides bright yellow. Length 27 inches —wings 19—tail 10½—2½ inches beyond wing—tarsus 3½—middle toe $3\frac{8}{9}$ths of an inch. Eyebrows prominent.

GENUS CIRCAETUS.—Vieill.

Harrier-eagle—Serpent-eagle.

* *Journal, Asiatic Society, Bengal* No. 65.

13—*C. brachydactylus.—A. brachydactyla*, Meger. *White bellied Harrier Eagle or Serpent-Eagle—Samp-mar*, H.—*Mulpatur*, Can.

This species is very generally spread over the country. It affects chiefly the open plains and patches of cultivated ground. It may frequently be observed perched on a low tree, or even a bowrie pole, or seated on the bank of a river, whence it occasionally darts upon its quarry, but generally takes a long and lofty circling flight, or flies heavily along, but a few yards above the ground. The most favourite food of the *samp-mar* is, as its Indian name implies, snakes. It will, however, take other food. Colonel Sykes found a rat in the stomach of one. I saw one strike at a wounded hare, and another make a swoop at a teal that was shot. From Mr. Elliot's notes I take the following :—"Pounces on snakes and guanas—my *meer shikar* has seen them on the ground with their claws on the snake's head, its body coiled round the bird's wings, in which state the herd-boys sometimes kill them. The Yerklees say it has a figure of the God's *chukram* under each wing, by which it prevents the snake going forward. In the stomach of one I found a snake, about 2 feet long, and a centipede."

Irides, orange yellow. Legs, pale and dirty yellow. Length of a female 30 inches—of wings to end of 4th quill 23—tail 12—tarsus 4—middle toe 3—outer and inner toes, without the claws, nearly equal.

14—*C. ? undulatus.—Hæmatornis undulatus*, Vig.—Gould, Cent. Him. Birds.—*Goom-can-mooryala*, Mah.—*Crested Serpent-Eagle.*

As I see Mr. Swainson has claimed the priority of the name *Hæmatornis* for his crested bulbuls, I have at present, though with hesitation, retained this species under the genus *Circaetus*, to which it is evidently strongly allied in parts of its structure (more especially its legs and feet) as well as in habits and food, and of which it will probably be found hereafter to form a sub-genus. I have found it in Goomsoor, Travancore, Malabar, and the Baramahl. It almost always affects woody situations, preferring lofty jungle, over which it may often be observed slowly sailing, or seated on a lofty tree, watching for its prey. Its chief food is snakes, which I have found in every instance that came under my observation. Mr. Elliot says "utters a plaintive cry, feeds on insects, lizards and snakes."

Length of male 24 to 26 inches, of female 28 to 30. Of a female 28 inches long, the wings were 17, tail 10½, tarsus 3¼, middle toe 2¾, tail 2 inches longer than the wing.

Sub Family CYMINDINÆ, Sav.—*True Kites.*

Genus ELANUS, Sav.

15. *E. melanopterus.*—*Kupāsee*, H—*Blackwing*, Hodgs.

Though very generally spread over India, this kite is by no means common. It is most frequent in woody districts. Its general food is insects (chiefly grasshoppers and locusts), lizards and mice. I shot one in Goomsoor, which was devouring the carcass of a dove; this, however, appeared to have been dead for some time, and I doubt if it was killed by the blackwing. The *Kupāsee* often frequents long grass and grain fields, over which it may be seen to hover like the *Kestril.* It is comparatively rare in the Deccan, owing to the country being so devoid of trees. For a full account of this bird, its habits, &c. and accurate measurements, *vide* a paper in this Journal No. 16 by Mr. Hodgson. Irides fine crimson. Legs deep yellow,peculiarly soft and gummy.

Sub Family BUTEONINÆ—*Buzzards and Harriers, &c.*

Genus MILVUS, Auct.

16. *M. Cheele.*—*M. Govinda*, Sykes.—*Cheel*, H.—*Common* or *Pariah Kite.*

This very useful bird is extremely numerous, more especially in cantonments, villages and camps, and is continually on the look out for refuse of every description. Colonel Sykes says "constantly soaring in the air in circles, watching an opportunity to dart upon a chicken, and upon refuse animal matter thrown from the cook-room." I rather think that the blame of carrying off chickens is, occasionally at least, unjustly attributed to this bird. Vide *postea, Spizaetus.* Away from cantonments, it preys chiefly on reptiles, is also remarkably fond of fish, both fresh and dried. Has a very shrill cry or squeal. Irides dark brown, bill black, yellow cere, legs yellow, anterior scales large and transverse, all the others small, irregular. Length 23 to 26 inches; of one 23 inches long the wings are 18, tail 10½, tarsus 2, middle toe 2·1$\frac{1}{10}$.

17. *M. pondicerianus.—Haliætus pondicerianus.—Roo-mubarik* (Angl. happy face), *H.—vulgo, Bahmunee cheel.—Brahminy kite* of Europeans.

There is great dispute among naturalists, as to the true situation of this very common bird: most writers refer it to the genus *Haliætus* or sea eagle. Swainson refers it to the *Accipitrinæ* or hawk family, but at the same time allows its near alliance to *Pandion*. Hodgson, the only writer who has observed it in its wild state (except Colonel Sykes who refers it to *Haliætus*) calls it a paltry *milvine* bird, and says it should be placed as a *Buteo* or *Milvus*. With this opinion, I nearly agree, and accordingly place it for the present as a *Milvus*, of which, or of *Buteo*, it will probably be hereafter found to constitute a sub-genus. The greatest difference is, perhaps, the shape of the bill, and in the young bird, this is much less perceptible. Its manners, mode of life, &c., are certainly similar to those of the kite, being much on the wing, sailing over tanks, paddy fields, and rivers, at a moderate height, and with a flight like that of the kite, but perhaps with more frequent motion of its wings. Hodgson says it quests like *Circus*. This I have only seen in wooded country (in Travancore) and then its flight was higher and not nearly so regular. I may also remark that its squeal is very similar to that of the kite. Hodgson says, it lives chiefly on insects. Colonel Sykes says, it never feeds on carrion but always on fish (living). From my own observations, made chiefly in the Carnatic, where it is very abundant, I should say it prefers aquatic food. It may frequently be observed to carry off a fish from the surface of water, but I never saw it dip under, as Colonel Sykes relates. It also feeds much on crabs from tanks and paddy fields, also on frogs and various aquatic insects; and occasionally carries off a dead or wounded snipe, or other bird, and even carrion, and, it is also credibly said, young birds, chickens and pigeons, though I have not myself witnessed it. I have, though, very rarely, seen it whip an insect off a tree or standing grain: this, and its food generally, if not heavy, it often devours in the air, like the common kite, or seated on the edge of a tank, or river, or bank of a paddy field. It partakes very greedily of the small fish so generally dried by the poor on our coast, and I have repeatedly seen it catch one thrown up in the air for that purpose by a native. From this we must conclude that it varies its food, according to opportunity, but undoubtedly it prefers the neighbourhood of water, and aquatic food, as crabs, frogs and fish, when procurable. It is, as is well known, sacred to Vishnoo.

Length 18 to 22 inches—of one 18¼ inches long, the wings to 4th quill are 15 inches ; tail 8¼ ; tarsus and middle toe about equal, nearly 2 inches. Irides brown ; legs dirty yellow ; anterior scales large transverse—posterior smaller, in a double row—lateral scales small, bill greenish horn colour, whitish at tip ; cere greenish white.

Genus PERNIS, Cuv.

Honey-buzzard—Shahuteia, H.

18—*P. cristata*, Cuv.—*F. ptilorhynchus*, Temm.—*Crested Honey-buzzard.*

I have only met with this bird in the jungles of the Western Coast and Neilgherries. It is by no means common. I occasionally saw it seated on a tree, alternately raising and depressing its peculiarly formed crest, and on the Neilgherries frequently saw it questing diligently backwards and forwards over the dense woods there. I procured a female at the foot of the Conoor pass, and a male on the summit of the hills. Their usual flight is rather slow, but I once observed one flying much more rapidly than in general with a continued motion of its wings, and every now and then stopping and attempting to hover, which it did with its wings turned very obliquely upwards ; this seemed a great exertion to it and was very clumsily performed. In the stomach of the female I shot, was a soft green mass which looked like vegetable matter, but which was probably the half digested remains of green caterpillars. In the stomach of the male there was a large quantity of pure honey. (Mr. Elliot found the hair of a rat in the stomach of one—in another ants, wax, and honey). The female contained an egg ready for expulsion, which was very different in colour from that of the English honey-buzzard, recently figured in the 'Naturalist's Library,' and closely resembled that of the common European kite, also figured there.

As my specimens differ somewhat from the descriptions of this bird in Cuvier and Lesson, I shall briefly describe them. Female—colour of plumage pale brown ; lightest below and darkest on the scapulars and larger coverts ; the shafts of the feathers of head, neck and breast, dark brown ; an occipital crest of 3 or 4 deep brown oval feathers ; a few white blotches on the belly increasing in number towards the vent ; tail light greyish brown, numerously barred with deep brown, three of the bars being conspicuously broader than the others. Bill blackish blue colour ; legs and feet yellow ; irides bright yellow.

The male bird is throughout of an uniform dark clove brown, with rather less white about the belly and vent.

Length of male 24, of female 27 inches: of the latter the wings are 18; tail 11; tarsus 2¼; middle toe $3\frac{3}{10}$ths; outer and inner toes, without the claws, nearly equal. The irides of one of Mr. Elliot's specimens were blood red.

19.—*P. Elliotti*, Jameson's Edinburgh New Philosophical Journal (no description).

The following account of this new species of honey-buzzard, I take entirely from Mr. Elliot's notes, who met with it in the Southern Mahratta country, and took home specimens, which are deposited in the College Museum, Edinburgh, and in honour of whom it was named by Professor Jameson, of Edinburgh. I have never met with it.

Description.—Hind head considerably crested; colour above, brown, the crest and shades on the back very dark; head, neck, and middle coverts very pale, intermixed with white; ocular band dark brown; cheeks and beneath white; throat with a few brown lines; quills with darker bands on the inner webs; tail irregularly dark banded with 5 or 6 bands, edged with whitish, and passing into pale brown in the centre of the intermediate spaces; cere, legs and irides yellow; beak and talons black, the former paler at base. In another specimen the space in front of the eyes and a band below the eyes also were dark, and the tail had two broad dark bands near the base, and one near the tip, with between them about six narrow pale transverse stripes, also whitish extreme tip.*

Length of male about 2 feet; beak $1\frac{6}{10}$ths of an inch to front; tail 10 inches, exceeding wings by 2½ or 3 inches; tarsus $2\frac{3}{10}$ths; middle toe 3; claw alone $\frac{9}{10}$ths; bill strong bent with scarcely a festoon; claws strong, bent and channelled. In the stomach of one were some fragments of black ants, some hair, and what was supposed to be the rough skin of a monitor lizard: another had eaten honey, wax and bees.

* It differs entirely from the former in having a smaller crest, and being altogether of a light colour, and *white* beneath; the *Ptiloryhnchus* being nearly black, dotted with white beneath and under the wings, and the tail with fewer bands.—W. E.

GENUS SPIZAETUS, Vieill.—*Eagle buzzard.*

20.—*S. milvoides.*—New species.?

Description.—Head and hind neck of a pale orange brown, the feathers lanceolate and streaked in centre with dark brown. Some of the feathers of the occiput entirely brown and elongated, showing that the bird has been probably crested (I did not see it in the fresh state) ; a narrow superciliary stripe, and a band from the angle of the mouth to the ears and chin, deep brown. Rest of the upper plumage of a sepia brown ; middle coverts and some of the scapulars, broadly edged with whitish brown, causing a conspicuous broad light coloured mark on the wings, as in *B. teesa* and, though less conspicuously, in the *Milvus cheele* ; tail darker, barred indistinctly on the inner web only. Beneath, dark reddish brown—palest on the feathers of the tarsi. Cere and nasal portion of the bill yellow—feet do. Bill small, bending from the base ; cutting edge almost perfectly straight. Inner edge of the centre claw, dilated, as in *Pernis*. Feet short ; length 23 inches ; wings 16¾ ; tail beyond, 2 ; from base 9 ; tarsus 2½, stout ; mid. toe 2¾ ; three broad scales at the base of each claw, inner claw very large.

This is the bird alluded to, under the head of the common kite, as the one to which the blame of carrying off chickens, pigeons, &c. should, at all events from the accounts I received, be sometimes attributed. My attention was first called to this bird at Trichinopoly, by Mr. Hooper, C. S. who kindly gave me a specimen shot by himself in the act of pouncing on some of his pigeons. I occasionally afterwards recognised it, as I thought, among the kites, and saw it attempt to swoop off chickens and pigeons, though I failed in procuring a second specimen. Its appearance in the air and mode of flight much resemble that of the kite, but the crows appear to distinguish it readily, and often clamorously pursue it. I have not hitherto observed it elsewhere. I have given it provisionally the name of *Milvoides* from the general similarity of its markings, and its usual association with the common kite.

GENUS BUTEO.—Auct. *Buzzard.*

21. *B. longipes.*—New species ?—*F. albidus?—Temm. P. C.—Chooa mar*, H ?—*Long legged buzzard.*

This bird, if a true species of buzzard, and hitherto undescribed, may be named as above, from its long tarsi, which evidently ally it to the Harri-

ers. It approaches somewhat to the description of *B. albidus, Less.* but that is said to be crested, and if so, is more probably a honey-buzzard.

Description.—I possess two specimens differing a good deal from each other, both of which I shall briefly describe.—The first has general ground tint of a yellowish brown, purest on the head, neck, throat and breast, most of the feathers are centred darker. On the back the tint is nearly lost by the prevalence of the darker shade, an edging of the lighter colour only being left; quills with outer web greyish, inner web blackish from tip to deep sinuosity; white beyond; tail reddish grey and indistinctly barred. Belly, vent, thigh, coverts, deep auburn brown; the line of demarcation between this and the lighter tint of the breast strongly and abruptly marked. Cere pale greenish yellow; irides yellow; legs dirty yellow; length 26 inches; wings 18½; tail 10; tarsus nearly 4; mid toe 2¼.

My other specimen I at present possess alive, having only very slightly wounded it: its head, neck, throat, breast, and belly are white, streaked on some of the feathers with reddish brown; back, as in the other specimen, but rather lighter; tail with the outer webs reddish white; inner white, indistinctly and incompletely barred with darker; cere yellowish green; irides pale yellow. This is apparently the younger bird of the two.

This bird differs from the characters of *Buteo* in its higher bill and larger cere and nostrils. In these respects, as well as in its length of tarsus, it approaches the *Circi*, but has remarkably short though strong feet and claws, a robuster make, and different habits. Tarsus shielded anteriorly and posteriorly with large and well defined scales; toes only furnished at their extremity with large scales; outer and inner toes, without the claws, sub-equal; wings with 4th quill largest, reaching to end of tail, which is slightly rounded; four first quills much notched.

This is certainly a rare bird. I have hitherto only seen it near Jaulnah, perched on low trees or on the ground, in fields, or near water, and taking a low and short flight to another similar perch. In the stomach of the specimen I shot there was a *Gryllotalpa*. Mr. Elliot, who met with this species only in Guzrat, says, "This bird evidently preys on the field rats which abound in the sandy soil of this province. He is seen sitting on low trees or bushes, over the rat burrows, and, watching his opportunity, darts down on his victim. In the stomach of one were the exuviæ of a rat (*Arvicola*) and a large beetle." He also says, "eyebrows very prominent; large eye; full pupil; irides pale dun."

22—*B. teesa*, Gray.—*Circus teesa*, Frankl.—*F. tricirgatus*, Temm.—*Astur Hyder*, Sykes.—*Teesa*, H.

I shall, for the present, here place this somewhat anomalous bird, and shall consider it as a connecting link between the buzzards and falcons. Colonel Sykes, and others, consider it as an *Astur*, to which it certainly has some resemblance ; but as in Swainson's classification the falcons and not the hawks are united to the buzzards, and as it certainly in many points is allied to *Buteo*, I have accordingly left it as the medium of junction of the two families. I am by no means certain, however, that it should remain here ; for its small size, its manner of flight, and other habits, tend to remove it from this heavy-flying family. I have only hitherto seen the *Teesa* in the more northern portion of the Deccan, and it increases in number as you advance to the northward ; about Jaulnah it is very numerous. It frequents topes, as well as the open country, where it may be seen seated on low trees and bushes, an ant hill, or the banks of rivers, whence it pounces on mice, lizards, small snakes and various large insects and their larvæ. Mr. Elliot in his notes says, "It is said to be fond of crabs. It certainly does not refuse them. I saw a *Pardee* catch one directly by baiting his springs or nooses with a crab." The flight of the *Teesa* is tolerably rapid, performed by repeated strokes of the wings, exactly like that of the *Kestril*, for which at a distance I have occasionally mistaken it. Its flight too in general is low. I have seen it several times take a much more extended flight than usual over a *rumna*, flying at a low elevation, and now and then rising slowly a few feet, and I observed it apparently capture a locust or some other insect on the wing. I possess at present a pair of the *Teesa* alive, a young male and adult female. The male has much white below, streaked with brown, and the brown of the upper parts is not so dark as in the adult specimen. The irides are light brown. I had lately also brought me a full fledged young bird, which had dropped from the nest. In this the head, back of neck, and all below, were of a reddish fawn colour, streaked with brown. The light wing spot was also of a reddish white colour, and the irides dark brown, in other respects it did not differ materially from the older birds ; has a plaintive but crowing call, consisting of two notes. Irides silvery white ; cere and part of bill yellow ; tip of the latter blackish ; legs and feet yellow. Length 16—17½ ; of a fem. 17½, the wing 12—tail 6¾—tarsus, 2¼, mid. toe 2.

I shall here add a few particulars respecting the structure of this curious bird. Bill rather short, edge of the mandible scarcely festooned, gradually bending from base, nostrils rather small, pyriform, with narrow point,

placed upwards and forwards; wings reaching to within about an inch of end of tail; 3d and 4th quills longest and nearly equal; four first, with webs, notched, but not so deeply as in the last species. Legs and feet moderate, strong; anterior scales large, transverse; posterior not so distinct, in a double row. Internal lateral scales small, irregular. External ditto, larger. Feet short; inner toe without the claw, shorter than the outer one; whole length of the toes covered with broad scales.

GENUS CIRCUS, *Bechstein—Harrier.*

23—*C. pallidus*, Sykes.—*C. cyaneus*, var?—*Dust-mal*, H.—*Indian Harrier* and *Ringtail.*

Besides the peculiarities of plumage which induced Colonel Sykes to separate this bird from the European *Harrier*, it differs in having the wing longer, being in some specimens 14½ inches long, and reaching within 1½ inch of the end of the tail; it also differs somewhat in the proportionate length of the quills.

The Indian *Harrier* is very generally spread and in many parts indeed very abundant. It frequents the open stony plains and cultivated ground; especially when the grain is high—occasionally, though rarely, I have seen it in cantonment, hunting along a hedge side. I have seen it perch on trees, though very seldom. Its chief food is lizards, locusts and grasshoppers—also mice and small or young birds, especially quail, if an opportunity occurs of suddenly snatching them. Mr. Elliot says in his notes, "migrates from Southern Mahratta country in February, and returns at the end of the monsoon like the *Bhyree*."

24.—*C. cineraceus*, Mont.—*C. Montagui*, Vieill.*—*Montague's Harrier.*

This species is I think more abundant even than the last in the table land, but I did not observe it in the Carnatic. It frequents the same ground, and has the same habits as the last. It differs remarkably from it in the length of the tarsus, which is only 2¼ inches in the male bird, whilst in *C. pallidus* it is about three inches.

* I cannot help thinking that Nos. 23 and 24 are the same bird. I deposited a series of specimens showing the varieties of age and sex in what I considered to be three species, but which, on comparison, were found to agree pretty exactly with a full series of English specimens in the College museum Edinburgh, and by which I was satisfied of the existence of two well defined species only,—*Circus cyaneus* and *C. cineraceus*, or *Montagui*. —W. E.

25.—*C. rufus*, Briss.—*C. variegatus*, Sykes' adult bird.—*Marsh-Harrier.* —*Kootur*, H.

I venture to bring these synonymes together on the authority of Gould, as mentioned in a late volume of the Naturalist's Library on British Birds. The *marsh-harrier* is generally spread throughout India, but is not nearly so common as either of the former species. It prefers hunting over rivers, tanks, marshes and paddy fields, but also is frequently seen skimming over the dry grain fields; it feeds on various water insects, fish, frogs, mice and small birds. The irides of the adult bird are yellow, of those in imperfect plumage, dark brown. Length of one specimen 21½ inches, wing, 16, tail, 9, tarsus, 3-$\frac{5}{10}$ths, mid. toe, 2½.

26.—*C. Melanoleucus.—Black and White Harrier.*

Though I have not yet procured a specimen of this rare *Harrier*, I have seen it occasionally both in the Carnatic and West Coast, and it is included in Mr. Elliot's catalogue of the birds in the Southern Mahratta country, from which I take the following, measurements:—Length 17—18 inches; tarsi 2-$\frac{8}{10}$ths, weak; mid. toe 1½; bill and cere black; legs yellow; wings 1-$\frac{7}{10}$ths, shorter than tail.

Sub Family FALCONINÆ, *True Falcon.*

Genus FALCON.—Auct. *Falcon.*

27.—*F. peregrinus, Peregrine Falcon.—Bhyree*, H.—the male being the *Bhyree bucha.*

It is surprising that the *Peregrine* falcon has not hitherto been recorded as an inhabitant of India, as it is universally spread and much used in Falconry by the natives. No mention of its having been found here is made in 'Yarrell's British Birds,' nor in Sir W. Jardine's later work, though in the latter it is stated 'we think it much more than probable that it may also be found in the Alpine regions of India.' The *Bhyree* is found even in the hottest parts of the peninsula. I obtained one alive at Trichinopoly which was said to have fallen into a tank. Many are yearly captured about Ramnad and also in the Northern Circars. I shot a specimen on some rocks, in the sea of Tellicherry, at the end of

April; and it is tolerably abundant in the more northern parts of the Deccan, as near Jaulnah, occasionally coming into cantonment and carrying off chickens, &c. Mr. Elliot in his notes says, "It is migratory, appearing on the eastern shores of the peninsula in September or October, and remaining till March or April, when it disappears for the purpose of breeding and moulting." (I think I have observed it as late as June near Jaulnah, but cannot be certain). "Great numbers are caught every year in the Northern Circars by a cast named *Yerklees*, and sold to the falconers of Hyderabad, Kurnool, &c., at an average of 10 rupees each. The falconers distinguish three kinds, the black, the red and the white, according to the shades in their plumage." The *Bhyree* affects, in general, open country, rocky hills and deep valleys where brushwood abounds, also frequents tanks, and preys much on paddy birds, ducks and other water-fowl. It is more esteemed for its courage and powers of flight than either of the other two large falcons found in this country. It does not differ, as far as I can judge, from the descriptions of British specimens.

28.—*F. luggur.*—New species?—*F. lanarius*, L.?—*Luggur*, H.—the male being the *Juggur.**

This species of falcon, apparently undescribed, appears much to resemble the description of *F. lanarius* or the *Lanner*; but, owing to the only description I have access to being very brief and imperfect, I cannot speak with any certainty. It is said by Mr. Gould to exceed the *Peregrine* in size, and if so, is probably distinct as the Indian bird, though much about the same length as the *Peregrine*, is not so large or heavy a bird. Mr. Gray has given the specific name of *juggur* to a falcon, which I do not know, but which does not resemble this one in the least.

The *lugger* is the most common of the large falcons of India; unlike the last it breeds here and on trees during the hot weather.

Descr.—Above, of a uniform brown colour; below, white, with a few brown spots and brown cheek stripe; cere and legs, blueish; wing feathers hardly reach to the end of the tail. Quills and rectrices with numerous white spots on their inner webs; young bird is entirely brown

* The old bird at the 5th year is figured in Gray & Hardwicke, very correctly; vol. ii. pl. 26. Mr. Jerdon's remarks, seem to refer entirely to the young bird. It is probably a new species, differing from the *Lanner*; is about the same size as the *Shaheen*, and much smaller than the *Peregrine*.—W. E.

below. It loses the brown of the breast at its first moulting, and that of the belly with the two following moults. Length of an adult female, first year, 19 inches. I have derived most of the above information, regarding the change of colour of the *luggur*, from Mr. Elliot's notes, as, though it is far from being uncommon, and I have frequently seen it, I have hitherto only procured young birds. One was brought to me alive at Trichinopoly; it was a bird of the year, and entirely brown. Another I shot lately at Jaulnah, has the head and hind neck of a light fawn colour, broadly streaked with brown; chin and throat white; feathers centred with brown; under tail coverts fawn, barred with brownish grey, rest of the plumage dark brown, the feathers margined with a lighter tint.

The *Lugger* is flown frequently at the crow, in pursuit of which much sport is said to be afforded. It is a bird of heavier and slower flight than any of the other falcons of India.

29.—*F. Shaheen.*—New species.—*Shaheen*, H.; the male being the *koela.**

This also apparently undescribed falcon, very much resembles the colouring of the *F. juggur* of Gray, but differs in wanting the rufous head of the latter. It is not so common as the last, I think, and prefers a wooded country, or at all events does not dislike it, for I have shot it in Travancore, in a thickly wooded district, and seen specimens from other parts of the West Coast. From Mr. Elliot's notes I extract the following: "The *shaheen* is a native of India, and breeds pretty generally among rocky mountains. The moulting begins about March, when they also pair, and the young begin to fly about June, when they are caught by the falconer. Their natural flight is a high hovering in the air, from which they pounce on their prey. This the falconer improves into a standing gait, and makes them stoop on partridges, florikin, &c. I have also heard of their being made to fly at duck and teal."

Description.—Above, of a slate blue colour, lightest on the rump; head, hind neck and cheek streak nearly black; beneath, brownish orange, or a sort of chesnut colour, which gradually disappears on the throat, breast and upper part of belly, being replaced by white. In the young bird the parts beneath are spotted with dark brown drops, which gradually disappear from the crop downwards. Cere and legs yellow; irides

* It is figured correctly in Temminck, Pl. Illum. as *F. Aldovrandii*.—W. E.

deep brown ; quills and tail blackish grey. Length of female 17—17½ inches; of a male bird 14¾ : wings to end of second quill 10¾ ; tail 5¼ ; tarsus 1½; middle toe 2½. It differs in structure from the *Peregrine* in having a shorter wing, shorter tarsus, and in the 3d quill (if my specimen is in perfect plumage) being considerably shorter than the first.

The *Shaheen* is said to be very speedy, even more so than the *Peregrine*, though it will not hold out so long.

30.—*F. chicquera*, Lath.—*F. ruficollis*, Swain.—Fem. *Turoomtee*—male *Chetwa*, H.

The specific name of *Chicquera* has been erroneously applied to this species, being the Indian name for the common sparrow hawk of the country. It corresponds in colouring exactly to the description by Swainson of his supposed new species ;* the black marks round the ear and beneath the eye, supposed by him to distinguish his *ruficollis*, are always present. It is generally, however, a larger bird. The *turoomtee* frequents patches of wood or single trees in the open country, and even gardens. It is found in all parts of the peninsula, is a bird of great courage and activity, generally hunts in pairs, rising alternately over their prey, and sometimes following closely on the wing. I have seen it hover, occasionally, though rarely. It preys chiefly on small birds. Mr. Elliot has, " will not suffer other birds to approach their perch, but drive away even the *wokhab*, hovering over him with shrill cries. The *turoomtee* is occasionally reclaimed and flown at small birds, especially at the common jay or roller (*Coracias Bengalensis*), in pursuit of which much amusement is afforded from the clumsy evolutions and harsh cries of the quarry." Naked space round eyes, cere and base of bill yellow ; legs do. ; length 14—15 inches,—of *chetwa* 11—12. Tail exceeding wing by nearly two inches.

31.—*F. tinnunculus*, L.—*Kestril* or windhover.—*Nurzee Nurzanuck*, H.

The *kestril* is an extremely common and abundant bird, frequenting chiefly the open plains and bare rocky hills. Its chief food is lizards, also large insects, and occasionally young birds. The male is occasionally as large as the female.

* V. Birds of West Africa, vol. 1.

Sub Family ACCIPITER.—*Hawks.*

Genus ACCIPITER, Will.—*Sparrow Hawk.*

32.—*A. dukhunensis*, Sykes.—*A. dussumerii, Temm. ?—Chicquera* or *Shikra*, H.; the male *chipka*.— Common *sparrow hawk.*

Colonel Sykes has accurately described the young state of this bird; but the adult plumage differs so much that it might be mistaken for a distinct species, and I shall accordingly describe it:—Above of a delicate bluish grey colour, darkest on the head, ears greyish fawn, throat white, with, in some instances, a faint longitudinal stripe; breast and belly white, very numerously barred with narrow, transverse, fawn coloured marks, so much so as almost to conceal the white ground. Lower belly, thighs and under tail coverts pure white; a brownish red mark extends partially round the upper part of the back of the neck, forming a half collar, only conspicuous however when the neck is stretched. Quills blackish. Tail with 2 middle and 2 outer feathers not barred, the remaining ones only on their inner webs. Cere bright yellow; irides, deep orange yellow; feet buff yellow; length of male 12½ inches; of female 14½; of the latter the wing to end of 4th quill is 8 $\frac{5}{10}$ths; tail 4 inches beyond, from base nearly 7; tarsus about 2; mid. toe 1-$\frac{6}{10}$ths; tarsus with anterior scales large, transverse; posterior scales, small and numerous above, larger below, and in two rows; external lateral scales distinct and transverse; internal lateral, indistinct, or confounded with the posterior.

This widely spread hawk prefers a woody situation, though not in general found in thick jungles. It hunts about avenues, hedge rows, topes and open spaces in the jungle, often enters gardens, approaching close to houses. It takes its prey by a sudden pounce, seldom attempting to follow. Its chief food is lizards and small or young birds. The *Shikra* is very commonly reclaimed; in this state it is a bird of great courage, and will easily strike down partridges, crows, and even larger birds, as the small hornbills (*B. gingianus*) and young half grown peafowl. I am informed that at Hyderabad it has been trained to hunt hares. Mr. Elliot says, "a variety without the black line on throat is called *meetun*, and is particularly esteemed in falconry."

I think it barely possible that the *F. Dussumerii* of Temm. may be identical with this bird; though I see Colonel Sykes has referred to this another species, and Mr. Elliot considers it as properly belonging to the next species.

33.—*A. Dussumerii.*—*F. Dussumerii, Temm.* P. C. ?—*Basha* (the female) *Basheen* (the male), H.

I have not hitherto seen this sparrow hawk, and take the following brief description from Mr. Elliot's notes: "Above, brown, white eyebrow, tail with 5 or 6 bars; beneath, white barred, and a tinge of reddish on breast; utters a plaintive cry like the *besra*; legs long and thin." Colonel Sykes says, 'Irides bright yellow, wings short, tail long and narrow (6½ inches); total length of a female 12½ inches.' As I before stated, I think that this species may be yet undescribed, for several specimens of *F. Dussumerii* appear to have been taken home by the French travellers, and the *Shikra* is the only species at all common.

34.—*A. Besra.*—New species ?—*Besra* (female), *Dhotee* (male), H.

Of this species I am also ignorant, and am indebted again to Mr. Elliot's notes for the following very brief notice.

"Above, brown; beneath, white with brown spots; becoming more cinereous with age, and the spots beneath becoming broad bars; cere and legs greenish yellow; eyes yellow, large pupil; length about 12 inches, tarsus $2\frac{8}{10}$ of an inch."*

35.—*A. fringillarius.*—*English sparrow-hawk.*†

I shot a specimen of what I suppose may be the European species in thick and lofty jungle on the Coonoor pass of the Neilgherries, at about 5000 feet of elevation—I add a description of my specimen:—Above of a deep clove brown with black reflections, head and back of neck almost black, tail light grey, with 4 broad dark bars on the centre feathers, and 6 on the external ones, face and ears dusky, throat white, with a longitudinal stripe, and a few streaks of dusky black; breast, abdomen, and thigh coverts, white, numerously and broadly barred with rufous brown, mixed with dusky brown; under tail coverts pure white; cere and legs lemon yellow; irides bright yellow; total length 14½; wings to end of 4th quill 7½; tail 5-$\frac{8}{10}$ths; tarsus 2; middle-toe 1-$\frac{7}{10}$ths; tarsi thin, with the anterior and posterior scales each of one entire piece; no lateral scales.

* I have only met with it in the Soonda jungles, where it is taken young by a caste called *Halapyks*, and sold to falconers from Hyderabad.—W. E.

† I think the *Basha* will ultimately turn out to be identical with this. My impression on seeing the *Basha* in the *Gykwars Shikar Khanah* at Baroda, was that it was the English sparrow hawk. It was very like the *Baz* in miniature, which I here first identified as the *Goshawk*.—W. E.

GENUS ASTER.—*Goshawk.*

36.—*A. palumbarius.*—*Goshawk.*—*Baz* (female), *Joorah* (male), H.

I obtained a specimen, of what I consider as the young male of this bird, seated on a bough on one of the thick woods of the Neilgherries close to Ootacamund. I several times afterwards observed a pair of apparently the same bird hunting together near Coonoor, where they had committed several depredations on some pigeons, and I one day saw them make an unsuccessful swoop at a flock of pigeons close to the house. Their flight was swift, similar to that of sparrow-hawks, but at a considerable height, whence they made a sudden pounce. I add a description of my specimen:—Above of a dark brown; the eyebrows white, and the feathers of the head, hind neck, and upper part of back narrowly edged with whitish, and with white base; tail of a lighter tint, barred with 4 dark bands on centre feathers, and 5 on the rest; beneath, white; on the sides of the breast a cluster of large oval brown spots, and a few others sparingly distributed over the abdomen; the thigh coverts are transversely banded with brown; cere and feet lemon yellow; irides bright yellow; length 16½ inches; wing 8½ to the end of 4th quill; tail beyond 4½, from base 7; tarsus $2\frac{1}{10}$; feathered in front more than half its length; middle toe 2 inches; anterior and posterior scales large, transverse; external lateral, small irregular. I see by Mr. Elliot's notes that he considers the celebrated *Baz* of India to be identical with the European goshawk.

FAMILY STRIGIDÆ.—*Owls.*

SUB FAMILY STRIGINÆ.—*Typical owls.*

GENUS STRIX, Auct.

37.—*S. Javanica. Horsf.*—*S. flammea*, var. ?—*Kareya*, or *Kurail* H.—*vulgo, Booree Chooree.*—*White Owl.*

This has been separated from the European species on account of some slight though permanent deviations of colour, which many do not consider as sufficient to warrant a specific distinction. As, however, Colonel Sykes has followed Horsfield, I shall also do so. The white owl frequents wooded places, topes, bushy nullahs, and trees, near tanks

and rivers. Though generally spread, it is not very common. It utters a harsh shrill cry at night; Mr. Elliot in his notes says, "The natives assert that in doing so, drops of blood are forced from its bill, and should any of these fall on the backs of cattle, they become weak in the loins."

The chief food of this owl is rats and mice. Whilst at Madura lately, one flew into my room at an open window after a rat that was running about, and I secured it alive; length of one specimen from tip of bill 17; (from top of disk 14) wings 12; tail 5; tarsus 2¼; middle toe 2¼; expansion of wings 3 feet.

38.—*S. Longimembris.*—New species?—*S. Javanica*, var.?

On the Neilgherries, near Coonoor, in a bushy valley, I obtained a specimen of an owl very similar to the last, but differing in some structural points, as well as in the shade of plumage. If it should be considered a distinct species, it may be named as above, from the comparative length of both wings and legs.

Description.—The ground tint of the plumage is similar to that of *S. Javanica*, but lighter or more yellow. The grey tint on the upper plumage of the latter is replaced by a deep brown colour, and the white spots are less numerous. Below, the white is much tinted with ocherous, and the brownish red spot on the disk of the common species is here of a very deep brown. The most important differences, however, are structural, as will be seen by comparing the measurements with those of the last.

Total length about 17½; of wing 14½; tail 5½; tarsus 3½; middle toe 2¼. The wings reach two inches and more beyond the tail, whilst in *Javanica* they only reach half an inch or so. A similar species to this is indicated in Griffith's Cuvier as follows—"*Tuidara*, owl—*S. perlata*, Licht.—*S. Tuidara*, n. &c. Like *S. flammea*, but the legs are longer—Brazil."

GENUS OTUS, Auct.

39.—*O. brachyotos*, Cuv.—*Short eared Owl.*—*Chota Ghooghoo*, H.

I have hitherto only obtained this species on the table-land, though I am informed it is also found in the Carnatic and Northern Circars in suitable ground. It is not very common—frequents long grass on the open plains, and is occasionally flushed when beating for florikin. Of

two specimens I possess, one is nearly white below, whilst the other is of a deep ochreous tint throughout.

40.—*S.* ? *lugubris*, Tickell*—Jour. As Soc. Ben. No. 23.—*Choghud Besruh*, H.

As I have never seen this species of owl I merely place it here provisionally. It probably does not belong even to this sub-family, for Mr. Elliot (to whom I am indebted for my knowledge of it as a peninsular species) says, " It seems to belong to the falconine owls, with a short tail, of Cuvier."

Description.—Above of a uniform dusky brown, beneath whitish, barred with rusty brown like the *Besrah*—this barring decreases in quantity every year. A white line on the forehead, wings and tail, with dark transverse spots; bars of the tail five in number, and the latter tipt with white. Irides, large, yellow; cere greyish, fringed with black hairs; legs greyish, covered with hairs to the toes; length about 12 inches, breadth 26. This owl inhabits hills, rocky and jungly places. Mr. Tickell says, " inhabits the retired parts of the thickest jungle, coming towards the edges and open parts at night. It is completely nocturnal, and in a calm moonlight night its cries may be heard to a great distance, resembling strongly those of a strangling cat." Mr. Elliot says, " when seized cries like a child."

SUB FAMILY ———— ? *Sub-typicel Group*, Sw.

GENUS URRUA, Hodgson.†

41.—*U. Bengalensis.—Otus Bengalensis*, Frankl. and Vig.—Gould. Cent. pl. 3—*Googoo*, H.—*Common Indian horned Owl.*

This large and handsome owl is the most abundant and most universally spread of the large owls of India. In the Carnatic the *googoo* frequents rocky barren hills chiefly, where seve-

* I have adopted the name given to this species apparently by Lieut. Tickell, of the Bengal army, in an excellent account of a few birds collected by him in the jungles of Borabhum and Dholbhum. It would not I hope be too much to expect from him a full catalogue of the birds of the vast plains of Bengal, and neighbouring countries, arranged according to the modern nomenclature, in which his former list is rather deficient. From this list (published in 1833) he appears highly qualified for the task, and as it is undoubtedly a desideratum, I trust he will be induced to undertake it.

† Journal Asiatic Society Bengal—No. 65.

ral may often be seen seated even for some hours after sunrise. In the Deccan it frequents rocky ravines, banks of rivers, and holes in the steep sides of the precipitous trap hills—also often found about old buildings, forts and walls. On the Neilgherries it is however generally found in the dense woody glens there. Though partially diurnal, it chiefly preys during the night; its chief food is rats and lizards, occasionally birds, crabs, and frequently large locusts and mantides. I have at present a pair, male and female, of this species alive in my possession. Their usual cry is a single, loud, clear and prolonged hoot. I occasionally at night heard them utter a low indistinct strangling sort of cry. They vomit bones and feathers in the form of a pellet. When alarmed they hiss, and make a loud snapping noise with their bills. If a dog or other animal approaches, they lower the head almost to the ground, erecting the whole of the feathers of the body, and spreading out their wings to their full extent; these from the stooping position of the bird are nearly vertical, almost touching the ground with their upper edge; and from their extent the bird presents a formidable front to an intruder. Their egrets certainly seem connected with their exalted sense of hearing, being generally raised whilst in the act of listening. They are also erect during sleep, at which time the wings are also occasionally brought forward. I may here remark that the egrets of this bird are drawn too large in Gould's Century, and besides they are never permanently raised in the position there indicated, being kept much more erect, nearly vertical indeed.

GENUS BULACA, Hodgson, *loc. cit.*—SCOTIAPTEX, Sw.?

42.—*B. Sinensis.*—*S. Sinensis*, Gray, Gray and Hardw. Ill. I. *Z.*—*S. pagodarum*, Temm. P. C.—*S. selo-puto*, Horsf.—*S. Indranee*, Sykes?—Young bird?

I have only once observed this very elegantly marked species, which I have referred provisionally to Mr. Hodgson's lately proposed genus. I met it in a tope, and some large single trees, near Verdupettah to the S. of Madura on the Palamcottah road. If, as I suspect, *S. pagodarum* and *S. selo-puto* are identical with this bird, Mr. Gray's specific name must be abandoned. It is an owl of pre-eminent beauty, both as regards the shade of the plumage and the softness and delicacy of the markings.

Length (from top of bill) 21 inches; of wing 15; tail 7¾; tarsus 2¼; middle toe 2-$\frac{5}{10}$ths; irides, deep brown. Has aharsh and dissonant cry at night.

Antiquarian Papers
Ply.

Huhua pectoralis.

Printed by W. Wilmot

GENUS SCOPS, Sav.

43.—*S. Javanicus*, Less.—*S. Lempyi*, Horsf. ?—*S. noctula*, Temm ?—*Indian Scops Owl.*

I procured a single specimen of a small owl, that answers the brief description of Lesson, in the western ghauts near the Peria pass.

Description.—Above, brownish, varied with ferruginous and blackish. Quill feathers with the outer webs marked by several strongly defined bars of buff; beneath of a ferruginous tint, finely vermiculated with brownish, and the feathers streaked in the centre with blackish. Length (from tip of bill) 9½; wing 6; tail 2¾; tarsus $\frac{5}{10}$ths; 4th and 5th quill feathers longest, and the 2d is equal to the 7th.

SUB FAMILY AËTOGLAUCINÆ, Hodgson.—*Eagle Owls.*

GENUS HUHUA, Hodgson, *loc. cit.*

44.—*H. pectoralis.*—New species ?—*Ooman*, Mal.

Description.—Above of a deep sepia brown, having in some lights a golden tint; most of the feathers, especially on the wing coverts, tertials, scapulars and tail, barred and mottled with light buff. Egrets long, with narrow bars of whitish; face, ears, rictal and mental bristles silvery grey, very strong and rigid; the frontal feathers also rigid and bristly. Beneath, white, feathers barred with brown numerously on the throat, less so in the belly and vent, and the bars are larger and take an arrow-headed form. A narrow pectoral band of brown, with a golden tinge, and edged with buff as above. Irides deep brown; cere greenish yellow; bill greenish-horn, with a tinge of flesh colour; toes dirty reddish yellow.

Though I have placed this bird under Mr. Hodgson's new genus *Huhùa*, with which it agrees in some of the most important characters, especially in its large and lengthened bill, large egrets, short stout and feathered tarsi, strong toes, and immense talons, yet it differs in the following respects: the bill is hardly straightened beyond the cere, it has an obsolete festoon, the nares are partially covered with bristles, which extend the whole length of the bill; the 5th and 6th quills are longest and sub-equal, and the tertials are nearly as long as the primaries; the hind talon like-

wise is rather larger than the outer fore; the toes are nearly covered by bristly feathers, and there are 3 large scales on each of the toes next the talons. These differences, however, probably only entitle this bird to rank as an aberrant species, or it may be as a sub-genus. Length, 23 inches; wing 16½; tail 8¼; tarsus 2; mid toe 3; inner 3½.

I have hitherto only found this powerful and splendid owl in the dense and lofty forests of Malabar. It is chiefly nocturnal, issuing forth to the more open spaces about dusk. I was informed by an intelligent native that it feeds on various mammalia, and also on fish, and that it will dive to some depth for these. The stomach of the only specimen I procured was empty. It had just perched on a large palmyra palm overlooking a tank. It utters a low moaning cry at intervals. Should it prove undescribed, it may be named as above, from the marked pectoral band.

GENUS CULTRUNGUIS, Hodgson.—*Ketupa*, Less.

45.—*C. Leschenaultii.*—*Ketupa Leschenaultii*, Less.—Temm. P. C. 20. —*S. Hardwickii*, Gray, Gray and Hardw. Ill. I. Z?—*Amrai ka Googoo*, H.—*Large horned wood Owl.*

I have here adopted Mr. Hodgson's excellent and classical name, though that of M. Lesson has the priority, not more on account of his accurate generic definition, than from the excellent composition of the word.* This powerful bird is generally spread throughout India, though far from being common. It frequents chiefly the more wooded districts, though also found in topes and avenues in open country. It is partially diurnal. Its voice is a loud and harsh hollow laugh. I know nothing of its food. Mr. Hodgson says that the genus is piscivorous, and thus the analogy of its feet and legs with those of *Pandion* are beautifully explained. The markings of the species figured as *S. Hardwickii* in Gray and Hardwicke's *Illustrations*, appear not to differ from those of our present subject, and I suspect the sentillation of the tarsi there represented is an embellishment of the native artist, most probably, and that this must therefore stand as a synonyme.

* It is, I think, much to be regretted that Mr. Hodgson, who in this and other instances has shewn his talent in the formation of classically compounded words, should in general adopt unmeaning (to most readers) and cacophonous generic names from the vernacular dialect of Nepal.

SUB FAMILY ——— .—*Hawk Owls.*

GENUS NOCTUA, Sav.—Hodgson.—*Athene* of recent authors.—*Nyctipetes*, Sw.

I shall here retain for the present the generic name of *Noctua*, though it has been properly objected to that it had been previously applied to a genus of moths.

46.—*N. cuculoides*, Vig.—Gould Cent. pl. 4.—*Junglee choghud*, H.—*Jungle Hawk Owl.*

This very handsomely plumaged little owl is said in Gould's Century to be "supposed to be confined to the Himalayas." I have found it wherever there is lofty jungle. In Goomsoor, on the eastern side; and on the west, in Travancore and Malabar, where it is by no means rare.

It frequents lofty trees and flies about actively in the day time, at least when disturbed; I have generally found it single, rarely in small flocks. It feeds on various large insects, chiefly *coleopterous*.

Irides golden yellow; bill and legs greenish horn colour. Length 9 inches; wing 5; tail 3; tarsus $\frac{5}{10}$ths; mid toe $1\frac{1}{4}$.

47.—*N. Indica*, Frankl.—*S. brama*, Tem. P. C. 68.—*Choghud*, H.—*Peenglah*, Mah.—*Little spotted Owl—Divining Owl.*

This little owl is extremely abundant in Southern India (more so, particularly in the Carnatic, I think, than in the Deccan), and is often very annoying from its familiar and noisy habits. It generally roosts during the day in large trees, but frequently also in the caves of houses or under the roof, and though it is most active and noisy during the night time, feeding then, yet it is often very noisy during the day, uttering its harsh squabble, three or four joining in chorus at the same time. Its usual cry is something like '*jukl jukl jukl*', repeated very quickly.

About sunset it usually sallies forth from its roosting place to feed; its chief food is beetles and other insects, but it occasionally captures mice. It takes insects sometimes on the wing, or snaps one off the ground or the trunk of a tree, during its low undulating flight, which is generally short, but at times prolonged to some distance over the plain.

In some parts of the country it is supposed to have the power of divination.

(*To be continued.*)

IV.—*A Catalogue of the Species of Mammalia found in the Southern Mahratta Country, and in the Province of Canara, with their various names in use there.*—By Walter Elliot, Esq., *Madras Civil Service.*

The district of Dharwar, in which the animals mentioned in the following list were procured, is a part of the high land extending towards the south of the Deccan, commonly called the Southern Mahratta Country, and comprises the Belgaum zillah of Bombay. It might likewise, geographically speaking, be called the southern portion of Sholapur, which, according to the political arrangement of the country, is placed under the zillah of Canara, in the presidency of Madras.

The general boundaries are the river Kistnah and Bhima on the north and N.E., the Tungabhadra river on the south, the Nizam's territory on the east, and the Sylhadri range of mountains on the west. The latter are generally called the Ghats, a term which however properly applies only to the passes leading through them.

The general face of this tract is much diversified, and affords a great variety of elevation and geological structure, these materially affecting the distribution and the habits of the different species of animals existing within its limits.

The whole of the western part is a thick forest, extending from the outskirts of the mountainous region of the Ghats to their summits, and clothing the valleys that extend between their different ridges. It abounds with the teak and various other lofty forest trees, festooned by enormous perennial creepers. The bamboo forms a thick and luxuriant underwood in some places, while others are entirely open, and the banks of many clear and rapid streams flowing through it abound with the black pepper plant, the wild cinnamon and other odoriferous shrubs. Portions of this forest are often left entirely untouched by the axe or knife, forming a thick impervious shade for the growth of the black pepper, cardamom and Mari palm—(*Caryota Urens*). These are called *kans* and are favourite resorts of wild animals.

To the east of the regular forest lies a tract called the *Malnad*, or *rain-country* (though the natives of the plains often include the *jhari*, or *forest*, under the same denomination), in which the trees degenerate into large bushes, the bamboo almost entirely ceases, and cultivation, chiefly of rice, becomes much more frequent. The bushes consist chiefly of the *karunda*, the *pallee*, &c. It abounds in tanks and artificial reservoirs for purposes of irrigation.

East of the Mulnad is a great extent of alluvial plain, producing fine crops of wheat, cotton, maizes, millet, &c.* and on the Nizam's frontier are found a succession of low dry hills, with tabular summits, often rising in abrupt scarped precipices, and intersecting and traversing the plains in various directions. They are clothed with low thorny jungle of *babul* and *acacia*, and their bases, and the valleys between, composed of a light sandy soil, are cultivated with millet, vetches, &c.†

The first or mountainous division consists chiefly of micaceous, clay, and other schists, which to the northward are succeeded by basaltic or trap formation. The Mulnad is composed of undulating clay-slate hills, which become covered with basalt to the north. This trap formation extends in a slanting direction from S. W. to N. E. nearly coinciding with a line drawn from Sadasheaghur on the coast, to Beejapoor and Sholapoor—and, what is remarkable, is almost coincident with that marking the separation of the two great tribes of the population using totally distinct languages,—the Mahrattas and Canarese.

The hills to the N. E. and E. are all of primitive sand-stone, sometimes resting on schists, sometimes immediately on granite, which latter is the rock nearest the surface in the central and eastern plains. But a well defined range of hills to the S. W., called the Kupputgud, is entirely composed of micaceous and clay slates, resting on granite. The hills more to the N. and N. W. are basaltic. The extensive plains lying between these different lines of hills and eminences are composed of the rich, black mould, called *regur*, or cotton ground, resulting from decomposed basaltic rocks. To the N. E. a considerable tract of limestone is found, resting on the sandstone, about Bagalkote, Badami Hûngûnd, Mûdibihal, &c.

The distribution of species throughout these different tracts is shown in the following table; those marked * are confined to one tract only :—

* *Holcus sorghum, Panicum Italicum, Cicer arietinum.*

† *Panicum spicatum, Panicum miliare, Phaseolus max, Phaseolus mungo,* &c.

Distribution of Species.

Common to all.	Mountain Forest.	Mulnad.	Black plains.	Sandstone Hills and red sandy soil.
Simia Rudiatus	Simia Entellus	Cynopterus Marginatus	Canis Lupus	Simia Entellus (rare)
Rhinolophus	• Mangusta Vitticollis	Megaderma Lyra or Carnatica	—— Aureus	Cynopterus marginatus
Vespertilio	• Felis Wagatee	Rhinolophus Speoris	—— Bengalensis	• Rhinopoma Hardwickii
Pteropus Edulis	Mus Longicaudatus	——— Marinus	Felis Jubata	Rhinolophus Speoris
Ursus (Prochilus) Labiatus	Sciurus Palmarum	——— Fulgens	—— Chaus	• Taphozous ——
Sorex Indicus	• —— (*dark variety*)	Canis Lupus	Mus Indicus (black variety)	Canis Lupus
Lutra Nair	• —— Maximus	—— Aureus	—— Mettade do.	—— Aureus
Canis Ferus Dukhunensis	• Pteromys Philippensis	—— Bengalensis	—— Musculus Indicus	—— Bengalensis
Hyœna Vulgaris	Manis Pentadactyla	Felis Jubata	• Antilope Cervicapra	Hyœna Vulgaris
Viverra Indica or Rasse	• Elephas Asiaticus	—— Chaus	• Damalis Risia	Felis Jubata
Paradoxurus Typus	• Moschus Memina	Hyœna Vulgaris		—— Chaus
Mangusta Grisea	Cervus Hippelaphus	Mus Indicus (red variety, rare)		Mus Leggyade
Felis Tigris	—— Axis	—— Mettade, (rare)		—— Budga
—— Pardus	• —— Muntjak	—— Leggyade		—— Gulandi
Mus giganteus	• Bos Gaurus or Frontalis	—— Budaga		—— Longicaudatus
—— Rattus		—— Gulandi		—— Musculus
—— Decumanus		—— Longicaudatus		Gerbillus Indicus
Sciurus Palmarum		—— Rufus		Cervus axis
Hystrix cristata		—— Musculus Indicus		• Antilope Arabica
Lepus Nigricollis		Gerbillus Indicus		
Sus Scrofa Ferus		Manis Pentadactyla		
		Cervus Axis		
		• Antilope quadricornis		

CATALOGUE.

1.—*Simia (Macacus) Radiatus.—Cercocebus Radiatus*, Geoff.

Koti, Canarese..... ಕೊಂಡಿ

Mungya, do. .... ಮಂಗ್ಯ

Munga, do. .... ಮಂಗ

Bandar, Dekhani .... بانڈر

Makada, Mahratta .....

Kerda, do. of the Ghats.....

This species abounds over the whole country, sometimes inhabiting the wildest jungles, at others living in populous towns, and carrying off fruit and grain from the shops of the dealers, with the greatest coolness and address.

2.—*Simia (Semnopithecus) Entellus.—Cercopithecus Entellus*, Geoff.

Mooeya, Canarese..... ಮು ಸ್ಯೆ

Langûr, Dekhani .... لنگور

Wânur, Mahratta ....

The black-faced monkey of Europeans.—Abounds more particularly in the forests, where its loud wild cry is particularly striking. They are both useful and troublesome to the sportsman, who may often judge by their agitation and chattering of the vicinity of some beast of prey; while he himself is apt to be assailed in a similar manner when trying to steal upon the more timid kinds of game. The species is celebrated in Hindu mythology, for having, under their leader Hanuman, assisted the hero and demi-god Rama, the first Hindu conqueror of the forests of Southern India, as related in the Ramayana.

The *Entellus* appears to want the cheek pouches characteristic of *Semnopithecus*. An adult male measured, from muzzle to insertion of tail 1 foot 10½—length of tail alone 3 feet 2½—height from heel to crown 3 feet 2½—weight 22 lbs.—do. of an adult female 18.

3.—*Pteropus Edulis medius.—Pteropus Medius*, Temminck; *Monog. de Mam.* I. 176.

Tojgal Bawali, Canarese, ... ತೊಗಲುಬಾವಲಿ

Sikatyelle, Do. of the Wuddur caste. ಚಿಕ್ಕ ಟಿಲಿ

Gaddal, Dekhani .... گدل

Barbagal, Do..... ..... بربا گل

The flying-fox of Europeans. Its flesh is esteemed good eating. The tongue of this animal is remarkable, being covered with large papillæ, pointing backwards, and each one terminating in a brush or collection of bristly points.

Length of the male, 12 to 13 inches—weight 29oz—of a female, 20 oz. Expanse of wings upwards of 4 feet.

When disturbed during the day, they fly slowly round and round, with a low screaming noise, and soon settle again; hovering for a moment over a bough, they catch suddenly with the claw at the angle of the wing, and, allowing the body to drop, they swing with a single hold. They vary considerably in shade and colour.

4.– *Pteropus* (*Cynopterus*) *Marginatus*, Fr. Cuvier.—*Pteropus Marginatus*, Temminck; *Monog. de Mam*, I. 202.

Length, 4½ inch. Weight, 2oz. a male.

The dentition agrees with the statement of Fr. Cuvier, which he adopts as the character of his genus *Cynopterus*.

Incisors $\frac{4}{4}$ canines $\frac{1}{1}$ $\frac{1}{1}$ molars $\frac{3}{3}$ $\frac{3}{3}$ = 30. Is somewhat rare; found in clusters on the folded leaves of the plantain, the palmyra, &c.

5.—*Vespertilio* (*Megaderma*) *Carnatica* ?—New species ? *M. lyra* ?

General name for all bats, *Kankapati*, Can. ಕಂಕಪತಿ

Chamgidar, Dekh..... چمگیدر

Shab parak, Do..... شب پرک

This species differs from the dentition commonly assigned to *Megaderma*, in having incisors $\frac{2}{4}$ canines $\frac{1}{1}$ $\frac{1}{1}$ molars $\frac{3}{3}$ $\frac{3}{3}$ = 24; whereas the molars according to Geoffroy are $\frac{4}{4}$ $\frac{4}{4}$.

Above, mouse colour; beneath, paler. Nasal appendage large, oblong, reaching to the base of the ears, with a plait or fold down in the centre. Oreillon cordate, the anterior lobe high and pointed, the posterior rounded; the muzzle truncate, the under lip cleft. Four mammæ. Female generally larger.*

	Female.	*Male.*
Length.....	3½ inches.....	3 inches.
Expansion of wings	19½	18
Ear (behind)	$1\frac{8}{10}$	

* Temminck states that the females and young of some bats live apart from the males at certain seasons, which may account for this. Mon. de mam. Tom. ii. p. 5.

Ear (before) ..... $1\frac{4}{10}$
Carpus..... ..... $2\frac{1}{2}$
Tarsus .... 1 $3\frac{1}{2}$-10ths.
Head..... ... ... $1\frac{1}{2}$
Additional length of the interfemoral membrane } $1\frac{1}{2}$
Weight .... 1oz. 10drs.....1oz. 3drs. 10 grs.

These were the largest dimensions ascertained from 14 females and 7 males, obtained at various times. They are common in the Mulnad, in old temples, caves, &c.

6.—*Vespertilio (Rhinopoma) Hardwickii.*
Weight....10 drs. Male.. 8 drs. 13 grs. Female.
Length of body..... $2\frac{4}{10}$ inches.
——— tail... ... . $2\frac{5}{10}$
$5\frac{1}{10}$
——— carpus $2\frac{4}{10}$
——— tarsus $2\frac{5}{10}$
Expanse of wings...13.

This is probably the species already described by General Hardwicke, but the means are not at hand of verifying his description.

This species has the muzzle long, thick, truncated and surmounted with a small leaf. Oreillon oblong, bi-acuminated; forehead concave, with a fossa or channel running down the centre. The nostrils are placed in the truncated plane of the muzzle, being covered with a membrane slit transversely, and with a small round puncture in the middle of the slit. By means of this apparatus the animal is enabled to open or shut its nostrils at pleasure. The leaf-like process rises from the same plane of the muzzle. Found in old ruins to the eastward of the province.

Rhinolophus, Geoff.

This, and the two following species, seem to form a subdivision of the section *Rhinolophus* (Geoffroy), differing in the number of teeth and having in common a remarkable peculiarity common to all, not included in his specific characters, which may be described as a circular cavity, or sac, behind the nasal crest. This cavity the animal can turn out at pleasure, like the finger of a glove; it is lined with a pencil of stiff hairs, and secretes a yellow substance like wax. When alarmed, the animal opens this cavity and blows it out, during which it is protruded and withdrawn at each breathing. Temminck notices it under the name of a syphon, or purse in *R. Insignis* and *Speoris*.

Dentition, incisors $\frac{4}{4}$; canines $\frac{1}{1}$ $\frac{1}{1}$; molars $\frac{4}{5}$ $\frac{4}{5}$ 28; whereas in Geoffroy's group the molars are $\frac{5}{5}$ $\frac{5}{5}$, and the total number 30. But Temminck makes them vary from $\frac{4}{5}$ to $\frac{5}{6}$. The upper incisors are distant, placed near the canines and triangular, broad at the edge and sloping back to the root, the lower ones are close together, crenelate at the edge, each having three points. In all other respects, the characters are the same as *Rhinolophus*. Nose furnished with a complicated crest. Ears distinct, marked with transverse distant wrinkles. Interfemoral membrane large. Warts on the pubes.

7.—*Rhinolophus Speoris* ?—*R. Crumenifere*, Peron.—*R. Marsupialis*, Geoff.—*R. Dukhunensis*, Sykes.

Ears large, erect, acuminate, rounded to the base. Muzzle short, crest very complicated, consisting of a simple transverse membrane, or leaf extending between the eyes, behind which is the circular sac. In front is a cavity, in which are pierced the complicated nostrils, and surrounded by another smaller membrane; the upper portion next the frontal leaf thick and fleshy, the lower, above the lip, fine. On either side without this are three smaller parallel membranes or fringes, reaching from the eyes downwards. Body short, thick, of a light mouse colour. Interfemoral membrane, narrow, square, including the tail, which consists of about four joints, the half of the last joint being free at the point. Pubes naked, large, with one or two warts. Two pectoral mammæ, two inginual.* Females with the frontal sac less developed.

On a comparison of about 18 specimens, the measurement of the largest was—

	Male.	*Female.*
Length	$2\frac{3}{10}$ inches	$2\frac{3}{10}$
—— of tail	1	1
Total	$3\frac{3}{10}$	$3\frac{3}{10}$
—— of exserted portion of tail	$\frac{1}{2}$-10ths.	
—— of ear	$\frac{6}{10}$	
—— of carpus	2	
—— of tarsus	$\frac{9}{10}$	
Expansion of wings	13	$12\frac{1}{2}$
Weight	6 drs. 13 grs.	6 drs.

Found in old buildings, wells, &c.

The *Dukhunensis* of Sykes is said to differ from *Speoris* in the length of the carpus, but in Temminck, Monog. de Mam. T. II. p. 17, the fore arm

* Whether the latter are false or real is doubtful. It has been said they have no lacteal glands, but I have constantly remarked them, and that they are smaller in the young female.

is stated to be shorter than the whole length, and the difference of colour is not sufficient to constitute a specific difference.

8.—*Rhinolophus Murinus.*—New Species.

Ears large, erect, rounded; muzzle short, with a tranverse frontal leaf or membrane, and the sac behind it as the last, and in front a simple membrane round the nostrils. Body short, and thick. Interfemoral membrane large, including the tail, all but the extreme tip. Pubes small covered. Mammæ as in the preceding, colour dusky brown, paler beneath.

Male.—Length 1 $\frac{9}{10}$; tail 1 $\frac{2}{10}$—$3\frac{1}{10}$; ear $\frac{7}{10}$; carpus 1 $\frac{6}{10}$; tarsus, barely $\frac{8}{10}$; expansion of wings 10½; weight 4 drs. 20grs.—The sexes nearly alike.

9.—*Rhinolophus fulgens.*—New Species.

This resembles the last in every respect, but the membranes of the crest are more developed. Colour a bright fawn above, and golden beneath. Membrane of the wings blackish.

Length 1$\frac{9}{10}$; tail $\frac{9}{10}$—$2\frac{8}{10}$: ear $\frac{7}{10}$; carpus 1$\frac{8}{10}$; tarsus barely $\frac{8}{10}$; expansion of wings 10½; weight 4 drs. 24 grs.

Very rare. The above is the description of an adult male.

It cannot be identified with the *R. larvatus* of Horsfield, which it resembles in colour, because it (the *Larvatus*), has the complicated crest and dimensions of *Speoris.*

10.—*Taphozous* ———.

Of this only one specimen was obtained of which the description has been lost.

Vespertilio Proper.

Two small species are common, but neither of them have been identified.

11.—*Vespertilio* ———.

Ears small, sub-triangular, shorter than the head; oreillon oblong, rounded, colour above pale dusky brown, beneath lighter.

Length 2 inches; tail $\frac{7}{10}$—$2\frac{7}{10}$; carpus 1$\frac{3}{10}$; expansion of wings 10 inches.

12.—*Vespertilio* ———.

Smaller than the last. Ears larger, rounded, nearly as long as the head. Oreillon curved and rounded at the end. Colour dark brown above and below.

Length $1\frac{5}{16}$; tail $\frac{7}{16}$—$2\frac{1}{16}$; carpus 1; expansion of wings $7\frac{3}{4}$.

13.—*Sorex Indicus*, Geoff.

Sondeli, Canarese..... .....సుందేలి

Chachundar, Dukhani..... .....چھچھوندر

14.—*Ursus* (*Prochilus*) *Labiatus*.—*Ursus Labiatus*, Blainville.

Kaddi, *Karadi*, Canarese ....కరడి

Rinch, Dukhani..... .....ريڈنچھ

Aswal, Mahratta.....

The peculiar dentition of this animal, distinguishing it from Gen. *Ursus*, has been remarked by Colonel Sykes. There are never more than 4 incisors in the upper jaw. I possess several crania, one of them with the milk teeth just giving way to the adult ones, all agreeing in this peculiarity. Their food seems to be black ants, termites, beetles, fruit, particularly the seed of the *Cassia fistula*, of the date tree, &c., honey. When pursued, they carry their cubs on their back. In 1833 a bear was chased and killed, having carried her two cubs in this manner nearly three miles. It appears to be a long-lived animal. Instances are known of their living in a state of captivity for 40 years.

15.—*Lutra Nair*, Fr. Cuvier.

Nirnai, Canarese, (literally "water dog.") నీరునాయి

Datwai bekk Do. of the Wuddar tribe.....దాటువ బీక్కు

Pani kutta, Dukhani, (literally "water dog.") پاني کتا

Hud or Hada, Mahratta of the Ghats.

Jalmanus ana Jal manjar, Mahratta...

16.—*Canis Familiaris*, (*wild variety*).—*Canis Dukhunensis* of Sykes.

Jungli Kutta.....Dukhani..... جنگلي کتا

The wild dog was not known in the Southern Mahratta Country until of late years. It has now become very common. The circumstance of their attacking in a body and killing the tiger, is universally believed by the natives. Instances of their killing the wild boar, and of tigers leaving a jungle in which a pack of wild dogs had taken up their quarters, have come to my own knowledge: and on one occasion a party of the officers of the 18th regiment, M. N. I. saw a pack run into, and kill, a large Sambar stag near Dharwar. I once captured a bitch and seven cubs of this species, and had them alive for some time.

17.—*Canis Lupus*, Lin.

Tola.....Canarese..... ತೋಳ

Landgah.....Dukhani... ..... لانڈگا

This species does not appear to differ from the common wolf. Three young ones which I had alive for some time agreed very much with the description of the *Canis pallipes* of Colonel Sykes, but several adults that I shot differed in their colours and general character. The head was large, the muzzle thicker, the colours in some cases more inclining to rufous, particularly on the fore legs; which in some cases were deep red; and the same colour was found on the muzzle from the eyes to the nose. Others have more rufous on the hind legs, together with some black on the thighs, rump, and tip of the tail.

Length from muzzle to insertion of tail 36 to 37 inches; do. of tail 16 to 17½; height at shoulder 24 to 26; length of head 10; circumference of do. 16 to 17; weight of an adult female 42 lbs.

The wolves of the Southern Mahratta Country generally hunt in packs, and I have seen them in full chase after the goat-antelope (*Gazella Arabica*). They likewise steal round the herd of *Antelope Cervicapra*, and conceal themselves on different sides till an opportunity offers of seizing one of them unawares, as they approach, whilst grazing, to one or other of their hidden assailants. On one occasion, three wolves were seen to chace a herd of gazelle across a ravine, in which two others were lying in wait. They succeeded in seizing a female gazelle which was taken from them. They have frequently been seen to course and run down hares and foxes; and it is a common belief of the ryots that in the open plains, where there is no cover or concealment, they scrape a hole in the earth, in which one of the pack lies down and remains hid, while the others drive the herd of antelope over him. Their chief prey however is sheep, and the shepherds say that part of the pack attack and keep the dogs in play, while others carry off their prey; and that, if pursued, they follow the same plan, part turning and checking the dogs' while the rest drag away the carcass, till they evade pursuit. Instances are not uncommon of their attacking man. In 1824 upwards of 30 children were devoured by wolves in the Purgunnah of Rone. Sometimes a large wolf is seen to seek his prey singly. These are called *won-tola*, and reckoned particularly fierce.

18.—*Canis Aureus*, Lin.

Nari.....Canarese..... ನರಿ

Kolah.....Dukhani ..... کول

Shighal..... ..... do..... ..... شغال

The native sportsmen universally believe that an old jackal, which they call *bhalu*, is in constant attendance on the tiger, and whenever his cry is heard, which is peculiar and different from that of the jackal generally, the vicinity of a tiger is confidently pronounced. I have heard the cry attributed to the *bhalu* frequently.

19.—*Canis Bengalensis*, Shaw and Pennant.—*C. Kokree*, Sykes.

Konk.....Canarese..... ಕೊಂಕ

Kemp nari (red jackal) do. ..... ಕೆಂಪುನರಿ

Chandak nari..... do. ..... ಚಂದಕನರಿ

Lomri, Nomri.....Dukhani..... لومڑي

Kokri.....Mahratta .....

Length from nose to insertion of tail 20 inches; do. of tail 14 in.; weight, male 7¼ lb.; female, 6¼ lb.—both large specimens.

Shaw's animal appears to be identical with the *Canis Kokree* of Colonel Sykes. Its principal food is rats, land crabs, grasshoppers, beetles, &c. On one occasion a half devoured mango was found in the stomach. It always burrows in open plains, runs with great speed, doubling like a hare; but instead of stretching out at first like that animal, and trusting to its turns as a last resource, the fox turns more at first and if it can fatigue the dogs, it then goes strait away. It is remarkable that though the brush is generally tipt with black, a white one is occasionally found, while in other parts of India, as in Cutch, the tip is always white.

20.—*Viverra Indica*, Geoff.—*Rasse*, Horsfield.

Punagin bekk.....Canarese. ..... ಪುನಗಿನ ಬೆಕ್ಕು

Mushak billi.... .....Dukhani... ..... مشک بلي

Kasturi.....Mahratta.. .....

Length from the nose to insertion of tail 22 inches; do. of tail 15¾ in.—total 37¾—weight 5½ lb.—an adult female.

Varies much in the distribution of the marks on the fur. Specimens from the Southern Mahratta Country illustrative of this variety have been deposited in the British Museum.

21.—*Mangusta Mungos.—Herpestes Griseus*, Desm.

Mungli ....Canarese.. ..... ಮುಂಗಲಿ

Mungoos.....Dukhani..... منگوس

There does not appear to be any difference between the *Mangusta Mungo* and *Mangusta Cafra*, both of which are referrible to the *Herpestes griseus* of Desmarest.

22.—*Mangusta Vitticollis.*—*Herpestes Vitticollis*, Bennett, Proceed. Zool. Soc. 1835, PART III. p. 67.

A specimen of this animal was procured in the thickest part of the ghat forests by accident, in 1829, and is now deposited in the British Museum. It is very rare, inhabits only the thickest wood, and its habits are little known. Size the same as *M. Griseus*.

As the animal has never been figured, a drawing is given.

23.—*Paradoxurus Typus.*—Fr. Cuv.

Kera Bek,.....Can..... ಕರಿ ಬಿಕ್ಕು

Menuri,.....Dekh..... مینڈوری

Common in the Mulnad, living in trees, thatched roofs of houses and huts, &c.

Dimensions.

Male.	Ft.	inch.	Female.	Ft.	inch.
Length of body..	1	10½		1	$5\frac{7}{10}$
Do. tail.....	1	7½		1	6
	3	6		2	$11\frac{7}{10}$

Length of head.....	$5\frac{8}{10}$		$5\frac{6}{10}$
Do. ear.....	$1\frac{8}{10}$		$1\frac{7}{10}$
Distance between the ears	$3\frac{7}{10}$		
Length of sole of fore foot	$2\frac{4}{10}$		$1\frac{9}{10}$
Do. do. hind do.	$3\frac{1}{10}$		$2\frac{6}{10}$
Weight.....	8½ lbs.		5¾ lbs.

21.—*Hyœna vulgaris.*

Kirba.....Canarese..... ಕಿರಬ

Kutt kirba..... do..... ಕತ್ತಿ ಕಿರಬ

Taras.... ....Dakhani..... ترس

Length from nose to insertion of tail 3 ft. 6 in.; do. of tail 1 ft. 5 in. —total 4 ft. 11 in.; do. of head 1 ft. 10 in.; circumference of do. 1 ft. 8½ in.; weight 74 lb.

25.—*Felis Tigris*, Lin.

Huli, Canarese..... ಹುಲಿ

Bagh, Dukhani..... باگھ

Patayat Bag, do. ..... پتایت باگھ

Wâkag, Mahratta..... ....

The tiger is common over the whole district, breeding in the forest and mountain tracts, and coming into the open country when the grain is on the ground. In some places they do much mischief, and have been even known to carry off the inhabitants out of the villages, whilst sleeping in their verandahs during the night.

The following are the largest dimentions of any tiger, male and female, killed in the Southern Mahratta Country, between the years 1829 and 1833 inclusive, and in affording a comparison of from 70 to 80 individuals.

	Adult Male.		*Do.*		*Adult Female.*		*Do.*	
	ft.	in.	ft.	in	ft.	in.	ft.	in.
Length from nose to insertion of tail	6	2	5	6....5		3¼	5	2
—— of tail.....	3	1½	3	3....2		11	3	2
Total.....	9	3½	8	9....8		2½	8	4
Height at the shoulder.....	3	2	3	0....2		9	2	9
Length from top of shoulder to end of toes.....	3	7¾	3	7....3		2½	„	„
—— from the elbow to the extremity of the toes.....	1	10	„	„....1		8¾	„	„
Circumference behind the shoulder	4	3	3	11¼..3		6	„	„
—— of the forearm below the elbow	1	8	1	7....1		2¾	„	„
—— of the neck.....	2	8	2	10½..2		1½	„	„
—— of the head.....	2	9	3	1....2		3	„	„
—— of forearm above the elbow....	2	3	„	„....„		„	„	„
Weight.....	380 lbs.		360 lbs.		249 lbs.			

I have been thus particular in detailing the measurements of this species, because nothing is more common than to hear of tigers of 12, 14, and even 15 feet in length. Most persons content themselves with measuring the skin of an animal after it is taken off; and I once measured a lion of 9 feet 4 inches, which was noted by another of the party in his journal, as 11 feet; and by a third as 12—the one having measured the skin newly taken off and pulled out, the other when it was stretched to the uttermost by pegs, to dry. I do not believe that any tiger has ever been known that would exceed ten feet.

The following particulars relative to the habits of the tiger were collected during several years.

The female has from 2 to 4 young, and does not breed at any particular season. Their chief prey is cattle, but they also catch the wild hog, the *sambar*, and, more rarely, the spotted deer. It is naturally a cowardly animal and always retreats from opposition until wounded or provoked. Several instances came to notice of its being compelled to relinquish its prey by the cattle in a body driving it off. In one case an official report was made of a herd of buffaloes rushing on a tiger that had seized the herd-boy and forcing it to drop him. Its retiring from the wild dog has already been adverted to. Though the wild hog often becomes its prey, it sometimes falls a victim to the successful resistance of the wild boar. I once found a full grown tiger newly killed, evidently by the rip of a boar's tusk; and two similar instances were related to me, by gentlemen who had witnessed them, one of a tiger the other of a panther. It is generally believed that a tiger always kills his own food and will not eat carrion. I met with one instance of a tigress and two full grown cubs devouring a bullock that had died of disease. I saw the carcass in the evening, and next day, on the report of tigers having been heard in the night, I followed their track, and found they had dragged the dead animal into the centre of a corn-field and picked the bones quite clean, after which they found a buffalo, killed it, and eat only a small portion of it. Another instance was related in a letter from a celebrated sportsman in Kandeish, who having killed a tigress, on his return to his tents, sent a pad elephant to bring it home. The messenger returned reporting that on his arrival he found her alive. They went out next morning to the spot and discovered that she had been dragged into a ravine by another tiger and half the carcass devoured. They found him close by and killed him also.

The Bheels in Kandeish say, that in the monsoon, when food is scarce, the tiger feeds on frogs, and an instance occurred some years ago, in that province, of one being killed in a state of extreme emaciation, from a porcupine's quill that had passed through his gullett and prevented his swallowing, and which had probably been planted there, in his attempts to make one of these animals his prey.

Many superstitious ideas prevail among the natives regarding the tiger. They imagine that an additional lobe is added to his liver every year; that his flesh possesses many medicinal qualities; that his claws arranged together so as to form a circle, and hung round a childs neck, preserves it from the effect of the evil eye. That the whiskers constitute a deadly poison, which for this reason are carefully burnt off, the instant the animal is killed. Several of the lower castes eat his flesh.

26.—*Felis Pardus*, Lin.

Of this species there appear to be two varieties, a large and a small kind, though others are of opinion, that the smaller animal is the leopard.* The natives distinctly recognize the two kinds by different names.†

The large variety—*Honiga*, Canarese....ಹೊನಿಗ

Tendwa, Dakhani....تيندوا

Tendwa, of the Bauris or chita catchers.

Asnea, Mahratta of the Ghats.

The smaller one—*Kerkal*, Canarese .....ಕೆರ್ಕಲ್

Gorbacha, Dukhani..... گربچہ

Bibla, of the Bauris.

The most remarkable difference between these seems to be that of size, but on a careful inspection, other particulars are detected.

An examination of a large collection of skins, that had been brought for the Government reward, and were deposited in the office of the district, gave the following characters. The larger skins measured from 4½ to 5 feet; the tail 2¼—7¾; the height appeared to be 2½; the smaller ones were 3 to 3½ ft. long; the tail 2½—6; the height was from 1½ to 2.

The colour of the larger skins was generally pale fulvous yellow, the belly white, whilst others were deeper and more tawny, some being a sort of reddish yellow, without any white at all, beneath. In the *Kerkal* there is also a great variety of shade. But generally a greater number of *Honigas* are pale coloured and of the *Kerkals* dark; whence probably the name of the latter from *kera*, dark or black. As a general rule too, the fur of the *Honiga* is shorter and closer, that of the *Kerkal* longer and looser. The character of the spots is always the same. They may be characterised as imperfect annuli, consisting of groups of spots, arranged in imperfect circles; but sometimes approximating more and becoming like trifoils ⁘, squares : :, or like the impression of a dog's foot, particularly along the dorsal line, and on the head, neck, shoulders, loins and legs. Where the ground colour is dark, the spots are more confused. The tail is without annuli, spotted throughout, but sometimes the spots run into each other at the end, giving the appearance of a black tip.

* Col. Sykes also distinguishes two kinds of *cheta*, but considers the larger one to be the leopard.

† Shaw says, the leopard is distinguished from the panther by its paler yellow colour, and again that the leopard is considerably the smaller of the two. Here the paler is the larger.

The large variety is found chiefly among the rocky hills to the eastward, the smaller is more common in the wooded country of the Mulnad. The former is a taller, slighter, more active animal, exceedingly strong and fierce, the latter is smaller, and stouter, and varies much in size, some being not bigger than a large tiger-cat, though the skull proved them to be adult animals. The latter may be killed easily, while the *Honiga* is a very formidable assailant; and several instances occurred of as many as four men having been killed by one, before it was put *hors de combat.*

The strongest marked difference of character that I observed, was in the skulls, that of the *Honiga* being longer and more pointed, with a ridge running along the occiput, and much developed, for the attachment of the muscles of the neck—while those of the *kerkal* were rounder and the bony ridge was wanting. If this character is universal and permanent, it will afford a good ground of distinction.

At present I should be disposed to consider the Indian species as consisting of three varieties:

(*a.*) The larger or *Honiga.*

(*b.*) Ditto of a uniform black colour, the spots appearing when the light shines strongly on the skin, from the Malabar Coast.

(*c.*) The smaller variety or *kerkal.*

The following are the dimensions of a very large *honiga* killed in the *Mulnad*: length of body from nose to insertion of tail 4 ft. 6 in. tail 3-2; in all, 7-8; height at the shoulder 2ft. 3½in. from ends of toes to top of shoulder 2—7; circumference of the arm below the elbow 1-3; head 1-11.

This was a very large male called by the natives a *Mar honiga*, stouter than the generality of the larger kind.

27.—*Felis Jubata*, Lin.

Chircha, Chirtsa...Canarese.....ಚಿರತ ಚಿರ್ತ

Siwungi, do. .....ಶಿವಂಗಿ

Chita, Dakhani.....چيتا

Yuz, Hindustani of the trainers..... يوز

They are caught in the district and trained to kill the *Antelope cervi capra.* They are taught always to single out the buck, which is generally the last in the herd; the *Meer Shikars* are unwilling to slip until they get the herd to run across them, when they drive on the cart, and unhood the *cheeta.*

28.—*Felis Chaus*, Gould.—*Felis Affinis*, Gray,

Maut Bek	Canarese.....	ಮಾಕಚಿಕ್ಕು
Kadu bek or Kar bek..	Do. of the Waddar caste who eat them.....	ಕಾಡುಚಿಕ್ಕು
Bella bek		ಬಿಲ್ಲಚಿಕ್ಕು
Jangli billi	Dakhani.....	جنگلي بلي
Bhaoga	Mahratta of Ghats.....	

From an examination of a number of skins deposited by me in the British Museum, Mr. Gray seems to consider the *Affinis* to be identical with *Chaus*.

29.—*Felis*.———. *Wagati*, Mahratta of the Ghats.

This animal I was unable to identify with any of the species described, so it may perhaps be a new one. It seems to differ both in size and colour from the *Felis Viverrinus* sent home by Mr. Heath, and described by Mr. Bennet.* It is peculiar to the western ghat forests. It approaches most nearly to the *Felis Tigrina* or *Margay*, *Gm.*; the *Felis Javanensis* or *Kuwuk*, Horsf.; and the *Felis Diardi*.

The *Wagati* (an adult male) is 26 inches long, from the muzzle to the insertion of the tail, which is nearly 11 more—in all nearly 37 inches. The colour is pale yellowish grey—darker on the back—yellowish white or pale yellow on the sides—white on the under parts of the body. The forehead has 4 longitudinal spots. In a line with these, from the vertex, four lines run to the shoulders, the outer broader, the centre ones narrower, and these two last are continued almost uninterruptedly to the tail; the others break diagonally into large longitudinal spots, which are continued in rows of smaller rounder spots to the centre of the belly. There are about six rows on each side, exclusive of the two dorsal lines. Two smaller bands run from the eye, and along the upper lip, to a throat-band running transversely below the ears. Two other similar transverse bands cross the breast with a row of spots between. The inside of the arm has two broad bands, and the soles are dark brown or nearly black. The tail is spotted on the upper half and indistinctly annulate towards the tip. It is very fierce—living in trees in the thick forests; and preying on birds and small quadrupeds. A *shikaree* declared that it drops on larger animals, and even on deer, and eats its way into the neck; that the animal in vain endeavours to roll or shake it off, and at last is destroyed.

* Proceed. Zool. Soc. 1833, Part I. p. 65.

(To be continued.)

V.—*Some Account, Historical, Geographical and Statistical, of the Ceded Districts.—By Lieutenant* NEWBOLD, A. D. C. *to General* WILSON, C. B. *commanding the Ceded Districts Division of the Madras Army.*

Geographical position and artificial divisions.—The Ceded Districts are situated nearly in the centre of Peninsular India, between the 13th and 17th degrees of north latitude, and the 76th and 80th east longitude. They comprize an area, in no part touching on the sea coast, of about 235 miles long from east to west, and about 195 broad from north to south. The superficial extent, not including the Kurnool and Sondur territories, amounts to 23,557 square miles of which about one-third is under cultivation. Though constituting a single military division, under command of a general officer, they are divided into two distinct collectorates, viz. the western portion, termed Bellary, and the eastern, termed Cuddapah. The former has an area of 13,056 square miles, and is subdivided into 17 taluks or provinces; the latter with an area of 10,501 square miles contains 16 taluks—viz.

BELLARY.		CUDDAPAH.	
1 Adoni.	10 Kudlighi.	1 Banaganpully.	9 Gurrumcondah.
2 Bellary.	11 Kumply.	2 Budwail.	10 Jummulmudgoo.
3 Durmaveram.	12 Mudducksera.	3 Camlapur.	11 Koilcoontla.
4 Gooleum.	13 Pennaconda.	4 Chinnur.	12 Muddenpilly.
5 Gooty.	14 Punchapollem.	5 Chitwail.	13 Poolvendla.
6 Harponhully.	15 Raidroog.	6 Cummum.	14 Punganur.
7 Hovin Hudgully.	16 Tarputtri.	7 Doopaud.	15 Raichooty.
8 Hundi Anantapur.	17 Yadaki.	8 Doovoor.	16 Sidhout.
9 Kodikonda.			

Each taluk is subdivided into more minute divisions, containing a certain number of villages, the total of which is 14,969. To each collectorate is appointed a principal collector of revenue, uniting to this office the functions of a magistrate; and a sub-collector, with one or two assistants. In the judicial department a judge and register. The whole of the above are European civil servants of the Company. Over each taluk is a local native collector, termed a tahsildar, who resides generally in the kusbah or capital town of the taluk. Under the judges are 15 district native assistants munsifs, two muftis at the zillah courts of Bellary and Cuddapah, and two pundits. Over each village are potails or hereditary headmen.

As a military division the Ceded Districts have two cantonments, viz. Bellary and Cuddapah, and two small stations occupied by detachments, viz. Gooty and Cummum. The division headquarters is usually at Bellary, where a native cavalry corps, a regiment of Queen's infantry, a company of European foot artillery, and two regiments of native infantry, are usually cantoned. It was recommended as a military post by Sir T. Munro in 1802, during the disturbances at Raichoor, in order to curb the unruly Poligars, to be a check on the Nabob of Kurnool, and to overawe the petty zemindars residing in the

Nizam's dominions between the Tumbuddra and Kistnah rivers, which from the distance from Hyderabad had always been a disturbed district, and entirely beyond the control of the Nizam. One regiment of native infantry is stationed at Cuddapah, and from these two principal stations two companies of native infantry are detached to Gooty, and one to Cummum.

Boundaries.—The boundaries of the Ceded Districts (including Kurnool) on the north are the Tumbuddra and Kistnah rivers, separating the districts from the territories of His Highness the Nizam; the latter river also divides them from a portion of Guntoor; on the south they are bounded by Mysore and northern Arcot; on the east, Nellore, and on the west by the Southern Mahratta Country, and a portion of the Nizam's dominions; the Tumbuddra here forming the line of demarcation.

Historical Sketch.—The Ceded Districts of the Balaghat, a compound word signifying a tract on the summit of the mountains, anciently formed part of the Hindu empire of Bijanugger, situated in the Carnatic. This old Hindu geographical division originally comprised the whole of the vast plateau in Southern India situated above the eastern and western ghats, but has been misapplied by modern writers to the tract along the eastern coast, in consequence of its being under the nominal or real sway of the Hindu rulers of the Carnata. It is a well known historical fact, that the site on which the present city and fort of Madras stands was ceded to us by one of the later sovereigns of the Carnata, Sri Rung Rayel, a fugitive from his capital of Bijanugger, and then residing (1693 A. D.) at Chunderghiri, a place to the N. W. of Madras. The existence of the Bijanugger empire can be traced as far back as the commencement of the 14th century of the Christian era, and comprized within its limits the capital of the Hindu princes (vide Bijanugger); while the rule of the Chitwail Rajas extended over the wild and jungly belts of the eastern frontier. After the defeat of Ram Raj, on the plains of Talicota, by the four Mussulman sovereigns of the Deccan (A. D. 1564) the Ceded Districts fell under the sway of the Bijapore and Golconda princes; and, about 1689 A. D., under that of the wily Aurungzebe. After the demise of this monarch in 1707 A. D., and on the consequent decline of the Mogul empire, most of this part of India was annexed to the dominions of the Nizam ul Mulk of Hyderabad, from whom it was won in several hard-fought campaigns by Hyder Ali, between the years 1767 and 1780. By the treaty of 1792, the Nizam obtained, as his share of Tippoo's dominions, that part of the Ceded Districts extending from the Kistnah beyond the Pennaur river, including the forts of Cuddapah and Gundicota: the British, the Baramahl, the

Sultan's possessions on the Malabar coast and the lower ghats. On the fall of Tippoo in 1799, the Nizam acquired the districts about Gooty and Gurrumcondah, and the tract of country around Colar, Nundidroog, Chittledroog, and Sera, the British retaining the forts. To the Mahrattas were to be allotted, among other districts, upper Soonda, Annagundi, Harponhully, and part of Chittledroog and Bednore, on certain stipulations. On the 12th October 1800, the British government concluded a new treaty with their late ally the Nizam, by which he ceded to the Company all the territory of the Balaghat south of the Kistnah and Tumbuddra rivers, and in short the whole of the possessions he had acquired by the treaty of Seringapatam, dated 18th March 1792, and by that of Mysore on 22d June 1799. The taluk of Adoni, which had been held in jaghire from the Nizam by the son of Muhabet Jung, was given up to the English in lieu of the fortresses of Copal-droog and Gujanderghur on the northern side of the Tumbuddra. Part of Gudipet and two-thirds of Punganoor were subsequently exchanged for some of the territories that had been set apart as the conditional share in the spoil of the Peshwa, in case he acquiesced in the British arbitration of the differences existing between himself and the Nizam, and in the exemption of the latter from the payment of that odious tribute, the chout. These conditions were not acceded to by the Peshwa, and the reserved territories were divided by the Nizam and the British in the proportion of two-thirds to the former. In return for the districts thus ceded, the British government, among other things, agreed to defend the Nizam from hostile aggression, both external and internal; a regiment of native cavalry and two of native infantry were added to the subsidiary force, which increased it to 1,000 horse 8,000 foot, and a detachment of artillery. The cession of territory was made ostensibly to guarantee to us by its revenue, valued in the schedule at 17,58,000 pagodas, the regular payment of the expense of the troops placed at the Nizam's disposal; or, to use a native expression, as a *tunkah*, in lieu of upwards of two lacs of rupees (or Arcot rupees 24,17,100 annually) paid in monthly by him for the support of six infantry battalions, a proportion of artillery and a cavalry regiment, the subsidiary force of 1798. Banaganpully was continued in Jaghire to Assad Ali, Sondur to the Peshwa, and Kurnool, after paying its annual peshkush for two years to the Nizam, was finally to be transferred to the Company.

The collection of the revenue and civil administration of the Ceded Districts was first entrusted to the able management of that sound and practical statesman, Sir Thomas, then Major, Munro, who found the country in a state of anarchy and misery, arising from the mal-administration and negligence of the Nizam's officers. Proceeding on the so-

called "permanent system" they had carelessly confided the collection of the revenue to numerous petty Poligar zemindars, brought up in a lawless country, which, since the expulsion of its Hindu sovereigns, had been shattered by repeated foreign invasions, and torn by domestic broils: on one side tyranny and rapacity prevailed, on the other a determined obstinacy in withholding the sircar dues, either by fraud or corruption, or, when strong enough, by open resistance. The authority of the Nizam was set at nought by all parties. His own soldiery wrested their arrears of pay with interest from the villages on which they were billeted; while upwards of eighty Poligars, with about thirty thousand armed followers, occupying the forts and walled villages, were engaged in endless and bloody feuds with each other. Bands of robbers pillaged with impunity; and, in short, murder and rapine stalked triumphant throughout this war-stricken land. But the master-hand was upon it. Under the vigorus measures of Munro, the disorderly soldiery of the Nizam was expelled within three months; and before a year had rolled on the most refractory of the contumacious Poligars, whom neither the Delhi viceroys, the Mahrattas, the Nizam, nor Hyder and Tippoo, could keep in subjection, were either reduced to obedience or compelled to quit the country. Order being at last restored, this excellent public servant, after a laborious investigation into the land tenures, and such of the revenue accounts as had escaped destruction, lost no time in laying the foundation of that admirable system of revenue, known under the term royetwar, which still exists under some modification. This he found the more easy to do, inasmuch as the ancient Hindu sovereigns of the Ceded Districts, like the Malayan princes of the Indian Archipelago, and the chiefs of other ultra gangetic nations, had always been considered as lords of the soil: consequently all lands, with the exception of some that had been given away in *enaum*, reverted to Government.

It has been said that the race of Poligars first sprang up between the fall of Bijanugger and the reign of Aurungzebe: but they existed long previous to this period, and often proved rebellious vassals to their liege lords, the Hindu princes of Bijanugger, to whom they paid peshkush. Among the most powerful were ranked the chiefs of Anantapur, Raidroog, Auk, Punganoor, Harponhully, Gurrumcondah, Ghuttu and Bellary; the three first are said to have formerly held the great offices of state under the Hindu administration, and to have been presented with land in jaghire in order to enable them to support their official dignities. The descendants of the Hindu sovereigns, who for many generations had been permitted to retain Annagundi, and some other places, in jaghire from their Mahomedan conquerors, remained in quiet obscurity, residing principally at Camlapur in the suburbs of the ruined capital of their ancestors, and at Pennaconda, indulging the firm hope, founded upon an old Hindu

prophecy, that they will one day regain the lost possessions of the family. The next of kin, a young boy about 10 years of age, resides at present in Annagundi under the care of the Dalwai, or hereditary prime minister, enjoying a handsome pension of 16,532 rupees per annum, and the revenue of a few villages, from the British government; also of certain districts on the north bank of the Tumbuddra from the Nizam. The descendants of the Harponhully, Raidroog, Punganoor and other chiefs are likewise handsomely pensioned. The Nabob of Kurnool pays an annual peshkush for his dominions of 80,000 Company's rupees. It was settled at a lac; but, in consequence of the difference of coins, amounts only to the sum just specified.

Physical aspect.—A considerable diversity exists in the physical aspect of the country. The general character however is that of an extensive plateau elevated on the shoulders of the western and eastern ghats, the plain of which forms a considerable angle with the horizon, inclining towards the eastern coast of the peninsula. For instance, we find the height of the plain east of the western ghats at Belgaum in the Southern Mahratta Country to be 2,500 feet above the level of the sea—at Bellary 1,600 feet; the average of the plain east of Bellary and Gooty 1,182 feet—proceeding easterly to Cuddapah 507 feet, and the average on the eastern limit of the district 450 feet. The western ghats clearly form the anticlinal line, to which the arenaceous and schistous eastern ranges are more or less conformable. The plain has another and more gentle dip towards the north, viz. to the beds of the Kistnah and Tumbuddra, rising southerly as it passes the frontier to Nundidroog in Mysore, whence it slopes to the southward, forming the table-land on which stands the cantonment of Bangalore. The bed of the Kistnah on the northern frontier of the Ceded Districts is 1,000 feet above the level of the sea: the plain rises as we proceed southerly to the centre of the district to 1,500 feet; on the north frontier of Mysore to 2,223 feet; at Nundidroog to about 3,500 feet; whence it sinks southerly to Bangalore, which is about 3,000 feet above the surface of the ocean. The granitic cluster of Nundidroog constitutes the axis of elevation of this part of the country. Towards the centre of the district, the surface of the plain presents a monotonous and almost treeless extent, bounded by the horizon, and unbroken save by a few rocky elevations that stand forth abruptly from the sheet of black soil, like rocks from the ocean. The country from Bellary to Tarputry, and from Pennaconda, Gooty and Adoni to the Kistnah, is much of a similar nature. Sir T. Munro might well observe that these districts are more destitute of trees than any part of Scotland he ever saw, and that the traveller scarcely meets with one

in twenty miles, and no where with a clump of fifty.* The country around Cuddapah, Gurrumcondah, Cummum and Budwail consists of flat lands at the bases of hills, well watered by streams and springs from the neighbouring heights, and studded with topes and tanks. In the Chiwail taluk the soil is said to be fertile and water abundant, yet its chief produce is *raggi*. The country to the west of Bellary is wild and hilly to the verge of the Kumply hills, whence it descends in a gently sloping plain to the bed of the Tumbuddra, its western boundary ;—here it meets with the limits of the Nizam's dominions, the Southern Mahratta Country and Mysore.

Hills.—The hill ranges most worthy of note are those of the Nulla Mulla & Lanca Mullah to the east, of Sondur and Kumply to the west, and of Gurrumcondah and Punganoor to the south. The former take a S. by easterly course, by Cummum to Cuddapah, whence they turn in a south-easterly direction towards the famous hill-shrine of Tripetty. Their formation is clay slate, sandstone, quartz rock, siliceous and arenaceous schist, with a few hills of blue and grey limestone : the base of these rocks is granite. The Sondur and Kumply ranges have a somewhat parallel direction. Granite, laminar granite, granitoidal gneiss, gneiss in distinct strata, hornblende rock, mica, hornblende, chloritic, ferruginous and siliceous schists, prevail. A blue limestone imbedding iron pyrites occupies a large portion of the Cuddapah plain, where it occurs in beds dipping generally at an angle of 5° to the east. Granite occurs in clustered and detached, dome-shaped masses, often crowned with tors and logging stones. The principal clusters are those of Bijanugger in the N. W. frontier—to the S. at Palsamudrum, to the N. at Adoni, and to the S. those of Pennaconda, &c. The greatest elevation attained is by the slate and sandstone formation of the Nullah Mulla, some of whose peaks rise to about 3,500 feet above the level of the sea. One of the peaks of the schistous ranges, to the west of Bellary, has an elevation (by trigonometrical measurement) of 3,143 feet.

Valleys.—There are no valleys that I can satisfy myself have been entirely caused by the erosive action of water, but there are many rifts in the sandstone and slate hills, that have been deepened and widened from this cause. In the same hills we see ravines and *cul de-sac* hollows, which have evidently been formed by the water rushing down to the plains during the rains. Deep vertical fissures cross the sandstone

* Since his time the late collector Mr Robertson has done much to improve the appearance of the country by the plantation of numerous topes.

ranges often clearing the hills to their bases; which appear, from the absence of disturbance in the stratification, to have originated in the contraction of the rock itself, during its solidification; and subsequently enlarged by the action of springs, which are often seen to burst forth at these discontinuations of the strata, and the rivers that find a vent through, and wash the base of the cliffs. The pass of Ganjecotta, and the fissures of the hills south of Cuddapah afford good examples of these contractions. The principal valleys, however, follow the direction of elevation, that is southerly and easterly.—The spaces between the granite hills, (for they cannot with propriety be termed valleys,and their flatness is only interrupted by small tali round the hills of alluvial matter washed from the rocks by the rains), are often strewed or blocked up by large masses, precipitated by spontaneous splitting and exfoliation from their sides and summits.

Rivers.—The Kistnah, Tumbuddra, Pennaur and Hogri are the most considerable streams. The Kistnah rises in the Mahabaleshwar hills, enters the Ceded Districts, or rather Kurnool, at Calloor, where it meets with the Tumbuddra a few miles to the N. E. of the city of Kurnool, and taking an E. by N. course quits the territory a little to the east of the Hoosanugger ghat, falling into the Bay of Bengal, after a course of about 700 miles, at Sipelar point.

The Tumbuddra is formed by the confluence of two rivers—the Tunga and the Bhadra: the first rises among the western ghats south of Bednore; the latter among the Baba Booden mountains. The *sungum*, or point of confluence, is at the sacred village of Coodly near Hooly Honoor. The united rivers enter the S. western frontier of the Ceded Districts, nine miles north from Hurryhur, taking at first a N. by W. course, but shortly turning to the E., flow in a north easterly direction, dividing the ruins of the ancient cities of Bijanugger and Annagundi, to Hullaykola, where they are joined by the Hogri about 40 miles N. by E. from Bellary. At the foot of the walls of Kurnool the Tumbuddra is met by the Hendery, and shortly afterwards mixes its waters with those of the Kistnah at Calloor.

The Hogri river has its rise near the Baba Booden mountains in Mysore; pursuing a northerly course of about 200 miles to the Tumbuddra,it enters the S. W. limit of the district about 12 miles S. of the hill fort of Raidroog, passing about 9 miles eastward of Bellary.

The Pennaur springs from the granite hills near Nundidroog in Mysore. It enters the southern boundary of the district at Challoor; pursues a N. by W. course to Ooderpidroog, whence, passing easterly by Tarputry through the chasm in the Gundicota chain, and washing the

south-eastern base of the Cuddapah hills, it escapes through the valley of Sidhout and the Nellore district to the Bay of Bengal. Its tributary streams are the Chitravati, the Coond, the Paupugni, the Maundavia, the Paugher, the Baugonuddi, the Saggelair, the Goongaina, and a few others of minor note.

None of the rivers of the Ceded Districts are navigated for the purposes of trade beyond the transit of merchandize over the ferries; and, with the exception of the Kistnah and the Tumbuddra, serve merely for the purposes of irrigation and as channels of drainage during the rains. During the greater part of the year the beds present a sandy waste, and the banks a succession of barren sand dunes. The Kistnah and Tumbuddra have in many places rocky banks and beds, which, added to the rapidity of their currents, are great obstacles to navigation. They are unfordable commonly from June to October or November; but this of course must depend on the monsoon. A large quantity of carbonate of lime is deposited in all by their tributaries, on whose banks it is often seen in mounds and large beds, often forming a conglomerate with the pebbles and sand brought down by the streams.

Ferries.—The principal ferries from the Ceded Districts into the Nizam's countries over the former are those of Moorconda and Purwuttum: and over the latter those of Kurnool, Madaveram, Naguldinny, Hulhully, Bijanugger, Humpsagur and Mangala. The two last lead to the Southern Mahratta Country.

These ferries are crossed by means of the well known basket boats; one or two of which, belonging to the Government, are generally stationed at each ferry, and a similar number belonging to the Nizam on the opposite bank; but in cases of emergency, for instance for the passage of troops, from twenty to thirty can be collected at any given spot at a few days warning. They are generally from six to eleven feet in diameter, and the largest will readily admit of the transit of a mounted 6 pounder. One of 15 feet in diameter and between 3 and 4 feet deep, with flat bottom, and straight or slightly curved sides, will carry a brass 18 pounder or 8 inch howitzer mounted, or a tumbril loaded with ammunition. The boats can be easily carried with troops on the shoulders of coolies. The invention of these useful means of transport is of considerable antiquity among eastern nations: Herodotus observed boats of a similar construction on the Euphrates near Babylon. The banks of the Tumbuddra, at the principal military ferry into the Southern Mahratta Country at Humpsagur, are 1,159 feet asunder; at Hulhully into the Nizam's country 1,642 feet, and at Madaveram and Kurnool; on the military roads from Bellary and Bangalore to Hydrabad, about 1,990 feet.

Lakes, Marshes and Springs.—There are no lakes nor marshes of any note: the springs and wells are often impregnated with muriate of soda and carbonate of lime in varying proportions. Saline and fresh springs sometimes occur in almost immediate proximity; a phenomenon to be ascribed probably to the almost vertical strata through which they rise. It is a curious fact that many gardens, particularly at Bellary, formerly extremely productive, now yield, comparatively speaking, little or nothing: this I have found to arise from the practice of irrigating them with water drawn from brackish springs; the water evaporating leaves its saline contents disseminated in the soil, which, by constant progressive accumulation, first diminishes, and eventually destroys the power of vegetation. Copious springs of fine water occur in the Paliconda hills, a little to the south of Cuddapah; falling from precipices occasioned by deep rifts in the sandstone rocks they add much, during the rainy season, to the picturesque character of the wild scenery among which they are situated. Some of the springs near the base of the hills rise from a considerable depth, as indicated by the slightly thermal character I found them to possess. The thermometer, immersed in the water close to the orifice from which it bubbles up from the rock, indicated a temperature of 88° Fahrenheit; while that of the water in the rivulet close by amounted only to 72°. The temperature of the atmosphere was 65°. There is a saline spring in the blue limestone at Jummulmudgoo, into which the newly dyed chintzes are dipped for the purpose of fixing the colour. The water contains a considerable proportion of muriate of soda, which is also found in thin effloresceing layers on the edges and between the planes of the laminæ of the rock.

Soil.—The soil is principally the regur, or black cotton ground, mingled more or less according to situation with calcareous matter, arising from the kankrous deposit so common in many parts of India, the debris of the subjacent rocks, and decayed animal and vegetable matter; the latter in small proportion. In the Bellary division, for instance, where the rock formation is chiefly granite, gneiss, and its associated schists, the regur is mingled with decomposed felspar, gritty particles of quartz, and often covered with angular pebbles of white quartz, ferruginous quartz, jasper, &c. The bases of the hills are generally surrounded with the soil arising from their own disintegration, which is carried to a considerable distance by the transporting power of streams and rain. In the Cuddapah district the decomposition of the limestone, calcareous veins, clay slate and sandstone, imparts a lighter colour and a looser texture to the regur; which, added to the nature of the stratification

and greater abundance of springs in the limestone and sandstone, renders it favourable for the cultivation of indigo, there carried on to a considerable extent. The trap dykes decompose into a deep red or coffee-coloured soil, which appears to be more fertile than that resulting from the decomposition of granite and gneiss. The term *mussub* is often indiscriminately applied to all reddish soils, but native agriculturists confine the word to the mixed black and red soils. Of all soils, the most sterile are those where saline efflorescences are observed; and those resulting from the decomposition of beds of unmixed quartz.

Agriculture.—Cultivation may be classed under two heads, viz. the dry and wet, the *khushki* and *tari* of the Moguls. The former depends on the heavens for a supply of water; the latter, the extent of which is estimated at about one-seventh of the total superfices of cultivation, on wells, tanks, anicuts, acqueducts and streams. Dry cultivation is divided into two seasons, viz. the crops usually sown in June, termed *mungari*, including the staple articles of produce, viz. red and yellow juari (*Andropogon Sorghum*), bajra (*Holcus Spicatus*), culti (*Glycine tomentosa*), and dal; and the crops sown after the rains in Sept. or October, called *hingari*, embracing cotton, white juari, wheat, and chenna, tobacco, rice, sugar-cane, &c. are articles of wet cultivation or artificial irrigation; the first is sown in September. Rice is generally sown in June and July, and also in October and November. Indigo is a triennial plant, producing two and sometimes three crops in the year, and requires much care.

The expense of bringing waste regur lands into cultivation falls heavy on the rayet. The surface is first cleared of the *kikar*, *turwer*, and other bushes and thorns. The next process to disencumber the soil from roots, weeds and superfluous stones, by ploughing it three times successively; the second time at right angles with the first and the third in an oblique direction. This is a most laborious process, lasting often nearly two months, and is done by means of the large plough drawn by from ten to sixteen bullocks. It is however absolutely necessary, in order to break up the roots of that bane of Hindu cultivators the *nuth* grass, particularly that partially choked by the *gurraka nuth*, for which no remission is made by government, except when it completely covers the land and requires the great plough to eradicate it. A remission of rent is allowed for regur lands which have lain waste six years or more, and for ground encumbered with patches of the *kundai nuth*. After the first clearing, the great plough is laid by for the next 12 or 20 years. All that is necessary, preparatory to sowing the succeeding crops, is to run the soil over with the light common plough. After the ground

has been thoroughly broken up, it is thrice harrowed for about a month; after which the cotton seed is sown with *kusum* or *kungoni* by means of a drill plough, the drills being usually from twelve to eighteen inches asunder. If the season be favourable, the cotton makes its appearance in about 5 days. The weeding plough, furnished with the double or treble hoe, now comes into use, and is employed from time to time until the pod is ready for gathering, viz. from January to March. The rayets, aware of the tendency of cotton to exhaust the fertilizing principle of the soil, sow it in rotation biennially with white *juari*: and sometimes even in triennial rotation, viz. one crop of cotton after two of *juari*. Many agriculturists sow their regur lands in the following order, viz. cotton, juari, chenna, and so on. The cultivation of cotton has been on the increase for the last few years, owing to the increasing demand for the raw articles in European marts. It has been tried in the *mussub* soils of Bellary and Mysore, but without profitable results.

The cultivation of the *mussub*, or red soil, is too well known to require explanation here. It is simply cleared of rubbish, shrubs and roots, and run over two or three times with the common plough. The chief products are *bajra* (*Holcus Spicatus*) yellow *juari* and *culti*. The principal rice or wet land districts are those of Pennaconda, Mudducksera, Codyconda, Durmaveram, Anantipur, the Cummum valley, the banks of the Tumbuddra, and taluks lying near the beds of the Pennaur and Hogri rivers. Indigo is grown principally in the Cuddapah collectorate, in a regur, mixed with the detritus of the limestone kunkar and sandstone. It has lately been introduced into the Bellary collectorate at Tarputry. Sugar-cane flourishes best in the mixed black sedimentary and red soils, containing both protoxide, peroxide of iron, and lime, near the banks of rivers, and in the beds of tanks. It is cultivated with the greatest success in the western taluks of the Bellary collectorate, on the S. bank of the Tumbuddra, and under tanks. It is planted by cuttings, generally from February to the end of April, and ripens in about nine months. The crops are made to alternate once in three or four years with rice. I need hardly observe that the seasons of sowing and reaping all the crops depend upon the timely supply of water, the failure of which caused a severe famine in 1803 and great scarcity in 1833. In 1838, the early crops failed from a similar reason: in some places not a blade appeared above the ground, the plain presenting a dreary black waste; in other situations the crops did not come into ear, and the straw was cut for forage.

Implements of Agriculture.—The implements for agriculture in common use, are a variety of small ploughs, drawn each by two bullocks, and

the great plough that requires from eight to sixteen. The latter is used to break up the roots of the nuth grass, in preparing waste or choked up regur lands for the smaller plough. Drill ploughs with three or four shares, are employed for sowing; and for weeding, large and small harrows, furnished with small hoes, cutting almost horizontally. They are drawn commonly by two bullocks. The bill-hook and pickaxe are sometimes employed in clearing the land. The mamotie, or Indian hand spade, is in universal use. The total number of ploughs in the Ceded Districts amounts to about 155,522.

Manure.—It is a remarkable quality of the best sort of regur or black soil, that, provided proper attention be paid to the due rotation of crops, it does not require manure nor irrigation, beyond the usual periodical supply afforded by the rains and dews. In the immediate vicinity of villages we sometimes see its refuse thrown on the mixed black soil, but I am assured by many intelligent rayets that the first sort of regur would be deteriorated by manure. We must therefore consider its component parts blended together in proportions too accurately balanced to need addition. The most common manures for the inferior sort of regur and mussub lands, are sheep dung, mixed with village ashes, rubbish, &c. ploughed in for dry grain lands, once every three or four years. Red soils are also manured annually by folding large flocks of sheep upon them; 1,000 sheep being calculated to be sufficient for six acres in ten nights. Cow-dung for sugar-canes is considered inferior to sheep dung, which is used annually, and, when the soil requires loosening, mixed with a little red earth. Cow dung is also in great request in the Ceded Districts, where fire-wood is scarce as a fuel; for which purpose it is made up into thin cakes, termed *bratties*, dried in the sun, and piled into stacks: the ashes form a good manure. In the indigo districts I have seen the stalks and leaves of the plant, after the extraction of the dye, used as a manure, sometimes twice a year, particularly to wet rice grounds. In other districts the leaves of wild plants, such as the *Cassia auriculata*, mixed with sheep dung, are employed. In gardens, sheep's blood, garbage, stale fish and other stimulating matter, are applied annually to the roots of the grape vines, which are bared for the purpose. To betel plantations, sheep's dung, wood ashes and red earth mixed, are applied once in from three to seven years. To the roots of the cocoa and areca palms, cow and sheep dung, mixed with the sedimentary deposit from the beds of tanks and pools, should be applied once a year. Some natives apply a quantity of common salt to the very top of the cocoanut tree, which dissolving is supposed to penetrate downwards to the root

and increase the produce of fruit: others apply it to the soil around the root of the young tree.

Irrigation.—Irrigation is conducted by means of tanks, wells, rivers, rivulets, water-courses leading from the larger streams. Water is generally drawn up from the wells at a depth of from 6 to 50 feet by the common mote, or water-wheel, turned by from two to four bullocks moving down an inclined plane, the length and degree of inclination of which is dexterously adapted by the natives to the depth of the well. The water is thus drawn up in a large leathern bag, or bucket, and poured into a channel artificially raised above the level of the land to be irrigated, and diffused by small acqueducts over its whole extent. The skill and ingenuity displayed by the Hindus in this practical branch of hydrostatics, is no where better exemplified than in the ruins of Bijanugger; where, by means of a number of magnificent dams, or anicuts, thrown across the course of a large and rapid river, its waters were plentifully distributed by stone acqueducts in many places raised on pillars, to every corner of a most extensive and populous city, and to this day irrigate large and fertile tracks on the river's banks. By means of the mote water is also raised to the surface from the deep beds of rivers, and poured into the adjacent fields. The *yettum*, or balance beam, turning on a wooden pivot, and moved on the principle of a lever by a single cooly, is much employed in garden and other cultivation of small extent. The principal tanks are those of Cummum, Hundi, Anantipur, Bukapatnam, Dunnaikenkerra, Durmaveram, Daroji, Herri Toombul, and Yerratimraja Cherru. The keeping in repair of the embankments of the tanks and of the anicuts, is provided for by Government, and confided to the charge of the civil engineers. The number of anicuts* over large rivers in the Bellary collectorate, amounts to 46: over small streams to 285. The number of tanks, that are kept in repair and conduce to irrigation, in the same collectorate is 1401, and of wells 22,440.

Meteorology.—The wind blows generally from S. W. to W. and N. W. from March to October, and during the rest of the year, from N. E. to S. E. In January and February, it often shifts from the N. E. to the S. W., W., and N. W. and is usually strongest in March and April. Showers fall from April to November, at first attended with severe thunder storms. March, April, May and June are the hottest months; November, December and January the coldest months during the year. The greatest

* The anicuts are constructed of large masses of granite, in many places clamped together with iron. They are built in great part on masses of rock which reduces the height of the artificial stonework—much of which is only five or six feet high. The general height of the anicuts from the river-bed, is from 9 to 12 feet.

quantity of rain generally falls in September and October: though, in 1838, more fell in July than in October. On account of its centrical inland position, Bellary is removed from the full force of either monsoon; this renders the periodical changes which occur with comparative regularity in tropical regions, subject to vicissitude and uncertainty; therefore, what is here said regarding its climate, &c. must be taken merely as approximative. The thermometer (Fahrt.) ranges during the year from 48° to 98° in the shade. Less rain is supposed to fall at Bellary than at any other place in Southern India. During the year 1838, only 11¼ inches of water fell; but it must be recollected, that this was an uncommonly dry season. Hail is rather uncommon: I have seen it fall during the thunder storms in May, in globular concretions varying in size from a swan shot to a musket ball. The quantity of moisture in the atmosphere indicated by the hygrometer, during the months of December and January, is extremely minute, although the air is remarkable for its transparency. Humidity increases the transparency, as may be observed a few hours, or even a day before, or after a fall of rain. The degree of electricity it contains, is evinced by the simple experiment of passing a brush rapidly through the hair once or twice, after it has been dried: this frequently produces a harsh crackling noise, the explosions of a shower of electric sparks plainly visible in a darkened room. Mirages and halos are of frequent occurrence. I have witnessed a curious species of the former phenomenon on dewy nights and mornings, caused by the rays of the moon, when low in the zenith, falling at an acute angle on the horizontal plane of the bank of vapour. This lunar mirage produces the illusive spectacle of a vast sheet of water, tranquil and glittering as the surface of a polished mirror. Objects seen at a distance on the undulations of the extensive plains by the rays of the morning sun, are often singularly magnified to more than double their natural size: this deception vanishes as the sun advances in the heavens. Meteors are most frequent from November to March. On the 2d January 1831, a meteorolite fell in the Cuddapah district, a fragment of which is deposited in the Museum of the Asiatic Society of Bengal. Few experiments have been made, or at least their results not made public, on those interesting objects of meteorological enquiry, viz. radiation, light, electricity and moisture; but it is to be hoped that these branches of research in a climate so remarkably influenced as that of the Ceded Districts, will be more carefully attended to. The mean temperature of Bellary, result of a year's observations, is 80° 5″ Fahrenheit, the temperature of a spring is a little below this.

Fences.—The waste lands are never, and the cultivated seldom, divided by fences, except during the time the grain is on the ground, and then they are merely slight enclosures formed by a few thorns. The betel and other gardens and orchards are permanently fenced, generally with *diwanah gunna*, milk-hedge, aloe, prickly-pear, or *hinna*, the latter is rare and usually seen in gardens. Loose stone walls, resembling those in Wales, or the hilly parts of England, are met with in rocky situations, such as Chillumcoor, Chitwauripully, &c.

Domestic animals.—Most of the animals useful to man and common to Peninsular India, are found in the Ceded Districts. The horse is rarely bred: those used by the natives being generally brought from the banks of the Bhima in the Southern Mahratta Country. Tattoos, or ponies, of a hardy description are bred in abundance. The ass is smaller than that of Europe, though large for India. The bull and cow are of the common Indian species. They are of a hardy description, capable of much fatigue, though not so large as those of Guzerat or Nellore. The buffalo is of the long-horned variety; and, from the animal's partiality for water, much better adapted to the purposes of wet cultivation than the bullock. The sheep is remarkable for the excellence of its wool; from which *cumlies* of the best description are manufactured (principally in the Harponhully taluk), both for local consumption and exportation. The number of black cattle in the Ceded Districts, is estimated at 1,353,930, of sheep 961,520.

Wild animals.—The principal *ferœ naturœ* that come under notice, are monkeys, principally of the genus *Semnopithecus*, the common and great bat, the flying fox, and other members of the cheiropterous family. The great black, or labiated bear, the jackal, mongoose, royal tiger, the cheta, or hunting leopard, the leopard, the tiger-cat, the hyæna, the wolf, fox, hare, wild boar, porcupine, and the common, spotted, and goat-antelope. I have seen elk in the forests of the Nulla Mulla, they occur also among the Sondur hills, the *sciuri* or squirrel tribe, are numerous. Among birds are the Indian eagle, vulture, varieties of the hawk and falcon tribe, paroquets, doves, king-fishers, wood-peckers, the common sparrow, swallow and the crow, pea and jungle fowl, partridge, rock pigeon (the *pterocles exustus* of Temminck), quail, bustard, floriken, plover, snipe, stork, heron. Among palmipedes, we have a variety of gulls, terns, the common wild duck and goose, the black backed goose (*anser melanotos*), teal and pelicans. Among chelonians, are the fresh water and geometrically shelled tortoise, and of saurians, we have the alligator, iguana, chameleon, and a great variety of lizards. Among ophidians ranks first in deadliness the cobra di capello and venemous whip-snake.

The rock snake is uncommon, but there are numbers of green snakes that glide among the foliage of the trees, from which they are with difficulty discernible. There is a countless variety of insects, among the most useful of which rank the silk-worm, the lac insect, and the honey-bee.

Trees and Plants most useful to man.—The most useful timber trees grow on the Nulla Mulla and Lanca Mulla hills, on the east of the districts, and in the Sondur and Kumply ranges, on the west. These hilly tracts produce teak, blackwood, moochie and chandan woods; abundance of excellent bambus and other woods used for building, agricultural implements and for fuel. In the sandy alluvial flats, and moist low grounds, especially towards the eastern frontier, the feathery cocoa-nut, the graceful palmyra (*Borassus flabelliformis*), used for rafters, the odoriferous dwarf date (*Elate sylvestris*) abound. The plains yield trees and shrubs, many of which are employed in medicine, agriculture, and the arts—the *indigofera cœrulea*, yielding a blue dye, the *kusum* or *carthamus tinctorius*, pink and scarlet, the *muddi* (*Terminalia alata*), and the *Morinda citrifolia*, yielding red dyes, the common milk-hedge used as a black dye for leather, turmeric, the *Parkinsonia*, the *nim* or *margosa* useful for its timber, and the bitter medicinal oil expressed from its seeds, the sacred banyan, the *jaman*, the juice of which is employed to precipitate the colouring matter of the indigo, the graceful tamarind whose acidulous fruit is used as an article of food in medicine, dyeing, and other arts affords a strong durable timber, though the natives I am assured are averse to its use in house-building. The bark of the useful and hardy *Acacia Arabica*, or babul tree, often the only prominent object in the boundless plain, is used in tanning, and in medicine, its wood for the harder implements of agriculture, the thicker branches for tent pegs; and the gum, which closely resembles that of the Arabian tree, in medicine and the arts. The bark of the *turwer* (*Cassia auriculata*), the *amaldas* (*Cassia fistula*), and the juice of the *yercum* (*Asclepias gigantea*), is used in staining and preparing leather: the latter and the milk-hedge afford the charcoal used by natives in the preparation of gunpowder. The flowers of the *Nyctanthes* are used as a yellow dye, and the leaves of the *shewbali* (*Vitex negundo*), that loves the sandy beds of rivulets, and the fruit of the trailing *Elaterium* in medicine. The wild oleander, whose deliciously scented flowers are held sacred by the natives, grows in luxuriance on the banks of the Tumbuddra. The verdant guruwi (*Ixora parviflora*), whose branches are universally used as torches, is found growing on the low jungly hills. The shrub *jatropha glandulifera* is almost confined to the cotton ground plains. That singular siliceous substance tabashir, is produced in the joints of the bambus that cluster the eastern forests, and

used by the natives in medicine as a tonic. Teak and other valuable timber is floated down the Tumbuddra from the forests of Mysore and Canara, during the S. W. monsoon, and landed near the anicut of Wullavapur on the western frontier.

Mineral products.—The chief mineral products are iron of good quality, copper, lead, antimony and manganese, diamonds, alum, culinary salt, natron or native soda, saltpetre, gun-flints, novaculites, and an inferior description of marble at Kurnool. It is probable that coal may exist in the limestone and sandstone formation around Cuddapah, and the bed of the Pennaur. The formation in this vicinity resembles that of the saliferous part of the peninsula of Araya, described by Humboldt as mostly sandstone and conglomerate, resting upon a compact bluish grey limestone. Salt is produced in the Cuddapah formation, though not confined to it. I have seen this mineral in the black soil, lying immediately above granite and gneiss, and in layers between laminæ of ferruginous schist, associated with chloritic, and hornblende slate, also between those of blue limestone, arenaceous slate and sandstone. Lead and antimony are found near Jungumrazpully in the Nulla Mullas. Copper and manganese and iron ore, also exist in these hills; the latter in considerable quantity. Copper ore, the green carbonate, is found in the ferruginous slate clay at the base of the crest of the southern epaulement of the copper mountain near Bellary; excavations are still to be seen, said to be the remains of mines excavated by order of Hyder Ali, but which were given up in consequence of the expence exceeding the produce. The most celebrated diamond mines are those of Condapetta, Ovalumpully, Punchagupadu and Lamdoor near Cuddapah, at Banaganpully; and at Muni Mudgoo and Wudjar Caroor near Gooty. I have found them invariably situated in the sandstone breccia and conglomerate. Manganese is found in the copper mountain and Sondur ranges.

Arts and Manufactures.—There are manufactories for cotton piece goods, principally salis, dupattas, turbans, palampores and carpets at Cummum, Cuddapah, Kumply, Bellary, Tarputri Adoni: for woollen cumblies (native blankets) at Harponhully, for brassware at Hirrihal and Hospett, for glass bangles at Pennaconda. The descendants of the diamond polishers of Golconda, are still to be found at Muni Mudgoo, in the Punchapoliam taluk near Gooty. There are gold and silver smiths at Bellary, Cuddapah and Banaganpully; dyers at Jummulmudgoo, and various other villages; indigo manufactories in the Budwail and other taluks of the Cuddapah collectorate. Dolls and other painted wooden and composition toys for children are made at Harponhully and Gooty. Images

are sculptured from a soft purplish stone at Tarputri. Cups and vases from variously coloured limestone at Ryelcherroo: here there was a manufactory for gun-flints in the time of Tippoo. Pyrotechny and the art of making gunpowder, are well understood by natives in most large villages, and also that of metallurgy, as far as the smelting of the ores of iron and copper is implicated. Potters, smiths and carpenters are to be found every where, being necessary members of each little village republic. The basket-makers and stone-cutters are in generally roving tribes, settling temporarily where their services are required. Silk-weaving is but little practised.

Trade.—The principal exports are cotton, indigo, coarse sugar, iron, woollen cumlies, silk and cotton cloths, cotton thread, dry grain and tobacco, chiefly to the eastern coast, Mysore and Southern Mahratta Country. The chief articles of import are betel, and cocoa-nut from Mysore, raw silk, sugar, iron and steel from Mysore, cotton and cotton thread from the Nizam's and Nuwab of Kurnool's territories, and the Southern Mahratta Country. The exports from the Bellary collectorate for 1837-8 amounted to 884,511 Company's rupees; the imports to 2,682,468. —Exports from the Cuddapah collectorate to 55,117 Company's rupees. Imports 476,263 Company's rupees.

Land Revenue.—According to Hamilton, it is traditionally asserted that the Hindu sovereigns assumed half the produce in kind, and converted it into money at a rate unfavourable to the farmers and cultivators. The Mussulman princes, after the fall of Bijanugger, also took half the produce in kind, but levied additional duties on the farmer's share, after converting their own into money at the average of the ten preceding years. When the British took possession in 1800, the rayetwar system was introduced by the first collector, Major Munro, with progressive advantage to the state and to the cultivator. The village system, which assimilates that of the zemindari in the *modus operandi*, was subsequently introduced, but, I believe, proved a total failure. The modified rayetwar system, which now obtains, was then reverted to, and is briefly as follows.

The cultivated lands of each village are carefully measured, and assessed agreeably to the average value of the crops. The tahsildar, or native collector of each taluk, visits every village under his charge, early in the season, in order to inspect the lands, to grant leases of waste lands, to receive back any which the rayet may not wish to continue or have the means of cultivating, and to settle the probable amount of revenue for the next season. When the crops are nearly ripe, the European collector assembles the rayets of each taluk, examines the esti-

mates and reports of the tahsildars, and compares them with the separate detailed accounts kept by the curnums, or accountants of each village, and the *vivâ voce* statements of the rayets themselves touching the lands they hold. From their accounts a minute statement of the quantity and value of ground occupied by each cultivator, the number of his family, cattle, &c. the sums paid by him to government for several years past, is prepared by the people of the kutcherry, on which the collector's final settlement is eventually based. The collector again checks these estimates by enquiry from the rayets themselves, to each of whom he finally gives in open kutcherry a *puttah*, containing a short abstract of the rayets holding and demand upon him for the year. These leases are renewed annually, but the rayet cannot be ejected from the land so long as he continues to pay the government dues.

The revenue is collected from the rayets by the village potails, curnums and the regular village servants under their authority, and delivered into the treasury of the tahsildars of their taluks, by whom it is remitted to the general treasury of the district. Receipts are regularly passed between the different parties, not only expressing the total of the amount delivered over, but specifying minutely the different coins in which the sums have been severally paid. The average amount paid by rayets upon lands held direct from government, amounts in the Bellary districts, to about 23 rupees 14 annas, and in the Cuddapah collectorate to about 15 rupees 9 annas per annum. The average of total revenue annually paid by each inhabitant in the former district, is about 2 rupees 8 annas, in the latter 2 rupees.

The other sources of revenue are the land customs, the *moturpha*, which includes taxes on shops, trades, &c., the *abkari*, duties on intoxicating liquors and drugs, the stamps, and a few small farms.

Regarding the amount of revenue derived by the Bijanugger princes from the Ceded Districts, nothing satisfactory is known. It was valued in the deed of cession in 1800 at 1,651,545 star pagodas, but Sir T. Munro was of opinion that the revenue had been decidedly and purposely overrated in Tippoo's schedule of 1792, in consequence of his deeming it certain that most part of the territory would be shared by the British government and the Nizam. The first settlements were therefore fixed much lower than the former estimates—that for 1801 amounted to 1,102,000 pagodas, exclusive of village servants ; the next year it was calculated at between twelve and thirteen lacs : in 1817 it amounted to 1,740,304 star pagodas—in 1836-7 to 5,362,738 Company's rupees, and in 1837-8 to 5,517,700 Company's rupees. The disbursements amounted

to 879,894 Company's rupees, leaving a profit to the state of 4,637,806 Company's rupees.

Population.—The population of the Ceded Districts amounted in 1805 to 1,917,376: it now (1838) amounts to 2,211,168, or a little more than 93 to the square mile, of whom about 121,777 are Mussulmans and 2,039,391 Hindus. The population of Scotland, which has an area a little more extensive than that of the Ceded Districts, amounted by the latest statistical accounts to 2,365,930, or a little less than 80 to the square mile. The population of the Bellary collectorate slightly exceeds that of Cuddapah: the former being estimated at 1,129,907 and the latter at 1,081,261. The number of males is greater than that of females by an excess of 105,868. The fact of there being fewer females than males in India, where a plurality of women is permitted, I have also noticed in ultra gangetic countries particularly on the Malayan peninsula. Whether the proportion of males actually born, exceeds that of the females born, or not, is a point of interesting, though difficult enquiry; at least during the present state of our social relations with natives. The expense of rearing female children is doubtless in some instances productive of infanticide, and might possibly induce many parents to neglect them from their earliest infancy, when most in need of support and protection, and thus passively permit the feeble spark of dawning life to wane, and be extinguished long ere fully lit. From many enquiries, I am led to believe, that the fecundity of the females of India does not on the whole average less than that of European females, although it has been so stated by political economists.

The artizans, tradesmen, agriculturists and shepherds, are generally Hindus. The Mussulmans dislike agriculture, preferring the chance of employment as peons, &c. under the civil authorities, rearing silk worms, weaving and cleansing cotton, &c. A few enter trade as cloth merchants, perfumers, druggists or farriers. They, as well as the Beders (the military class of Hindus in the Ceded Districts), can with difficulty be persuaded to enlist as sepoys, preferring idleness and almost starvation. Mahomedans are to be found both of the Sunni and Shiah sects; the former is the most numerous. The prevailing castes of Hindus are the Kunbi, Lingayet, Beder and Dhungar. Brahmins are numerous of the Vaishnava and Smarta sects. The Sri Vashnavam is comparatively rare. A few of that persecuted tribe, the Jains, still exist, maintaining themselves commonly by trading in brassware and cloths. A wild race, termed Chensuar, roam the forests of the Nulla Mulla hills, subsisting on wild fruits, honey, insects, roots and the spoils of the chace, also by barter with the inhabitants of the plains.

State of Education.—The Hindus appear to me to be better educated than the Mussulmans; they have numerous schools, which remind one of those of the Lancastrian system, and they are often excellent accountants. A few of the brahmins know as much of astronomy as will enable them to calculate an eclipse with tolerable accuracy. The education of Mussulman children, is almost confined to reading and writing, the knowledge of their creed, a few prayers, and a section or two of the Koran. The number of native schools in the Ceded Districts amounts to about 1,030.

Prevailing Language.—The prevailing language spoken from the western frontier to Gooty, is Canarese: from Gooty to the eastern limit, Telinghi. The Chensuars it is said possess a dialect peculiar to themselves.

Roads.—The direct military road from Madras to the head-quarters of the division, stands much in need of repair. Coolies and loaded bandies, to avoid it, often take the circuitous route of Nundidroog, preferring the great additional distance to the inconveniences of the direct route by Cuddapah. It is said that Government has it in contemplation to open the Nundi Cunnama pass over the Nulla Mulla range, this work will afford a direct communication between the Ceded Districts, Nellore and the ports north of Madras on the eastern coast, and is likely to prove highly beneficial to the trade of these countries. The following are the marches on the principal roads through the Ceded Districts from Bellary :—

TO MADRAS.

	M.	F.
Cuggul	10	0
Guddacul	13	3
Goontacul	10	4
Ameenapilly	8	1
Gooty	12	1
Ryelcherroo	14	7
Tarputtri	16	6
Tallapodatoor	11	1
Chettywaripilly	11	9
Chilmacoor	14	3
Appiapully	14	5
Cuddapah	12	0
Wontimetta	16	4
Nundaloor	12	4
Pollumpett	13	2
Codoor	16	3
	208	5

TO BANGALORE.

	M.	F.
Boodihal	8	2
Honoor	12	1
Bellagoopah	14	7
Gollah	9	6
Rampoor	9	7
Peroor	9	6
Terimany	10	2
Goghirry	10	1
Jalipett	6	5
Palsamudrum	11	7
	103	4

TO HYDERABAD.

	M.	F.
Karlagoondy	10	0
Taulloor	9	1
Lingadahully	12	3
Adoni	11	6
Heera Toombul	12	6
Madaveram	15	5
	71	5

TO S. MAHRATTA COUNTRY.

	M.	F.
Courtney	11	6
Gooricoopah	8	1
Paupnaikhully	11	2
Hospett	7	7
Balahoonsee	13	6
Humpsagur	15	0
	67	0

Antiquities.—The ruins of the ancient capital of Bijanugger are worthy of notice, presenting to the admirer of Hindu sculpture and architecture an interesting study, principally of the style of the 14th and 15th centuries. The Caryatid figures supporting many of the entablatures, the elegantly grouped columns of the Viddia Vittel temple, their richly ornamented shafts, capitals and architraves, the entablatures of the throne terraces, covered with spirited bas-reliefs, representing combats, fetes, hunting scenes, and mythological events, the colossal statues of the sacred bull, the lion avatar and the elephantine god Ganesa, hewn from solid granite, basaltic hornblende, greenstone, and a dark green talcose rock, beautifully polished, arrest the attention of the traveller. The arch, the alleged ignorance of the turning of which has been repeatedly adduced as an unanswerable proof of Hindu barbarism, may be seen in some portals and in the winding passages leading up to the summits of the *gopars*, or pyramidal towers of the pagodas, which assimilate the propylæa of Egyptian temples. The angularity and heaviness of many of the shafts, the lowness and gloom of the apartments, the excessive minuteness of detail, coupled with the want of general design, keeping and harmony of conception, have often struck me when gazing on the works of Hindu artists; defects from which even these ruins are not exempt. But, we are lost in admiration when we behold the stupendous masses of hewn granite, fitted and placed with the utmost nicety, one upon the other in the Cyclopean masonry of the mortarless walls and fortifications, that begird the city with a sevenfold cincture. The perspective view afforded by the colonnaded vista of the Humpa street, running along the southern bank of the river, its grass-grown pavement, the solitude and air of desolation that prevails, is almost free from the defects above mentioned, and might bring to mind the deserted streets of Pompeii. The mixed Hindu and Saracenic character of some of the later buildings, speaks intelligibly of the spread of the Mahomedan power that finally overwhelmed the Hindu empire of which this city was the capital. There are numerous inscriptions on pillars and stones interspersed among the ruined temples, copies of most of which are in possession of the Branch Asiatic Society of Madras. A few specimens of the ruder, or Cyclopean, style are to be met with in every part of the district. Ancient places of sepulture, marked by rude circles of stones, mounds and barrows, resembling those of Britain and Northern Europe, monuments to the memory of heroes slain in battle, and to such of their widows that perished on their husband's funeral pile, mutilated statues and ruined fanes, remnants of the subverted religion of the Jains, are scattered over the country. The most sacred Hindu shrines are those of Humper, Sondur, Tarputri and Purwuttum on the south bank

of the Kistnah. Numberless rude representations on stone, many apparently of great antiquity, of serpents collected together in temples, under trees, and the walls of the older villages are evidences of an ophitic worship that prevailed anciently to an unknown extent. To this day remnants of it exist, the clue afforded by which it might be of interest to trace. There are some singular mounds of a scoriaceous substance, containing carbonate of lime, in the vicinity of Bellary.

Coins.—The numerous political changes and revolutions that have convulsed this part of India, could not fail to produce a great variety of coins. Among the most ancient of those formerly current are the golden pagodas and half pagodas of the Bijanugger sovereigns, and of their vassals, the chiefs of Harponhully, Raidroog and Gundicota, known by the names of the Achit Raya, Kishen Raya, the old and new Harponhully, Vencatpati and Timma Naid Pertap pagodas. Next succeeded those of the Mahomedan kings of the Deccan, the Mogul empire, and their viceroys, called the Mahomed Shahi, Alumgiri, Farsipadi and Jummulmudgoo pagodas ; some of the later of which were coined at Adoni, Cuddapah and Jummulmudgoo. The gold coins of the Mahratta conqueror Morari Row were the Gooty Mahomed Shahi, the Subaroyi and the Tarputtry pagodas. A number of gold pagodas were introduced by the Asaph Jah or Hyderabad chiefs, among which were the Karkmodi, coined at Karkmod, Masulipatam, &c. Lastly, the conquests of Hyder and Tippoo overwhelmed the country with the Mysorean currency from the mints of Seringapatam, Mysore and Cullicota. Their pagodas are generally known by the terms of Bahaduri and Sultani. Those of Hyder bearing the Arabic initial of his name, and those of Tippoo, his name and title. Ashrafis or gold mohurs were rare, those of Delhi and the Ahmadi being the only specimens current. The gold fanams rank next to the pagoda: those of the Bijanugger dynasty are rare. The Naidi fanam, coined by Timma Naid of Gundicota, is worth 5 annas 10 pice. That of the Poligars of Ghuttu 3 annas 6 pice. This is also the value of the Kanjit gold fanam introduced by the Cuddapah Nuwabs, Hyder and Tippoo. I have not met with any silver or copper coins of the Bijanugger sovereigns: those formerly in circulation consisted almost entirely of rupees and fanams, introductions from the Nizam's dominions, Mysore and Arcot. The Adwani rupee was coined by Basalet Jung at Adoni, and is now valued at 15 annas 2 pice. The Imami Nokhara, a double rupee coined by Tippoo at Seringapatam, is valued at 2 rupees 1 pice; the Pulachari of Hyder at 1 rupee. The whole of the varieties termed Chelavani from the Nizam's dominions fetch 12 annas 10 pice.

VI.—*Journey of the Russian Mission from Orenbourg to Bokhara.**—*Translated by Colonel* MONTEITH, K. L. S. *Chief Engineer of the Madras Army.*

To the SECRETARY to the MADRAS LITERARY SOCIETY,
and AUXILIARY ROYAL ASIATIC SOCIETY

SIR,—I have the pleasure to send you a translation of the Journey of the Russian mission from Orenbourg to Bokhara, during the years 1820 and 1821. The author, Baron MEYENDORFF, attached to the Russian embassy, gives also some account of the different states in Tartary, which it had been my intention to translate also; but the map, without which it would be unintelligible, has unfortunately been mislaid: the remainder is therefore deferred till a future period.

I have never seen another copy of this work in India, and very few in England, though containing much useful and novel information, and giving the route from the Russian frontier to those of Captain Burnes and others to Bokhara. This, with Colonel Maravielle's route from the Caspian to Khiva, completes the different lines of road, by which a force may attempt to reach Affghanistan.

The route now described, appears almost impracticable for an army, which would, in my opinion, follow the banks of the Lake of Aral, on which the provisions and heavy baggage might be conveyed. This project I have heard discussed in high military circles in Russia: the object then was to chastise the Khivians for their depredations on Russian subjects, which was expected to be immediately carried into execution. In fact 1000 Yaik Cossacks actually established themselves on an island, at the mouth of the Oxus, and only returned in compliance with the orders of the Russian government. There are still two other land routes from the Russian frontier, but not so favourable as the one directly on the east bank of the Aral lake; viz. round the western and southern shore, and the second along the east coast of the Caspian Sea: they have long been known, and passed by many travellers, who have given their journals to the public, consequently do not require notice at present.

I have the honor to be,
Yours most obediently,
WM. MONTEITH.

MADRAS, 29*th August*, 1839.

* *Voyage d' Orenbourg a Boukhara, fait en* 1820, *a travers les steppes qui s' etendent a l'est de la mer d' Aral et au-dela de l'ancien Jaxartes; Redige par M. le Baron* GEORGES *de* MEYENDORFF, Colonel à l'etat major de S. M. l'Empereur de toutes les Russies; *et revu par M.* le Chevalier AMEDEE JAUBERT, &c.—Paris, 1826.

TRANSLATION.

BOOK FIRST.

CHAPTER I.

Preparations for the journey—Departure—Dangers on the road.

The persons attached to the embassy to Bokhara arrived at Orenbourg in the course of the month of August. About the same time, an order was given by general D'Essen, military governor of Orenbourg, for the Cossack soldiers andBaschires intended to form the escort: but the party could not be assembled before the middle of September, and the fine season was passed away. From economical motives, we had at first intended to use carts for the carriage of provisions, &c.; but we were obliged to give up this plan, from the information we received of the nature of the country,through which we had to pass, and we determined to substitute camels to carry the baggage, and merely to take 25 carts for the transport of any of the people who might fall sick or meet with accidents by the way. Each cart was drawn by four horses, driven by a Baschire. As we had to cross rivers in the steppe of Kirghiz, we were provided with two boats placed upon carts—the carts being so constructed, that, by fixing them upon the boats, they formed rafts capable of bearing 20 men.

Our march in the desert being likely to last two months,it was necessary to carry about 500-lbs. of biscuits for each soldier, and 5 quintals of oats for each horse; besides meal for the people, a double allotment of ammunition for our two pieces of artillery, 15 kabitkas,or felt tents, 200 casks for carrying water across the desert, and several barrels of brandy. 320 camels we loaded with the provisions, &c. for the escort, and 38 with the baggage and provisions of the ambassador's suite. The military governor had made arrangements with the Kirghiz chiefs, that, upon the payment of 110 paper roubles (about £4 10*s.*general exchange, 25 to the £ sterling, the 358 camels we required, were to be at the gates of Orenbourg on the 6th of September ready, each to carry a burden of 640-lbs. The long wished for day came, but not one Kirghiz appeared. The market of Orenbourg was unable to provide us with the quantity of oats indispensable for our escort, and we were therefore obliged to dispatch messengers to seek it in the surrounding country that is to say, 150 verstes from Orenbourg, and we did not obtain it till 20th September.

The expense of the escort during its absence from Russia, was calculated at about 72,000 roubles, which it was absolutely indispensable to take with us in cash, that we might obtain supplies at Bokhara. The export of Russian coin being forbidden, it was necessary to obtain ducats, but the merchants at Orenbourg did not possess a sufficient number of that coin, and we sent to Troïtski, a town about 600 verstes distance, and being then also unsuccessful, we were at last obliged to have recourse to the exchange at Moscow, a distance of 1,500 verstes from Orenbourg. Many unexpected difficulties thus retarded our departure. The fine season had passed, half the month of September was already gone, and hard frosts were beginning to appear, and the cold had set in with a constant succession of rain, hail and snow.

We were therefore on the eve of commencing a journey during the storms and fogs of October and November. I thought of the sufferings endured by the army of Timour against Khiva, related by Sherif Oudin, when "some lost their ears, noses, hands and feet; the sky looked like a cloud, and the earth was but a mass of snow."

We were about to pass through a colder country, than that which caused the destruction of this famous conqueror; and I felt compassion for our poor soldiers; who, unprovided with furs, would be exposed to the inclemency of a very severe winter. We had much consultation with the Kirghiz, to determine which route we were to pursue, and to make ourselves acquainted with the difficulties we were likely to encounter. Five of them were chosen as guides; the principal of whom was named chief; having also the command of sixty other Kirhgiz, who were engaged to load, drive, and take care of the camels.

These animals belonged to different proprietors, and are usually in herds of from twenty to sixty, called *koch*, led by a Kirghiz chief. The baggage was distributed among the different *kochs*; we made a trial of the way of loading the camels, and found packs of a long shape the best for that species of carriage. On the 9th of October, arrived the last of the camels we required, and our departure was positively fixed for the following day.

At last, on the 10th, the whole escort assembled in the great square at Orenbourg, and passed in review before the governor-general. He caused mass to be said, and a blessing pronounced upon the travellers. There was something solemn and imposing in the religious ceremonies, the loud vocal music, the benediction bestowed on the eve of so long a journey through immense deserts; and it acquired a fresh interest from the presentiment of the dangers and difficulties to which such an expedition was likely to be exposed.

In fact, the dangers to be apprehended were sufficiently numerous : it was very possible, that the Kirghiz, always greedy of plunder, and unwilling that the Russians should explore these deserts, might attack us during the night, nor was this fear without foundation,for not far from Sir-dèria in 1803, Licutenant Gaverdvosky was attacked by the Kirghiz. He himself escaped after the most obstinate resistance, but his wife, his physician, and the fourth of his escort fell into the hands of the savages. Even supposing the Kirghiz did not dare to attack so numerous a party, they still had it in their power greatly to increase the difficulty of our journey, nay, even render it impossible for us to go on, by burning the grass and reeds on the steppe through which we had to pass. Another very usual species of attack among those tribes is by stealing nearly all the horses, when grazing at night, carrying off a number of them with incredible celerity. These sort of attacks are greatly to be dreaded, as a small band of robbers might occasion us irreparable injury, if they surprized us from the negligence of our sentinels.

General D'Essen, who foresaw all these dangers, gladly accepted an offer made by the powerful Sultan, Haroun-ghazi Aboul-ghazi, of accompanying the embassy as far as the Sir-dèria, with a party of a few hundred faithful Kirghiz. The effect this offer would have upon the minds of the Kirghiz, greatly enhanced the value of the offer in the general's eyes.

The Khivians who occupy a part of the country to the south of the sea of Aral,were however much more to be feared than even the Kirghiz, as they are no less skilful, and more united ; sometimes making predatory excursions in bodies of from 4000 to 5000 men. Though a party of horse like these would not give much cause of alarm to our soldiers, the escort would still not be sufficiently strong to defend a troop of 700 camels, including those of the Bokharian merchants who had placed themselves under our protection.

The cunning displayed by the predatory tribes in plundering the caravans, increases the difficulty of defence. Their attacks are always very sudden, and unexpected. They terrify the camels by shouts and yells, and the animals once dispersed, easily fall in their power. The best way of preventing so dangerous a disorder is, by making the camels crouch down, as they do not willingly rise again, but often there is not time to take these precautions—and then the caravan is certainly lost ; for being without camels in the steppe of the Kirghiz, is attended with the most imminent danger, and often with the loss of life.

It was very possible, that it was not during the journey alone we were exposed to danger ; we might well feel doubts of our safety in

Bokhara, a country belonging to a warlike and uncivilized nation. Before our arrival at Orenbourg, some Bokharian merchants had said in confidence to their friends—"Perhaps none of the Christian travel-"lers will return to their own country. Even supposing the Khan of "Khiva allows them to pass, our own Khan would not commit that "folly. Why should we allow the Christians to become acquainted "with our country?"

CHAPTER II.

Appearance of the desert—Kirghiz Encampments—Junction of the Mission with Sultan Haroun-ghazi—Hunting of the Antelope.

The distance to be traversed is divided into three parts;—the first includes a space between Orenbourg and the mountains of Moughodjar, which we passed between the streams of Cara-akenti, and Touban, about 434 verstes from Orenbourg; the second, the space between these mountains and the Sir-deria; lastly, the third, between the Sir-dèria and Bokhara.

The ground through the whole extent of the first portion is nearly the same. You see generally an undulating surface, divided by chains of hills, of which the slopes are so gentle as frequently to extend to fifteen and twenty verstes. The absence of wood, and the trifling elevations of these eminences, always offer an extensive prospect, when the eye in vain seeks an object to fix itself on. Sterility, uniformity, and silence, are the characters of a steppe. Towards the end of May, the sun had burnt up the vegetation, and the ground assumed a brownish yellow colour.

Through all this extent, trees are only found in two places; every where else, a few thorny bushes, about three feet high, are so thinly scattered, that to the eyes of an European they scarcely break the monotony of these vast deserts.

A considerable number of streams cross the route, presenting almost always the same appearance, and generally follow the same direction. From the Oural to the Sir, they are fordable, and are nearly dry in summer and autumn. The Ilek, Emba, Temir, Or and Irghiz, merit however the name of rivers, and are never dry, though sometimes very shallow. Many of these streams only leave ravines to mark their course in the dry weather; others form a chain of ponds, frequently several

toises in depth joined by a minute thread of water but sometimes unconnected. The steppe is every year covered with deep snow, which melts with great rapidity early in spring, when the heat is frequently great. At this period the rivers and streams rise, and form rapid torrents, which scoop out deep ravines in the clay soil which universally characterizes these plains.

Thirty verstes from Orenbourg, we found on the Djilandu-tepeh, the highest hill in the neighbourhood, two fossil specimens, a belemnite and ammonite. Between the Ouzoun-Bourté and the Cara-boutak, and from that to the mountains of Moughodjar, we saw also many of these fossils, and a vast quantity of shells.

The soil is generally clay; dry and strewed with flints of different colours. The hills are usually round, with gentle slopes, as if water had smoothed the inequality of the ground.

Near the hills, of Bassagha, we saw a number of petrifactions, shells, and even a shark's tooth, which appeared to us a proof that the sea had once covered this spot. At Berdianka we observed traces of an exhausted copper-mine, mentioned by Pallas, and also of another near the Kizil-ova. They were merely excavations of an inconsiderable depth, beside which there were heaps of stones intermingled with copper ore, about 7 verstes from our encampment. On the Ouzoun-Bourté we found coal, which we tried in our forge and it burnt very well. On our arrival at Cara-boutak, we were agreeably surprised by the sight of a small wood of black alders; there also appeared to be an improvement in the soil; we had hitherto not seen any thing approaching to a healthy vegetation in the steppe, and were rejoiced to perceive it shortly after, on the banks of the Ilek. The eyes of the traveller, wearied with the nakedness of the desert, are refreshed by the sight of plants, trees, bushes, poplars and willows which are here very numerous; the pasturage, also, wherever the river overflows its banks, is very fine, and therefore a favourite resort of the Kirghiz. This is the largest river we met with, before reaching the Sir—it is 10 fathoms broad and very rapid, flowing over a gravely bottom, and abounds with various sorts of fish, such as pike, perch, gudgeons, carp, &c. It was on the banks of this river, we saw the first village of Kirghiz tents. Our attention was first attracted by the flocks of sheep, to the number of from 5,000 to 6,000—and, on approaching nearer, we saw 50 tents of white or brown felt, of all dimensions, pitched in irregular groups of three, four and six.

We learned that it was the camp of the Sultan Haroun-ghazi, one of the principal Kirghiz, who was waiting to accompany us as far as the Sir; anxious by this act of kindness to demonstrate his attachment to

the Russian government, whose support was in truth necessary to him on account of his incessant quarrels with the Khan of Khiva. The day after our arrival, the Sultan came on horseback to visit Monsieur Négri. He was accompanied by a hundred Kirghiz, and wore a turband, though it is not customary in the desert, but considered as a mark of piety in a Mahomedan who is desirous of being distinguished from the general mass of the Kirghiz. All the people that had accompanied him insisted upon entering the ambassador's tent, and as many as it could hold made their way in, and immediately squatted down after their fashion.

The interior of the tent filled with these bearded faces, had a most grotesque appearance. The Sultan was the only person with a fair complexion, fine and large black eyes, and a mild though serious expression, denoting a character of strong natural sense. He remained an hour and a half. The following day I returned his visit. On the road we encountered about fifty Kirghiz, assembled to carry into execution the sentence awarded by the Sultan against one of their countrymen, who had stolen a horse. He was condemned to death according to the law of the Koran,—but the elders of the Kirghiz interceded for him that providence may prosper the journey on which they were going, and that mercy extended to the culprit may be a favourable omen to their union with the Russians. The Sultan yielded to their solicitation, and substituted a corporal punishment for the sentence of death, which had first been awarded. This was immediately carried into execution in the following manner. The robber, half naked, having about his neck some stripes of black belt, was forced by two men on horseback who carried large whips, to run to the nearest tent, where his face was blackened with soot and marched through a group of Kirghiz; they then tied him to the tail of a horse, and forced him to hold a cord between his teeth. He was thus constrained to run after the horse which was pushed into a smart trot. The rest of the Kirghiz followed flogging the culprit with whips. The greater part of those engaged shouted and laughed with all their might. In a few minutes he was set at liberty, and immediately went to thank the Khan, promising never more to be guilty of theft. During this time the horse of the robber suffered the punishment at first intended for his master; the throat was cut, and the carcass divided into pieces, and instantly portioned among the spectators, but not without much noise, disturbance and blows of the whip.

After witnessing this scene, I proceeded to the habitation of the Sultan, who made me wait some minutes, to enable him to decorate and arrange his habitation. At last we entered, and found him seated, in the

middle of a large round tent: his friends were placed in a semi-circle on one side; on the other seats had been prepared for our accommodation. The floor was covered with a carpet, wearing apparel hung on a cord, and skins of tigers were stretched against the sides; a rich diadem of gold, very high, and ornamented with turquoise and rubies, the head dress of Kirghiz women; by their side might also be seen raw meat hanging on hooks, large leather bags of mare's milk, and some wooden vessels of different kinds. It was a strange mixture of rich objects placed beside those of the most ordinary description; the love of magnificence and show joined to the tastes and customs of a half savage society.

After quitting the Ilek, near the road to Tandy-ïaman, on a hill of red stone we discovered some large ammonites, of nearly 2½ feet in diameter, besides some rich specimens of copper ore, probably brought down by the river. Not far from the junction of the Souïouk-sou, four rivers fall into the Ilek, which, as well as the country through which it flows, from this point, is called Bech-tomak, or the five rivers.

There is a very extensive view from the summit of the Bassagha, the ascent to which is so gradual that one is quite surprised at finding so great an elevation. This hill is composed of crystallized gypsum, and the whole steppe in this neighbourhood, is covered with the same substance. The Bassagha appears to be only about thirty fathoms high, the slope is very easy on the north eastern side, and steep in the south western, a peculiarity observable in almost all the hills, on this side of the Sir.

Beyond Bassagha, the soil becomes more and more barren—*kawoul* (camel grass) hitherto abundant, becomes uncommon; and nothing meets the eye, but a clayey barren soil producing but a few miserable plants of a species of wormwood; the ground is burnt and cracked in a thousand places by the excessive heat of the sun.

We forded the Koubleïli-tèmir, after having broken the ice that covered it with a hatchet. This river was about three fathoms broad, and was in some places a fathom deep. The water is good, the bottom sandy, and the banks are covered with reeds; among which the wild boar is occasionally seen. I here observed a gang of Kirghiz, who had been working in the water for about ten minutes to break the ice. They returned to the land to deposit their axes, and then without appearing to dread the painful degree of cold that existed, they plunged three times into the water, a striking proof of the physical insensibility of the wandering tribes. The Koubleïli-tèmir is merely a brook, and I should not have considered it worth mentioning, but from the circumstance of our having found a great number of belemnites and skeletons of mice at the foot of a precipitous spot, about ten fathoms high. This attracted our

attention to the bank of the river. It was composed of many layers of conglomerate of gravel and clay, very interesting to a geologist. I was walking along by the precipice, sometimes on the ice, and sometimes on the ground seeking petrifactions, or other curious objects, when I suddenly saw in the air, a large animal that had just sprung from the top of the hill, and appeared about to precipitate itself upon me. I drew back, and he fell directly at my feet, on the ice, fracturing his limbs in his fall. It was a saïga, a species of antelope, the first I ever saw. It had been hunted by the Cossacks belonging to the escort, and they had pursued it from the plain to the top of the precipice. In its anxiety to escape them, it met its fate, owing to the blind terror characteristic of the saïgas, and which often throws them into the hands of the hunters. The Kirghiz know how to take advantage of it; they station themselves by the rivers, near the places where these animals are accustomed to resort, for the purpose of drinking—and they drive upon an inclined plain several rows of sharp reeds placed in a semi-circle, one behind another; at intervals of about twelve feet on each side of these reeds, they raise mounds of earth, and thus form an arch, of which the extremities are about fifty fathoms apart. When the herds of antelope come, the concealed Kirghiz start up, and frighten them towards this arch. The animals take the mounds for men, and fly towards the reeds, and entangle themselves in great numbers. The Cossacks of the Don chace them in another manner. During the great heats of summer, the antelopes assemble in flocks of from 400 to 500, and emigrate to a cooler region, when they swim the Don; the Cossacks throw themselves into the river armed with a knife, and kill vast numbers in the water.

People worthy of credit have assured me, that in the mountains of Gouberlinsk or Oural, during the season of the emigration of the antelopes, which takes place in June, herds of 8000 and 9000 are seen. The flesh of these animals is delicious, and the skins are used for clothes. It is in general very difficult to approach them, except during the great heats. The beasts then search some shade, and when there are no bushes or trees on the great plains, twenty antelopes will frequently place themselves close behind each other, the leading one putting its head behind a great stone, or in a hole; the hunter can then approach, and if he succeeds in killing the leading one, those that are behind will generally take its place, and several may be shot in succession.

The antelope has a very peculiar nose, it is arched like those of the Kirghiz sheep, formed with two large and deep nostrils, covered with a soft and very elastic cartilage. These nostrils are so open, that flies and

insects frequently enter, and oblige the antelope to stop and sneeze; their horns are not straight, as it is said, but spiral. Nothing can be more graceful than the motions of the antelope when not frightened; they change from a high trot to light and fantastic bounds. These animals, when young, are easily tamed; in the neighbourhood of Orenbourg they are seen, following their masters like dogs.

From the Tèmir, we marched towards the heights of Moussevil, which resemble those of Bassagha. We had got a sight of the mountain of Moughodjar, distant 60 verstes, the blue appearance of whose summits, which rise majestically and are strongly delineated on the horizon, have a very picturesque effect. Notwithstanding we were anxious to see them behind us, in hopes of escaping the extreme cold and storms of this region. By the account of the Kirghiz, the southern face of these mountains, enjoys a much milder climate. However thus far we had been fortunate. The sun had shone clear, and the cold at night seldom below 5 or 8 degrees of Reaumur; once only it was at 10°.

This cold, however trifling it may appear, was much felt by people who had been exposed all day, and had nothing but felt to cover them at night; and for fuel, miserable bushes of very small size—too happy when even they were to be procured.

The Cara-akenti, 15 verstes distant from the Moughodjar, has only brackish water, dirty and with an earthy smell; it is contained in a few holes, and was the worst we had ever seen. The Kirghiz laughed at the faces we made on first tasting it. To us it was hardly drinkable with tea; among the Kirghiz, who frequently came to drink tea with us, I have seen several who swallowed 8 pints of this liquid.

Chapter III.

Appearance of the Country—Kirghiz Tomb—Proofs of the diminution of the Sea of Aral—Mouth of the Sir.

On the 29th of October, we arrived at the foot of the Moughodjar rocky mountains, composed of irregularly grouped peaks; their appearance was wild, and they were covered with stones, rocks of porphyry, serpentine, granite, &c.

The valleys offer a remarkable contrast to the mountains; in the hollows, wherever the water collects and lodges for any length of time, the

vegetation is luxuriant, and the soil black and fertile: the Kirghiz take advantage of it both to cultivate grain, and also as pasturage for their cattle, pitching their tents among the hills so as to obtain shelter from the inclemency of the latter part of the season.

The highest peak of the Mougholjar (almost 150 toises) above the level of the plain, is mount Airouk—a name signifying isolated, and it is in fact a very just denomination, as it is very much higher than any of the other hills. It is also called Airouzouk or forked, on account of the two peaks which terminate the mountain. Generally speaking, the Kirghiz give very characteristic names to the spots through which they pass—as for example, the mountains lying to the south of the Airouk-tagh, are known by the name of *Jaman-tagh*, or bad mountains, those to the north are called *Jakhchi-tagh*, or good mountains, the former, because they are almost destitute of herbage, whilst on the latter the Kirghiz find good pasture, and abundance of water.

The Mougholjar are evidently a continuation of the Gouberlinsk mountains, the union of the two chains may be seen between the fortress so named, and the fort of Orsk: it is near the same spot that the Oural has formed a bed for itself through the chain of rocks, and that it flows in a narrow channel between rocky and steep banks of the same nature as appearance as the mountains. The hills assume the name of Tachkitchon and of Caraoultepeh, separated at first by the Kir-gheldi, they re-unite at the distance of about 30 verstes from the Oural, from whence they extend to the south over an elevated plain, afterwards forming the Ourkatch, or mountains of the Our, thus called from the Our or Or, which flows at their feet. Near the sources of this river, the mountains Ourkatch join the Mougholjar mountains, which extend to the south-east. Two ranges of hills spring from the Ourkatch, one separates the basin of the Ilek from that of the Oural: the other separates the basin of the Ilek from those of the Tèrir, and the Emba. The Iakhchi-tagh lie on the right bank of the Our, and leave it to join the Karnadur hills, a name signifying the junction of the mountains.

The Mougholjar are the highest hills in the plain, inhabited by the Kirghiz of the lesser horde. They are the ramifications of the Oural, none of its branches, however, extend to the lofty range of the Altaï. The passage of the Mougholjar is about 6 verstes (4 miles) beyond these hills: the snow seldom falls in any great quantity: when the climate is better, and the soil more barren; stunted plants of wormwood of a dark colour are thinly scattered over a country, which appears in dismal mourning. In a space of 400 verstes from the river Kacundjour to the Sir, we did not find a single stream.

On quitting this range of mountains, we crossed a level country of moving sand, with some few mounds or hillocks of clay, bare and utterly devoid of vegetation near their base; they were cut by deep fissures, which appear to have been excavated by water.

Supposing a level plain, with several brackish lakes, with a clay soil of a blue colour, so soft as to allow cattle to sink into it, with all the ordinary symptoms of having been once covered by the sea, a correct idea will be formed of the nature of the soil of this country.

The first plain of this kind which we met with, extended from the rivulet of Touban to the Kaoundjour in the bed of which we found only some holes full of water. The Kaoundjour, only flows in spring in a bed of from 4 to 5 toises. Every drop of water is precious in such a situation, and a Kirghiz never forgets where he has once found it in any period of his life. Our guide, Emantchi-beg, who had not visited these parts for 10 years, advised us to halt at the Kaoundjour, after a march of only 20 verstes; as we should not find water again nearer than Khodjakoul, a lake distant 15 verstes further. We were not inclined to believe him, as the Kirghiz who had an interest in delaying our march had frequently deceived us. We therefore continued our journey; the day closed, and we saw nothing of the lake. When night came on, which at this season of the year is generally dark, it became extremely difficult to find our road, which was hardly marked, even in the day. We could no longer see the tops of the hills, or Kirghiz tombs; objects by which the people direct their course. The more prudent of the party advised us to halt, and save ourselves and cattle from useless fatigue, and sleep, in place of seeking to allay our thirst; but as we had declared that we would go to the lake, we considered it necessary to persevere; several Kirghiz did all they could to prevent our losing our road; they dispersed in a line before us, endeavouring to discover some path, which is here a certain indication of being near water. A well, a hole filled with water, or lake, are points where the nomades of the desert assemble, and are the only places where even a path is discernible. We had already wandered for some hours in a dark night, and we became alarmed at having lost our proper direction, when suddenly, a Kirghiz in front struck a light, which had a great effect on our tired party; who now hastened to join the person who had fallen on this expedient of assembling the dispersed travellers. It is the usual mode followed by the Kirghiz in the desert, when they halt, to unsaddle and refresh their horses.

We followed our new guide for 3 or 4 verstes, and at 8 A. M. arrived at the lake, on the banks of which we halted, near several tombs; this was the first lake we met with in the desert.

All the tombs are of clay, mixed with chopped straw, except that of Khodja, which is of unburnt bricks. In the interior of these sepulchres there is another, smaller, where the Kirghiz pray. These monuments become more numerous as you approach the Sir, and appear like cities. The rich Kirghiz frequently bring artificers from Bokhara to make their clay tombs; they are very durable on account of the dryness of the climate. The custom is to construct these buildings on the most elevated spots of small hills; if not built of clay, the friends and relations assist in elevating these rustic sepulchres; and each must bring a certain quantity of stone or earth.

The Kirghiz, like all other eastern nations, have a great respect for the dead; generally all the relations of the deceased attend the funeral, except the women, who remain at home tearing their hair, and uttering loud cries. The relations, after the funeral, condole with the widows, who soon yield to their solicitations, and kill horses and sheep to entertain their guests. There never is with the Kirghiz an assembly, festival, or ceremony, which does not end in a great repast.

One of the greatest festivals with these nomades, is the day the head of a family has died, and particularly the first after it. The sons assemble the people of their acquaintance to the number of 3, 4, or even 600; and the pleasures of the table are always joined to the ceremonies of religion.

We soon quitted the banks of Khodja-koul, which were covered with reeds. In autumn, the lake is much reduced in size; but in spring, when the Kaoundjour overflows, it extends to a great distance.

We proceeded towards Coul-koudouk (well of the slaves), situated on the edge of the desert of Borzouk, 15 verstes of which we passed. It is entirely of moving sand, presenting the singular aspect of nearly perpendicular banks of sand, close to each other, and 3 or 4 toises in height; these change their situation with every gale of wind, some thorny bushes, herbs, and a species of *robinia*, grow here and there. The long roots of these plants resemble serpents; and when totally uncovered, extend on the sides of these moving hills.

We had great difficulty in riding through these deep sands; the more so, as our horses had become weak from bad forage. After our arrival at Coul-koudouk, we burnt 10 of our carriages; the materials of which furnished us for some days with a comfortable fire, free from the smoke of green bushes, which had been for so long our only fuel.

At Coul-koudouk there are several abundant springs, the water of which, had a mineral taste, and in the dry bed of a pond we collected

some bitter salt. Our Cossacks, guided by the Kirghiz, from a distance of about 2 verstes to the right, brought us common salt, which they found in layers of one or two inches thick.

The salt of these lakes is not so strong as our common kitchen salt, and is mixed with a great deal of earth, though perfectly white. From Coul-koudouk we met several of these salt lakes in the desert, and frequently a space of 10 verstes, is covered with a white efflorescence of a fine white powder, which rises in passing through it.

The 9th November, we halted near the hill of Sari-boulak, after having passed near Sirkanatji, the highest peak of the mountains of Moughodjar, to the little Borzouks sandy hills, or dunes, which commence to rise about 10 verstes from where we were, and resemble the great Borzouks. Where we crossed them, they were not more than 2 verstes in breadth; the sand which was frozen did not appear to be deep. Both the little and great Borzouks are near the lake of Aral; these last have a northerly direction, and the other extends in greater masses between the lake of Aral and the Caspian, ending about 10 marches from Khiva. The country continued to undulate and the slopes were always very gradual, the armoise (mothwort) is the only plant which our horses had to subsist on, for from the Moughodjar there is no forage. After passing Akhchèkoudouk we saw to us a new species of thorn, well known in the desert under the name of *saksaoul*.

The Kirghiz and all the people who dwell in the desert set a high value on this plant; the charcoal of which remains alive during half a day. If fire is made with the *saksaoul*, in the evening the embers slowly consume to a white cinder, keeping a gentle heat in the tent all night, this shrub is a species of the tamarisk; it has a leaf like the juniper, a brownish yellow bark, the wood is very hard, heavy, and more easy to break than cut. The *saksaoul* is little more than two inches in diameter in this quarter; but near the Djan-déria it becomes a tree of a half foot in diameter, and 12 in height, and so numerous as to form perfect thickets.

The southern part of the Sari-boulak is remarkable for a great number of excavations, extending two or three verstes. The northern side of the hill is covered with worm-wood, and the slope is easy; the south side is composed of barren clay ploughed up by torrents, or scooped into caves, surrounded by precipices 20 or 30 toises high. I climbed one of these eminences, and found layers three or four feet thick of little shells, as well as some fossil shells about 2 or 3 inches long, and a great quantity of the bones of fish, scattered over the sides of the hill. From the summit of the Sari-boulak, I discerned the hills of Kouk-ternak, which are at a distance of 60 verstes; the sea of Aral approaches their base.

I remarked to our Kirghiz the traces I had observed on the Sari-bou-

lak of water having once flowed there, and they assured me that their fathers had seen the sea of Aral extending to the foot of this hill, though it does not now approach nearer than sixty verstes. So many Kirghiz have declared the same thing to me, that I can have no doubt of the fact, which shows how considerable and how rapid the decrease of the sea of Aral is; it still continues, and one of our guides recollected having seen the sea extend beyond Kulli and Sapak, places which we passed on the 14th and 15th of November, less than a year ago, the Camechlu-bach, a large bay of the Sir-deria, extended three verstes farther than at the time of our journey.

At about 25 verstes from Sari-boulak, we passed the solitary hill of Dermnan-bachi; it is known to the Kirghiz by the name of Termembés, and is so called by all their tribes, though it is common enough for them to give different names to the same place. The smallest of the hills we saw near the Termembès, and in fact all those we saw between the Sari-boulak and the sea of Aral, have their slopes, on the side towards the lake, intersected by ravines and destitute of grass. They present a mass of hillocks, barren and always round at the summit, whilst the slopes on the opposite side are gentle, and covered with wormwood; signs of the action of water on all these hills is incontestible.

Before reaching the Aral lake, we entered the Cara-coum, or black sands, a desert thus called without its being possible to assign a reason. All the sandy deserts offer nearly the same aspect. The Cara-coum is abundantly supplied with water, which is found by digging one or two toises. The Cossacks who preceded us, dug seventeen wells at Behrat-chaï-koudouk, containing but little water, each more or less brackish.

The Cara-coum extends to the lake of Aral, and in some places to the river Sir, far to the eastward, where it is much wider. In returning from Bokhara, I crossed this desert in eight days, about 268 verstes, that is from the Sir to the Irghiz. After having passed near the Sari-tchaghanak, or yellow bay, a creek of the Aral, we again entered into the Cara-coum, and did not leave it till near Camechlu-bach. The banks of the lake of Aral, from Sari-tchaghanak to the mouths of the Sir, are composed of sand hills driven up from the Cara-coum. To the south of Kouwan, sand is again met with, intersected at intervals by patches of clay extending to the lake. From the Sir dèria, to Kouwan it is entirely of clay, flat and capable of cultivation, if water could be procured for irrigation.

The water had for a long time been so indifferent, that we thought that of the Camechlu-bach excellent; and, lying down upon the ice, we drank it with inexpressible pleasure. The Camechlu-bach is a conside-

rable bay, formed by the Sir, about 50 verstes in circumference; it is the largest collection of fresh water we met with during our journey.

The morning after our arrival, I started with some of my companions and Cossacks to see the mouth of the Sir. We went round the largest half of the Camechlu-bach, and observed two places where the bay becomes narrower and joins the Sir. After having travelled about twenty verstes by the side of the river, which had been covered with ice for two days, we reached the spot where the waters of the Sir, mingling with those of the sea of Aral, contract a saltish taste, and the river begins to widen. At the distance of fifteen verstes it becomes forty toises in width; the delta thus formed is covered with reeds, and the water upon it is not above four feet deep, while the river itself is navigable as far as Kokan, and is probably many toises deep the whole way.

We did not quite attain our end, the height of Caraïar, and of Oñ-adem, small promontories on each side of the mouth of the Sir, partly concealed the view of the sea of Aral. We were still about 20 verstes from the summit of these hills, and had already travelled more than 50, but as we had accomplished the principal object of our excursion by seeing the mouth of the Sir, we turned back again.

Near the Camechlu-bach and along the banks of the Sir, we met a great number of Kirghiz, who had fled from the cold of the northern steppe, to seek a milder climate. We also saw others who had been robbed of their cattle by the Khivians. Their destitute condition had obliged them to become fishermen and agriculturists—occupations which among the Kirghiz indicate extreme poverty. These two tribes, half savages, have alternately pillaged each other for the last 30 years, sometimes as aggressors, at others to retaliate. After this period they began to make use of flour in their food. Habit and economy soon taught them to consider it almost indispensable. They use, however, but a trifling quantity, and come for the purpose of buying it to the frontier towns of Russia or to Bokhara, and give in exchange sheep-hides, goat's and camel's hair. This appears to them a far pleasanter state of existence than the painful cultivation of the ground Besides which, they have a great dread of becoming serfs of the soil, and consider it the height of felicity to be as free as the birds of the air. This is their favourite comparison, when they speak of their wandering life.

It is therefore easy to imagine why Kirghiz in easy circumstances never cultivate the ground—besides which they have an ancient tradition which says "The Kirghiz shall lose their liberty whenever they begin to live in houses, and to follow agricultural pursuits;" and the tradition acquires new strength from the example of the Bachkirs, of whose

fate they entertain a great dread. None therefore but the poorest Kirghiz, who have nothing to give in exchange for corn, raise it for themselves in a few spots near the Ilek, the Emba, the Irghiz, and the Or, in the valleys of the Moughodjar and Ourkatch mountains, along the banks of the Khodja-koul, and of the Ak-sakal, near the Camechlu-bach, and the Sir-deria, and above all between the Djan and the Kouwan-deria, inhabited about 15 years since by the Cara-Calpak, or Kara Kalpak (black cobs) Tartars.

They prefer the spots where the water collects during the rainy season, or from the melting of the snows, and often seek a soil which can be irrigated by means of small canals—the fields near the Sir and the Camechlu-bach are thus situated. In other instances they conduct the water of a river into reservoirs, out of which they draw it to water the lands. This laborious mode of cultivation is followed near the Emba and the Irghiz, and does not allow the fields to be of great extent—indeed they are to be seen only a few toises square. The Kirghiz sow them with millet, which produces a hundred fold, and very rarely, if ever, disappoints the cultivator.

Near the Sir, there are canals five and six feet deep, and dug before the Kirghiz, who I consider incapable of so arduous a work, had established themselves in the country. Fields of a much greater extent are to be met with there—the Kirghiz cultivate oats and barley—they sow the first in autumn and the other in the spring. There are also a few melon grounds, and they preserve their crop in small pits under ground. The fodder for the few horses and cattle they possess, consists of the leaves of the young reeds, whose growth is accelerated by burning the plants of the former year, giving a most hideous aspect to the banks of the Sir.

The embassy arrived on the 19th November, on the banks of the Sir-deria, opposite the hill of Cara-tepèh; during the last 15 verstes, we had crossed a large plain covered with reeds, and constantly overflowed during the spring.

This plain extends about 80 verstes from the mouth of the Sir. It is 10 or 15 verstes in breadth, and in some spots, especially close to the banks of the river, the reeds give place to very fine grass. After passing through this plain, we again saw the sandy plains of the Cara-coum, extending almost as far as the Sir, and running parallel with it for the space of 150 verstes.

Water is very abundant in the Cara-coum: it is principally inhabited during the winter. The Kirghiz then retire with their kibitkas into some hollow, where they are sheltered from the wind. Near the Sir-de-

ria, the usual retreat of the poor, misery had multiplied the number of robbers, and in crossing this part of the country, we perceived on the tops of the hills, Kirghiz who appeared to be watching an opportunity of seizing upon some straggler, or our horses. The guides had warned us, and we kept on our guard.

The Sir near its mouth is about sixty toises in breadth—fifty verstes higher, its width exceeds 150 toises. It is rapid, and navigable, at least as far as Kokan. Some of the Kirghiz told us it was fordable about 150 verstes from its mouth—only during the very great heats. Others declare it cannot be forded at any season of the year.

Chapter IV.

Manners and Customs of the Kirghiz—Election of the Chiefs—their Dissensions—Examples of Cruelty—Severe policy of the Chinese, with regard to the Kirghiz.

The countries watered by the Sir, are the paradise of the steppe of the Kirghiz, who are proud of the existence of so large a river in their territories. To pass the winter with their flocks, on its banks, is the object of their most ardent wishes. The cold is much milder there than on the banks of the Ilek, the Or, and Irghiz; and also than the Monghodjar and Dourgatch mountains, and the sandy plains of the Cara-coum. On the banks of the Sir, the frost is never sufficiently severe to kill the cattle, nor to incommode people living in their habitations of felt—but during the last six years, the rich Kirghiz are deprived of the pleasure of spending the winter on this favoured spot, as their enemies, the Khivians, come and plunder them whenever they have the opportunity.

The Kirghiz delight in wintering amidst the reeds, which grow so thick as to afford a shelter from the storms of wind, which occasionally occur. The wandering tribes are generally of a melancholy disposition, and the murmur of the waters of the Sir has a charm for their idle moments, which are in fact pretty numerous. In truth, nothing disposes the mind to revery more than the sound of a river, which, like time, runs its course with a monotonous rapidity. The Kirghiz often pass half the night seated on a stone, gazing at the moon, and singing melancholy impromptu words to airs not less so. They also have historical songs, which celebrate the great actions of their heroes, but these are chaunted only by professional singers, and I greatly regret not having heard them. I often told the Kirghiz I would willingly hear their

songs; their impromptus were merely compliments, and did not deserve to be remembered.

These children of the desert have remained perfectly independent of foreign manners or civilization, exeept in religion, which, it is perhaps needless to observe, is the Mahomedan of Sunni sect. After having seen the Kirghiz, a correct opinion may be formed of the nomade life—highly prizing his liberty, and despising every thing that can impose a restraint on his actions. Undaunted, warlike and ferocious, the Kirghiz, on horseback and alone, fearlessly enters the desert, and traverses five or six hundred verstes with the most astonishing rapidity, to see a parent or friend in another tribe. In his journey, he stops at almost every oba (camp) he meets, gives what news he may have, and is certain of a kind reception every where, even when not known; he partakes of the food of his host. This is generally krout (cheese known in Persia and Afghanistan by the name of *punneer*), haïran (tyre of India) meat, and when they have it, koumes, a drink prepared from mare's milk, and much esteemed in the desert. He never forgets the appearance of the country through which he has passed, and returns to his own home after some days stay, with abundance of new stories, and enjoys himself with his wife and children till some new object calls him away. The women are his only servants: they cook, make his clothes and saddle his horse, whilst he, with the most perfect nonchalance, confines himself to the care of his cattle, sheep and horses. We saw the brother of a sultan, much respected among the Kirghiz, leading his sheep during 15 days, mounted on a good horse, and dressed in a red cloth cloak, without considering it derogatory to his dignity.

The Kirghiz are governed by elders, heads of families, begs, behadirs, sultans and khans.

The title of beg, properly speaking, is heredit ary, but any person who cannot support his situation by his talents, courage or conduct, soon loses it; whilst those who make themselves respected, obtain it either from the habit people acquire of calling them sultan, or by an assemblage of the tribe, who confer this honourable distinction.

An elder is generally an old man, whom the people have been in the habit of consulting; he must be rich and have a numerous family—he must possess these two requisites; besides a solid sound judgment. Whatever may be the moral character of a Kirghiz, if he is rich, he will always have friends, and will be powerful according to the number of his family.

The behadirs among the Kirghiz, are more celebrated for their courage, of an enterprising and clear judgment, and act as partizans during a war.

The sultans are the relations of the khan; who always exercise some influence among the Kirghiz. They are likewise called, *toura*,* and this title always ensures them great respect from the lower orders. But without merit, they will possess no power among the tribe, who will not be commanded without some great personal quality.

The khan has in fact the power of life and death among the Kirghiz, who have no security against his tyranny, except public opinion, and no where is it so powerful as among the pastoral tribes. The discontented party quickly desert an unjust judge, and choose another for themselves. The khan is consequently obliged to follow the established customs, and to conform to the laws of the Koran. This conduct increases his power. He, however, takes care to keep a *mol'ah* entirely devoted to his interests, and who will explain the laws according to his wishes; and as the sacred volume and its commentaries are susceptible of many divers interpretations, the khan knows how to take advantage of it to authorize proceedings he would never otherwise venture upon. He also is careful to be surrounded by counsellors, usually, all Kirghiz respected by the tribe,and he endeavours to render himself popular with them by means of flattery and presents. However all these precautions would be insufficient to overcome the natural inconstancy of his subjects, if he did not also insure their favour by his activity, boldness, courage, and also excite their awe by occasional acts of severe justice when indispensably necessary. The power of the khan therefore depends upon the general consent of the people. When he has once received that, he may reign despotically, as long as he acts for the interests of the people; his power is limited by the public opinion on that head, it is necessary it should be in his favour to enable him to govern. Woe to him who would strive to brave it—the same power that established, would not fail to overturn him.

I saw the following instance of the cruelty of the Kirghiz: several of the people that accompanied us, fancied that in a beggar whom we met, they recognized a robber of their tribe—they took away his horse, tied his arms, and wanted to cut off his head, though they had no right to do so. They only waited for the order to be given by a young sultan to whom their chief had delegated his authority, and they had sent to solicit it. Permission was, however, refused, and the beggar was set at liberty; but had great difficulty in escaping from the ill usage and abuse with which he was assailed.

I was witness to another case which shows their ferocity. The sultan Haroun-ghazi who accompanied us, caused the march to be led by several hundred Kirghiz—and they unknown to us, attacked the hamlet of the sultan Manem-beg Djanghazi, one of the enemies of Haroun, and

* This must mean tera or branch.

attached to the party of the khan of Khiva. Manem-beg, warned in time of the intentions of his adversary, had prudently fled—but his wives, his brother Iakach, and all his flocks fell into the hands of Haroun-ghazi. We saw them near the Sir-deria—the flocks were sent into Bokharia, and the women confined in their tents on the banks of the river, were delivered up to the brutality of the brother of the sultan.

So far from pitying these unfortunate captives, they only laughed at them, and said it was the right of the conqueror which no person could dispute. Iakach, guarded by five Kirghiz, and mounted on the worst horse they could find, followed Haroun-ghazi, who would never consent to see him. Iakach had served as a guide to the Khivians some months before, when they had plundered Haroun-ghazi. This unfortunate person was only twenty-two years of age, of a prepossessing appearance, and seeing the fate that awaited him, had a melancholy and downcast look.

An old Kirghiz presented himself before the conqueror, and thus addressed him—"My sons were massacred by Iakach during the excur-"sion of the Khivians; the institutions of God and man direct that the "dead should be avenged." The law of retaliation is firmly established among the Kirghiz. Haroun-ghazi was obliged to deliver up his cousin, whose death was instantly decided on. The old Kirghiz approached Iakach, who was mounted, snapped his gun close to his back; it missed fire; but other Kirghiz fell on him, taking off his clothes to prevent their being dirtied; and deaf to the prayers of their victim, they cruelly cut his throat like a sheep, with one of the small knives which they always carry with them; thus satiating the revenge they had vowed against this unfortunate young man.

The Kirghiz are very passionate, the most trifling cause, and frequently an unsuccessful attempt, is sufficient to excite them to the most cruel revenge.

These people have for several years been molested by the Khivians, which induced them to solicit the aid of the Bokharians, several of whose caravans had also been plundered by these banditti; the Kirghiz supposed the government of Bokhara would not fail to lend their assistance. Deceived in this expectation they became furious—one of their chiefs cut off the tail of his horse, and came to the minister at Bokhara, saying, "as this tail has been severed from my horse, so am I from "you; henceforth consider me your implacable enemy." He departed shortly after with two or three friends, and carried off eight camels and two men. They commenced the first hostilities, which this man alone dared to declare against all Bokhara. His ferocious and violent conduct gives an idea of the daring character of these people.

The most trifling motive is sometimes sufficient to induce the most honest Kirghiz to indulge in his favourite passion for pillage; so firmly is the spirit of rapine rooted in the hearts of these people. The great and little horde, have for the last fifty years been subject to a government, a little more settled, and now enjoy a greater state of tranquillity than the other Tartars. It is to a warlike spirit, and indifference to the fatigues of long and fatiguing marches, but above all, the fanatical spirit so prevalent among this rude people, which their chiefs know well how to excite, which renders them so fit for any dangerous enterprize. It may be easily imagined, then, after a severe winter, which is attended with great hardship and loss to the Kirghiz, their shepherds assemble to make an irruption, or establish themselves under a milder sky, such as Bokhara, so celebrated by them, and so much more fertile and beautiful than their own deserts. Thus the emigration of these barbarians may again take place into countries where artillery is little used, and regular troops unknown.

I will finish this digression on the subject of the Kirghiz, by a remark, that they never make use of this name among themselves ; they invariably style themselves *Kasak ;* which, according to some, signifies horseman, and to others warrior. They say the Bachkirs call them Kirghiz, but are ignorant from whence the name is derived, and it is used only in speaking of the great horde. This tribe has no khan, and is governed by different sultans; many of whom have sought the protection of Russia, others that of China, but their sole object is to obtain presents and assistance from either party. The Kirghiz of the great horde greatly fear the Chinese, whose severe and even cruel policy is, however, justified by necessity. A Chinese caravan was plundered near the frontiers of Soungarie, garrisoned by the advanced posts of the Mandchous Tartars. The Chinese retaliated, and thousands of the Kirghiz, innocent as well as guilty, paid with their lives this agression. Some such examples have put a stop to the agressions of these tribes on the frontier of the Chinese empire.

In the other two hordes, the khans ought to be confirmed by the emperor of Russia, who exercises a great influence in their election, and they swear fidelity to him.

The tribes of Turkoman now pay a tribute to the khan of Khiva and Bokhara ; probably one day the Kirghiz will be obliged to do the same to Russia. But it is necessary, in the first place, they should find the advantages of her protection, in defending them against the irruptions of the Khivians.

CHAPTER V.

Passage of the Sir—Bridge of reeds—Hunting the wild-boar—Ruins—Drying up of the Djan-deria—Route passed—Kizil-coum—Plunder.

In the month of June, the melting of the snow on the great range of Aba-tagh, swells the waters of the Sir-deria, and overflows the lands on each side, which are so greatly fertilized by it, that grain is produced with very little trouble. Fruit trees, willows, plane trees, also thrive, and it appears capable even of producing the silk-mulberry and cotton. At the time of our journey, the river was frozen, and we crossed it with the greatest precaution. The ice gave way after the passage of our two guns. A camel even broke it with his weight, and was got out with the greatest difficulty. The Kirghiz burnt bundles of reeds, and spread the ashes on the ice, to prevent the camels sliding. At last, after much noise and quarrelling, we passed the Sir, so celebrated in antiquity under the name of the Jaxartes.

On our return in the month of April, the passage was much more slow and difficult. Two boats which we carried with us served as a raft to transport our artillery—the horses were swam over. Three large Kirghiz boats used to ferry over caravans, served to transport our provisions, on the payment of a trifling sum. These boats were built of the wood of the poplar, without iron, and very frail; they had been brought from Khiva by the lake of Aral. A water communication exists between Khiva and the Sir, used by the poorer Kirghiz, as a simple coasting trade. The boats are sometimes brought from Turkestan, where they are dearer than at Khiva.

The camels were swam over, and it was a singular sight to see ten or twelve of these animals tied together, and directed by naked Kirghiz of the most athletic forms; sometimes they held hard on the camels, or swam by them shouting to encourage the beasts. They continued this work nearly a whole day, three camels were drowned, but brought on shore, and having their throats cut with the usual Mahomedan ceremony were eaten by the by-standers.

In swimming, the camel leans on one side, so as to present a greater surface to the water; his hump appears to assist him, and is always nearly covered with water. The passage of the river on our return kept us two whole days.

On our march towards Bokhara, we crossed the Kouwan-deria with great ease, the ice being sufficiently strong. It is a branch of the Sir, very rapid, and the banks covered with reeds; it may be about 20 or 30 yards broad, and from 5 to 10 feet deep, the water is particularly clear.

On our return we halted at a part of the same river (Kouwan-deria)

where there were the remains of a bridge of reeds, and re-constructed for our convenience of great façines made of this plant tied together, and laid on cables of the same materials fixed to posts firmly planted into the opposite banks—these façines were attached with strong ropes and a second layer put on. In this manner they formed a bridge, over which camels passed with safety fully loaded; we were not however without fears that the current would carry away this new kind of floating bridge.

Sometimes in place of reeds they employ bales of cotton so tightly tied, that the water penetrated very little into the material.

The land between the Sir and Djan deria is covered with sand-hillocks of 3 or 4 toises in height, resting on a bed of clay; after passing an extent of clay-soil, you frequently again enter a tract of sand.

On leaving the Sir, we crossed a plain covered with reeds, evidently overflowed, which obliged us to make several circuits; the Kouwan which we followed for 4 days, flows in a clear stream, through beds of sand, which extend to 25 verstes of the place; we passed it, on going to Bokhara; and it approaches much nearer in some places. On our return, we came on the banks of the Aralu-Koullar, lakes which run parallel to the Kouwan, to the place where the Djan-deria detaches itself; some of the sheets of water are nearly 10 verstes in circumference, whilst others are mere holes filled with water—they dry up in summer, and the beds are then cultivated by the Kirghiz.

This is the least barren part of the steppe, and the marks of extensive cultivation are still seen in fields which were tilled by the Cara-calpaks, as late as 1803. These people, of the same race as the Kalmouks, poor and powerless, were unable to resist the incessant incursions of the Kirghiz. After having in vain solicited the aid of Russia, Khiva and Bokhara, they abandoned their fertile fields, and removed into the territories of Khiva and Bokhara; thus divided, they now wander, one party to the south of the lake of Aral, subject to Khiva, the other under the dominion of Bokhara, have their station to the west of Samarcand, and north of Sarewchan. Not being rich, and possessing few camels, they use carts drawn by oxen or horses.

The Djan-deria is bounded on each side by plains of clay, here and there intersected by sand-hills, which extend to the Kouwan and Kizil-coum.

In this plain there are several thickets of the *saksaouls*, affording cover to different kinds of beasts of prey; wolves, tiger cats, and even tigers. The Kirghiz informed us that they have been obliged to withdraw their flocks from this quarter, to prevent their being destroyed by these animals, not venturing to attack them when they are in numbers

together, should they appear singly, then 20 or more men will assemble, armed with matchlocks, near the reeds where the tigers hide themselves, and set fire to them; the heat and smoke forces the tiger to quit his haunt, when he his shot by the hunters. We had seen something of this kind of hunting on the banks of Aralu-koullar and Kouwan-deria, which are likewise covered with reeds, and swarming with wild hog, of which we killed a great number, one day no less than eighteen in less than three hours.

This mode of hunting offers a very singular spectacle to Europeans. In the midst of a great plain covered with reeds, rise columns of smoke and flame, through which may be seen a hundred Cossacks riding their horses at full speed, sometimes before us and then behind; our horses frequently leading us directly on these ferocious animals, who plunge into the swamps, or suddenly disappear into the reeds, to return with greater fury on the hunters. Shots from guns and pistols are heard on every side, with the neighing of the wounded horses, which were instantly purchased by the Tartars to eat. The Cossacks enraged, were every where attempting to spear the hogs; one officer of Cossacks, offended at being told he feared the chase, dismounted and laid hold of an immense boar which had been wounded, and fired his pistol close behind its ear. To comprehend the scene, it must be witnessed; no description can convey an adequate idea of boar hunting in the desert.

I cannot describe to the reader the pleasure we experienced in again finding ourselves among wood, the rustling of the wind among the branches, and a confined horizon, might be said to be for us a novelty, recalling a fond recollection of our country. It is in the deserts and among nomades, that the true happiness of an European life is felt.

The ruins of old canals are still to be met with in this country; proving that it was once much better peopled than at present.

Aboul-ghazi, khan of Khiva, generally passed some months of the summer on the banks of the Kizil-deria, celebrated for their fine pastures.

In no part of the Kirghiz steppe, are to be so frequently seen traces of ancient habitations as on the banks of the Djan-deria. I have seen the ruins of Koul-tchomktau, which is composed of elevations of earth of 150 toises in length, and the highest may have 3 toises (18 feet) in height. It is clear these buildings, whatever they may have been, were built with sun-burnt bricks; near these ruins are small canals about 1 toise or 6 feet broad and two deep; a great quantity of broken pottery is also to be met with. These ruins are about 15 verstes from the Djan-deria. The Kirghiz could give us no account of their use or date, but

supposing they must have been erected by the Nogaïs, the name by which they call the people, who occupied these steppes before them. They also stated that these ruins are much more numerous in the eastern part of the Kirghiz country, and are also met with on the Tobol, the Ilek and Emba, those in the best preservation and most celebrated are those of Djankend, which they suppose to have been the residence of the Ouz chief. Djankend, situated about 40 verstes from the mouth of the Sir, between that river and the Kouwan, was built of burnt-bricks. The ruins are surrounded with canals of irrigation and cultivated fields of far greater extent formerly than at present.

The Djan-deria is probably nothing more than the ancient bed of the Kizil-deria; it is also possible, this river might have also flowed more to the south; for, 40 verstes in that direction from the Djan-deria, we found the traces of the bed of a great river. The Djan-deria was a considerable river even in 1816, of greater dimensions than the Kouwan. At present its dry bed only marks the former course. It may be 100 toises (600 feet) broad, and the banks 18 or 24 feet in height. A few holes here and there filled with water alone mark this once great river. This drying up has much astonished the Kirghiz, who are ignorant of the true cause; some attribute it to the construction of a dam to throw the water into the Kouwan at the spot it separated from this river.

Others suppose the bed has been filled with sand from the Kizil-coum, which appears the most probable; they may also account for this unfortunate drying up of the water to the great extent lost by evaporation and absorption into the sands of the desert. Whatever may be the cause, it is a most surprising fact, that the Djan-deria has disappeared. The water still found in the old bed, smells a little of sulphur, and is the most unhealthy we met with in our journey; it was still more dangerous from our not being able to replenish the supply during 5 days march in the great desert of Kizil-coum, which must be crossed to go to Bokhara. This water occasioned pains in the stomach to all our soldiers, and to some the most violent cramps. One died in strong convulsions.

We left the Djan-deria on the 3d of December, and found ourselves on the great road which leads to Bokhara. I call it the great road, for it was a track about 3 toises wide, and very much beaten by the multitude of travellers in that direction. The road first passed through a small forest of *saksaoul;*—it was less distinctly marked along a clayey plain which ends at the distance of about 57 verstes from the Djan-deria, and was again very visible in the Kizil-coum, where it crosses valleys formed by sandy-hillocks. This road is very much frequented by all the caravans which travel from Bokhara to Orsk, or to Orenbourg, and by all the

Kirghiz of the western side of the steppe who carry cattle to the markets of Bokhara, they take care to cross the Kizil-coum at the narrowest part and on their return, they provide themselves with water from the famous well of Boukhan, situated at the southern extremity of the desert.

The banks of the Djan-deria form a line of distinction in the nature of the country between Orenbourg and Bokhara; the clay, without being more productive, on account of the dryness of the climate, is much stronger; and the soil here rests on argillaceous rocks, whilst those of the steppe have for a base sandstone or lime.

The climate also is very different. Land tortoises, rare to the north of the Djan-deria, are very common in the Kizil-coum: very little snow falls during the winter, and it never remains long upon the ground, so that every thing denotes a warm climate. The banks of the Kouwan, and the Djan-deria are inhabited, principally in the neighbourhood of the sea of Aral, by some Kirghiz tributary to Khiva.

The barrenness however, is perfectly astonishing: from the Djan-deria, to the place where cultivation recommences, not a single river is to be met with in a space of 500 verstes, and water is only to be obtained from wells—sometimes abundant, sometimes the reverse; but in general containing brackish water.

At the spot where we crossed the Kizil-coum, it was 100 verstes wide. Its length is very considerable—for it extends from the Sir-deria, where it is much wider, to the sea of Aral and to the Amou-deria. This desert is remarkable for its sterility. Spring water is no where to be met with. It is said that there were formerly three wells near the road which we followed, and that they were filled up to prevent their being resorted to by the robbers, who generally remained in ambush among the surrounding hills. The robbers have actually been expelled from the Kizil-coum, but they at present hide in the ravines of the Bokhara mountains, and when they feel themselves strong enough, fall upon the travellers passing that way—pillage, and sometimes kill them, if they make any resistance.

The well of Boukhan, is at present as dangerous as the Kizil-coum used to be: particularly as it is the part of the road between Bokhara and Orenbourg, that is nearest to Khiva, and the Khivians are constantly on bad terms with the Bokharians, or the Kirghiz, or sometimes, as in the year 1820, with both at the same time. Our party therefore was on the alert, and patrols were sent into the defiles of the Boukhan—fortunately we achieved this dangerous passage without any accident—but 10 days afterwards a caravan of Bokharians and Kirghiz, was pillaged by

the Khivians, who assembled at the well of Boukhan, fell upon them, and pursued the fugitives as far as the Kizil-coum, where they met, and engaged with a troop of Kirghiz. On our return we found on the road the bodies of more than 100 people who had perished on the occasion of this irruption of the Khivians.*

Almost every day we met with caravans of Kirghiz coming from Bokhara; who, after selling their sheep, brought back barley, tobacco, meal and cotton, from that town. We felt much pleasure in conversing with these *bazartchi* (that is to say people returning from market), and felt great interest in hearing accounts of Bokhara, and enquired how long it was since they had left the city. We considered ourselves very fortunate in being so near the end of so long and troublesome a journey, of which we were beginning to get heartily tired.

We had travelled in the Kizil-coum, from 42 to 46 verstes (30¾ miles) a day—the marches were very long, as we were constantly encountering deep sand-hills—it was absolutely necessary we should not loiter, so as to be too long without the opportunity of getting fresh water.

Our horses had met with very indifferent forage in the Kizil-coum, and were becoming visibly thinner. The Bachkir horses were skeletons, and could no longer draw the six waggons that remained of 25 which we brought from Orenbourg, and we were obliged to replace them by Cossack horses, which had until then been employed to carry forage. All our people, and particularly the foot soldiers, were much emaciated—in short it was absolutely necessary we should arrive very shortly. We carried ice, and the water of the Djan-deria in leather bags, or barrels, notwithstanding it was very difficult to convey sufficient water for four and a half days, for our numerous party of men and horses.

On our arrival at Iouz-koudouk, one of the baggage horses drank to such excess that he fell, and was not able to rise for several hours. Notwithstanding these numerous inconveniences, not one of our saddle horses died, but we lost almost all the cart horses; particularly one day, when six were so perfectly exhausted, they could not follow us.

From the Djan-deria to Iouz-koudouk, the distance is two hundred and eleven verstes (51 leagues), which we traversed in five days with the artillery, through a sandy desert, destitute of water and grass, that after having performed 1000 verstes with the greatest celerity, camels carried our infantry by turns; but after all it was very difficult for a military body to accomplish such a march in so short a time.

* Two pages of my copy of M. Meyendorff's work are here lost.—*Translator.*

CHAPTER VI.

Gold Mines—Aghatma—Fine country—Reception by the inhabitants—European prisoners—Interview with the Couch-beghi—Entry into Bokhara.

After passing the Kizil-coum, we crossed a plain covered with absinthe, bounded on the right by the mountains of Bokhara. The Bokharians, who accompanied us, dreaded a surprize from the Khivians; as they said it was to take the nearest road to Iouz-koudouk; this prevented our examining the mountains of Boukhan, which I was not able to do till our return the next spring: like the mountains of Moughodjar, they rise to the height of about 600 feet above the plain, very much scarified, rocky, composed of quartz, mixed with sienite and diabase, forming numerous, but very narrow glens. Near the wells of Boukhan, a small spring runs from the mountains, which disappears a few hundred toises in the plain. The best road, and the shortest, is however that which runs from the Kizil-coum, near the mountains, to Iouz-koudouk.

After passing the plain, I have just mentioned, we entered an elevated district, through which runs the mountains of Boukhan, Iouz-koudouk Kapkantach; which are ramifications of the great range situated to the south of Khokhan and east of Bokhara.

Near the wells of Boukhan, this chain turns to the west, extending to the Amou-deria, separating near its banks into the hills of Tchavaswali and Vasilkara, famous for their rich veins of gold. It is said, this induced Peter the Great to send the expedition of Bekevitch. At present the khan of Khiva forbids the working of the gold mines of Vasilkara, not to attract the cupidity of the Russians. There is perhaps exaggeration in these stories, as I saw at Orenbourg a piece of sulphureous pyrites, found at Vasilkara, which might have deceived people, who take every shining yellow substance for gold.

The mountains which we had just passed are composed of sienite and diabase, or greatly mixed with calcareous matter, they were generally of a dark green. These stones split into their flakes like slate, and the hills have a much more rounded appearance, and less conical than those of Moughodjar. The soil and the valleys are also more sterile, even the absinthe is very rare.

In some places, the road is rugged, in others open, and easy for carriages. Iouz-koudouk, or the hundred wells, is a valley, where there are two wells about 18 feet deep, affording abundance of excellent water; besides thirty others, small, and generally dry.

The mountainous region commences at seven verstes, below Iouz-

koudouk on the road we followed, and extends about thirty-four verstes to Kapkantach, when we again entered the plain, leaving on the left the Bech-boulak, or Bukbouldouk, a low hill. Bukbouldouk signifies a quail, a word invented by the Kirghiz, in imitation of the cry of that bird.

At Kapkantach, there are several sulphureous springs, with a strong smell, and very saltish; our horses would hardly drink it, but on our return in the spring, a horse emptied five buckets of this nauseous water. As the weather was very hot even at this season, the men suffered from thirst, and we had great difficulty to prevent, even for a few minutes, our soldiers from drinking this detestable liquid, which at the same time was very cool.

At twenty-two verstes from Kapkantach, commences the sands of Batkak-coum, which are twenty-eight verstes broad—there are, however, only the four last which are heavy—twenty-six verstes from these sands, we again entered a hilly country, which is called Sousiz-cara, (black without water). These hills are in fact of a black colour; the surface perfectly bare, water is found in two wells, which we left ten verstes to our left. Our water being expended, we made use of the snow which lay in our route, principally on the hills, where, notwithstanding their slight elevation, we experienced a very sensible change in the temperature. We at last arrived at Cara-aghatch, after having performed the last forty verstes over a flat country, though surrounded with hills.

Two verstes from Cara-aghatch, four custom-house officers met the mission, and after a salutation, addressed us the usual compliments of *khoch amedid* (you are welcome), informing us that the khan had sent provisions for us to Aghatma, distant thirty-eight verstes from Cara-aghatch. Monsieur Nègri politely expressed our gratitude, we resumed our journey and arrived with these officers at Cara-aghatch.

It was in this place we saw for the first time trees; about a hundred old mulberry bushes growing round a spring of sulphureous water—the heat of which was nearly 15 degrees of Reaumur, 66° Fahrenheit. Some Mahomedan saint planted these trees—near which he had lived, and is buried there.

The water is said to possess some miraculous qualities; all the Mahomedans of our party bathed in it. The spring issues from a low hill of clay, and all the bushes are covered with pieces of cloth and rags tied on the branches as an offering to the saint.

The water of this spring is very abundant, forming a little brook, which is however soon lost in the clay soil. Notwithstanding we had

been marching without intermission for four days, we set off again on the fifth, to get out as soon as possible of this barren region, and enjoy the provisions prepared for us by the khan of Bokhara.

We arrived at Aghatma the 25th December, after having crossed the Cara-aghatch, a mountain of considerable height, whose slope is very gentle towards Aghatma. The Bokharians say that in this place there was formerly a city, which a neighbouring hillock covered with broken bricks appears to confirm. Aghatma is a kind of basin, with some appearance of having been once flooded, forming a lake which supplies this city with water.

There are still two strong springs of sulphureous water, but not so hot as those of Cara-aghatch. We remarked at Aghatma, a small tower or hut of mud with a vaulted roof, serving as a kind of advanced post towards Khiva: here the Bokharians keep a guard when they dread an excursion of the Khivians, or the arrival of a caravan from Russia; the sentinel placed on the roof, commands an extensive view of the country round.

On the road to Aghatma an officer of the khan, having the title of *Iouz-bachi*, with about 20 horses met the ambassador, informing him he was directed to be his conductor to Bokhara, and provide every thing the mission could require. Several of the horsemen then approached Monsieur Négri, and took his hand in the European manner.*

We here quitted the desert, through which we had performed a tedious and monotonous journey of 70 days. The desert ends at these last mentioned sandy plains, beyond which we found ourselves every where surrounded with villages, gardens, plantations, mosques, &c.—in fact, we appeared to be suddenly transported into a fairy land.

If the appearance of this country excites feelings of admiration in Europeans accustomed to the sight of populous and well cultivated fields, how strong must be the impression produced upon the Kirghis, and other inhabitants of the desert? How is it possible they should not long to invade a country so much favoured by nature, and which in summer would afford them vast plains for the indulgence of their wandering habits—whilst in the winter they could take refuge in the numerous towns and villages from the inclemency of the season.

Every thing excited our curiosity in this country, which is almost unknown to Europeans. It may be imagined with what interest we contemplated the oriental tribes, dressed in their blue clothes, and white turbands, who flocked to meet us—some mounted, others on foot—some riding on horses, others on asses—who crowded round us, saluting us after the fashion of this country. Several showed their joy on ap-

* Here, also, is a hiatus of two pages of unimportant matter.—*Translator.*

proaching us, by addressing us a few obliging words in the Russian language. Their signs of astonishment—their cries, and in fact, the tumultuous agitation of the whole crowd, gave our entry into Bokhara the appearance of a festival, which we should have enjoyed, but for the presence of the people connected with the police—whose voice sounded above all the tumult, and who armed with great sticks, struck indiscriminately on every side to make room for us. The sight of this violence saddened us when we remembered that our arrival was the occasion of all this confusion, and that the wish to see so many Ourousses was stronger than the fear of blows.

It was with feelings of the most painful nature, that we observed, in the midst of this Asiatic population, some Russian soldiers reduced to the sad condition of slaves. The greater part of them were old and infirm; at the sight of their countrymen they could not restrain their tears; they faltered out a few words of their mother tongue—they strove to cast themselves among us—so great was their emotion at the sight of our warriors. It is impossible to describe these affecting scenes which wrung our hearts.

We were informed at Khatoun-koudouk that the Couch-beghi, one of the principal officers of the Bokharian government, was waiting for us at the next village—at the distance of about a verst, from where cultivation begins, a chief of 100 men, Pendja-bachi, came to meet us with 200 horsemen. He led us through the crowd, and our infantry, beating drums, marched to the tent where the Couch-beghi was seated. We dismounted about 30 toises from it to advance through two rows of foot soldiers seated on the ground, who rose when the chargé d' affaires passed. We saw several tents of different colours, a great number of richly caparisoned horses, covered with chabragues embroidered in gold were picketted, tied by the head and the hind feet; the tents were surrounded by officers and slaves; and, in short, every thing that surrounded us added to the solemnity of this our first interview.

The Couch-beghi, named Hakim-beg, was seated in his tent with four Bokharian noblemen; when Monsieur de Négri had taken the seat assigned to him, the chief addressing himself to the persons attached to the embassy, said "Be seated, for you are strangers to us, and we feel great pleasure in seeing you." M. de Négri having afterwards conferred with the Couch-beghi, about the ceremonies to be observed on his presentation to the khan, did not agree entirely with that officer. The audiences had begun under most favourable auspices, but before its termination, the Bokharian character was completely unveiled. The Couch-beghi was so indiscreet as to request M. de Négri would present

our two pieces of artillery to the khan; when he found he was unable to obtain them, he did not hesitate to ask for M. de Négri's carriage for his master; yet he was not ignorant that we had several camels loaded with presents for the Court of Bokhara.

The Couch-beghi might have been about 50 years old, his long dark brown beard was beginning to turn grey. He was tall, the expression of his countenance pleasing and benevolent. He spoke with great ease in Persian, wore a white Cashmere shawl for a turban, a khilaut of the same material, figured with large flowers, and a sable pelisse, covered with striped cashmere.

Our journey had been as pleasant as we could have wished. With the exception of some foggy days, and a few hours of snowy weather or drizzling rain, the weather had been generally so fine, that the Kirghiz said we had doubtless a saint in our party. This continued fine weather, rendered our march much easier, by preserving us from all the discomforts that would have been caused by rain, snow and cold.

We passed the night of the 17th of December, near a small town, called Wafkend, after passing through a well-cultivated and populous country, the same flourishing appearance continued the following day, when we arrived at Bazartchi, a large town about two verstes from Bokhara. We had travelled 40 verstes since our interview with the Couch-beghi, and during the two last days we were constantly surrounded by a crowd of people. The police were constantly driving them off with their sticks, the most inquisitive allowed themselves to be beaten, fled and then returned to the charge. Our soldiers marched in the greatest order, they were in complete uniform, and the beat of their drums, which was heard every now and then, caused exclamations of astonishment from the crowd. We pursued our course in the midst of tumult, and public marks of the joy excited by our arrival.

Near Wafkend, four chiefs paid a complimentary visit to Monsr. Négri, delivering a letter of congratulation from the khan. One was a relation of this prince, but did not understand a word of Persian, he was the only Ouzbek I saw, who did not speak that language. Two others were slaves of the khan; one an Afghan, the other a Persian, the latter was simply dressed in a cloak made of camel wool, the others in rich dresses of gold and red silk.

About 15 verstes from Bokhara, the chief of the Iassaoul, with about 30 of his men, came to meet the ambassador, and accompanied us to Bazartchi, where we were lodged in a house belonging to the Couch-beghi; the rooms were so damp, we preferred sleeping in our kibitkas, notwithstanding the strong inclination we had to quit them.

After thirty-six hours of discussion, the ceremonial of our reception was arranged; and the khan agreed that Monsieur Négri should be seated in his presence.

On the 20th December, we made our public entry into Bokhara, a detachment of Cossacks marched in front with the presents, which consisted of furs, China, crystals, watches and guns. Another party of Cossacks were in the rear, and the march was brought up by a detachment of infantry. An Ouzbek of rank, who perfectly understood Persian, conducted the ambassador to the palace.

In this order we slowly advanced, and after passing the gate which was very lofty, we continued our route through a narrow winding street, of gloomy houses, built of earth, and flat roofed. At last we arrived at the great square, surrounded with mosques, colleges or madrissa, and the enclosure of the palace.

After dismounting, we entered a vaulted corridore built of brick; but with soldiers on each side, in number about 400, armed with muskets of every different shape and length. We then entered a small court, the passage, in which there were about 10 guns without carriages, and at last arrived in a square court, bounded by walls, round which were seated 300 or 400 people of Bokhara, dressed in white turbans and coats of gold brocade. Turning to the right, we reached the anti-chamber, which joins the hall of audience, where the khan was seated on cushions, covered with red cloth, ornamented with rich gold fringe: on the floor was a common Persian carpet, the walls of white plaster and the ceiling of coloured planks.

This hall was double the length of its breadth: the khan was seated with his back to the wall opposite the door we entered; on his left were his two sons, one about 15 years of age. On his right was the Couch-beghi, on each side of the door were five grandees. Monsieur Négri supported by two chamberlains, advanced to within 12 paces of the khan, whom he addressed in Persian, presented his credentials through the Couch-beghi; the officers of the mission remained standing with their backs to the wall, on each side of the door.

The Couch-beghi immediately presented the emperor's letter to the khan; the prince read it aloud; after which he requested Monsieur Négri to order some of the soldiers to enter the anti-chamber, who left their arms outside; on seeing them, the khan laughed like a child; in the expression of his countenance, there is very little intelligence; he may be about 45 years of age, with a full beard, black eyes, and an olive complexion; appearing much debilitated. He wore a dress of black velvet, ornamented with precious stones; a muslin tur-

ban; on it was an aigrette of heron's feathers, with a gold band crossing obliquely, and much resembled the Kalewi or head dress, of the grand vizier or kizlar-agassi, of Constantinople. The Couch-beghi, and three other principal officers, in place of turbans, wore cylinder caps of fur. The master of ceremonies carried a sort of halbert, with an axe-shaped head of silver. The presents were delivered to the khan in another room; the audience broke up in about 20 minutes, when we all assembled outside the palace. Our escort returned to Bazartchi, and bivouaced in a garden, during the whole remaining part of the winter. Monsieur Négri and the attachés of the mission, were lodged in a large house, within the city of Bokhara, belonging to the Couch-beghi.

We remained in this city from the 20th December 1820, to the 10th March 1821; the weather was very fine, when we proceeded to Bazartchi. The bivouac in the garden appeared preferable to us to the dull houses of the town.

The 22d of March, we left Bazartchi, and on the 25th, quitted the country of Bokhara, well pleased at having seen this country, and still more so at leaving it.

(*To be continued.*)

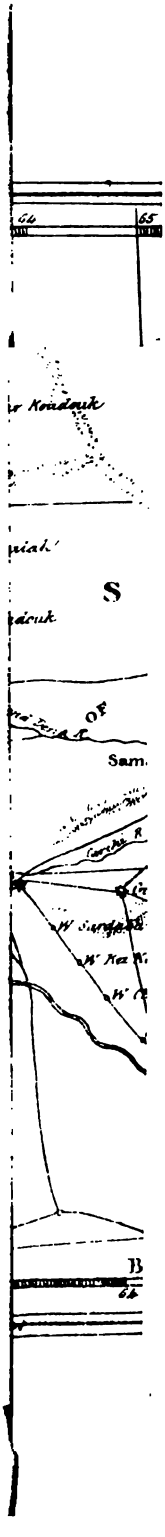
Route from Orenbourg to Bokhara as followed by the Russian Mission in the year 1820.

Date.	Encampments.	What was found at the halting stations.	Distance in Verstes and Toises.	
			Verstes.	Toises.
Oct. 10	Rivulet of Berdianka.....	Water and grass	20	251
11				
12	—— Bitli-sou.....	A little water	25	469
13	—— Bourté	Water.....	33	280
14	—— Ouzoun-Bourté	Water, grass and bushes.....	26	120
15				
16	—— Cara-boutak.....	Good water and grass.....	35	302
17	River Ilek	Do.. do. do.	27	403
18				
19	River Ilek	Do. do. do.	31	60
20	Brook Tamdy-iaman.....	Do. do. do.	27	380
21	—— Souïouk-sou	Brushes, reeds, water-grass.....	29	470
22				
23	Brook Talach-beg.....	Bushes, water and grass	35	37
24	Mountain of Bassagha....	No water, a few bushes, little grass.....	31	386
25	River Koubleïli-temir.....	Bushes, a little grass, water brackish....	29	89
26				
27	River of Tiraklu.....	Good water, a little grass, and a few bushes.....	31	219
28	Brook of Cara-akenti	Bad water, little grass, and few bushes	34	110
29				
30	Brook Touban	Water, bushes and grass	27	123
31	—— Kaoundjour	Do. do. do.	22	101
Nov. 1	—— Kaoundjour.....	Do. do. do.	29	260
2	Lake of Khodja	Water, reeds, grass....	44	450
3				

Route from Orenbourg to Bokhara as followed by the Russian Mission in the year 1820.

Date.	Encampments.	What was found at the halting stations.	Distance in Verstes and Toises.	
			Verstes.	Toises.
4	Wells of Coul-koudouk.....	Water, reeds, grass, a few bushes.....	29	520
5				
6	Adji-koudouk.....	Water, reeds, grass, a few bushes.....	24	383
7	Tchouber-tepeh.....	Brackish water do. do.	29	35
8	Source Ok-tani	Bad water, bushes and grass	26	432
9	——— Sari-boulak.....	Do. do. do.	39	229
10				
11	Mountain of Derman-bachi.....	Bushes, grass, no water.....	30	161
12	Wells of Ouratchaï.....	Bushes, bad grass, bad water.....	20	407
13	Kulli.....	Do. do. salt water	30	268
14	Hill of Sapak.....	Bushes, no water or grass	26	162
15	Bay of Kamechlu.....	Scattered bushes, good water, a little grass.....	25	219
16				
17				
18	Ialter-koul.....	Scattered bushes, fine grass, good water.....	27	19
19	River Sir.....	Good water, reeds, grass, bushes	26	12
20				
21				
22	Small lake.....	Water, bushes and grass	9	378
23	Plain.....	Bushes, no water or grass.....	24	79
24	River Rouvan.....	Scattered bushes, number of trees, good water.....	29	329
25	River Kouvan	Do. do. do. do.	19	304
26	River Kouvan.....			

Note.—104 verstes are equal to a degree or 69½ English miles.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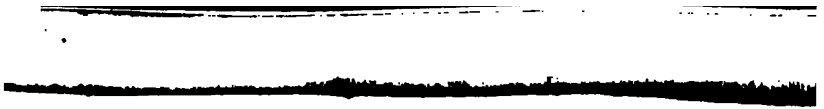


VII.—*Report on the manufacture of Tea, and on the extent and produce of the Tea Plantations in Assam.*—*By* C. A. Bruce, *Superintendent of Tea Culture.*

(Presented by the Tea Committee, August 16th, 1839.)

I submit this report on our Assam Tea with much diffidence, on account of the troubles in which this frontier has been unfortunately involved. I have had something more than Tea to occupy my mind, and have consequently not been able to commit all my thoughts to paper at one time; this I hope will account for the rambling manner in which I have treated the subject. Such as my report is, I trust it will be found acceptable, as throwing some new light on a subject of no little importance to British India, and the British public generally. In drawing out this report, it gives me much pleasure to say, that our information and knowledge respecting Tea and Tea tracts are far more extensive than when I last wrote on this subject;—the number of tracts now known amounting to 120, some of them very extensive, both on the hills and in the plains. A sufficiency of seeds and seedlings might be collected from these tracts in the course of a few years to plant off the whole of Assam; and I feel convinced, from my different journeys over the country, that but a very small portion of the localities are as yet known.

Last year in going over one of the hills behind *Jaipore*, about 300 feet high, I came upon a Tea tract, which must have been two or three miles in length, in fact I did not see the end of it; the trees were in most parts as thick as they could grow, and the Tea seeds (smaller than what I had seen before) fine and fresh, literally covered the ground; this was in the middle of November, and the trees had abundance of fruit and flower on them. One of the largest trees I found to be two cubits in circumference, and full forty cubits in height. At the foot of the hill I found another tract, and had time permitted me to explore those parts, there is no doubt but I should have found many of the Naga hills covered with Tea. I have since been informed of two more tracts near this. In going along the foot of the hills to the westward, I was informed that there was Tea at *Teweack*, or near it: this information came too late, for I had passed it just a little to the east of the Dacca river, at a place called *Cheriedoo*, a small hill projecting out more than the rest on the plain to the northward, with the ruins of a brick temple on it; here I found Tea, and no doubt if there had been time to exa-

mine, I should have found many more tracts. I crossed the Dacca river at the old fort of *Ghergong*, and walked towards the hills, and almost immediately came upon Tea. The place is called *Hauthoweah*. Here I remained a couple of days, going about the country, and came upon no fewer than thirteen tracts. A Dewaniah who assisted me to hunt out these tracts, and who was well acquainted with the leaf, as he had been in the habit of drinking tea during his residence with the Singphoes, informed me that he had seen a large tract of Tea plants on the Naga mountains, a day's journey west of *Chiridoo*. I have no reason to doubt the veracity of this man; he offered to point out the place to me, or any of my men, if they would accompany him; but as the country belonged to Raja Poorunda Sing, I could not examine it. I feel convinced the whole of the country is full of Tea.

Again, in going further to the south-west, just before I came to *Gabrew* hill, I found the small hills adjoining it, to the eastward, covered with Tea-plants. The flowers of the Tea on these hills are of a pleasant delicate fragrance, unlike the smell of our other Tea-plants; but the leaves and fruit appear the same. This would be a delightful place for the manufacture of Tea, as the country is well populated, has abundance of grain, and labour is cheap. There is a small stream called the *Jhangy* river, at a distance of two hours walk; it is navigable, I am informed, all the year round for small canoes, which could carry down the Tea; and the place is only one and a half day's journey from *Jorehaut*, the capital of Upper Assam. South-west of *Gabrew Purbut* (about two days journey) there is a village at the foot of the hill, inhabited by a race called Norahs; they are Shans, I believe, as they came from the eastward, where Tea abounds. I had long conversations with them, and the oldest man of the village, who was also the head of it, informed me, that when his father was a young man, he had emigrated with many others, and settled at *Tipum*, opposite *Juipore*, on account of the constant disturbances at *Munkum*; that they brought the Tea-plant with them and planted it on the *Tipum* hill, where it exists to this day; and that when he was about sixteen years of age, he was obliged to leave *Tipum*, on account of the wars and disturbances at that place, and take shelter at the village where he now resides. This man said he was now eighty years of age, and that his father died a very old man. How true this story is, I cannot say, and do not see what good it would do the old man to fabricate it. This was the only man I met with in my journeys about the country who could give any account of the Tea-plant, with the exception of an Ahum, who declared to me that it was Sooka, or the first Kacharry Rajah of Assam, who brought the Tea-plant from *Munkum*;

he said it was written in his *Putty*, or history. The *Ahum-Putty* I have never been able to get hold of; but this I know, that the information about the Tea-plant pointed out by the old Norah man, as being on the *Tipum* hill, is true; for I have cleared the tract where it grew thickest, about 300 yards by 300, running from the foot of the hill to the top. The old man told me his father cut the plant down every third year, that he might get the young leaves.

To the west of *Gabrew* I did not find any Tea; but to the westward of the *Dhunseeree* river I found a species, though not the same as that we use. If the people on the west side of the *Dhunseeree* river were acquainted with the true leaf, I think Tea would be found. I planted it all along the route I went, which may lead to its eventual discovery; but people should be sent to search for the plant who are really acquainted with it. I think a vast quantity of Tea would be brought to light if this were done; our tracts are distributed all over the country. How much Tea they would all produce if fully worked, I will not pretend to say; but in the course of this subject, I will mention such matters relative to the tracts and the plants on them, that every one may make his own calculation. Until lately we had only two Chinese Black-Tea makers. These men have twelve native assistants; each Chinaman with six assistants can only superintend one locality, and the Tea leaves from the various other tracts, widely separated, must be brought to these two places for manufacture. The consequence is, that an additional number of labourers must always be employed to bring the leaves from so great a distance. The leaves suffer when brought in large quantities from a distance, as they soon begin to ferment, and the labour of only preparing them so far in process that they may not spoil by the morning, is excessive. The men have often to work until very late to accomplish this. When labour falls so very heavy and on so very few, it cannot be expected that it can be equally well executed, as if more had been employed. The leaves last gathered are also much larger than they ought to be, for want of being collected and manufactured earlier; consequently the Tea is inferior in quality. I mention this, to shew the inconvenience and expense of having so few Tea makers.

The samples of Black-Tea made by the twelve assistants having been approved of by the Tea Committee in Calcutta, it was my intention to have distributed the men amongst the different tracts, but the late disturbances on our frontier have prevented this arrangement; and I have been obliged to employ ten men in Assam (two others having gone to Calcutta in charge of Tea) at the tract called *Kahung*, which is becoming

a very extensive and important Tea locality—so many others being near it, which can all be thrown into one. When we have a sufficient number of manufacturers, so that we can afford to have some at each tract, or garden, as they have in China, then we may hope to compete with that nation in cheapness of produce; nay, we might, and ought, to undersell them; for if each tract, or garden, had its own Tea maker and labourers, the collecting of the leaves would not perhaps occupy more than twelve days in each crop; after which the men might be discharged, or profitably employed on the Tea grounds. But now, for the want of a sufficient number of labourers and Tea makers, there is a constant gathering of leaves throughout the month; and as I said before, those gathered last can only make inferior Teas; besides the great loss by the leaves getting too old, and hereby unfit for being made into any Tea; and all this entirely for want of hands to pluck the leaves. It is true we have gained twelve Black-Tea makers this year, in addition to the last; and twelve more native assistants have been appointed, who may be available next year to manufacture Tea independently, as they were learning the art all last year. We have also had an addition to our establishment of two Chinese Green-Tea manufacturers, and twelve native assistants have been placed under them as learners; but what are these compared to the vast quantity of Tea, or the ground the Tea plants cover, or might be made to cover in three years, but a drop of water in the ocean? We must go on at a much faster pace in the two great essentials—Tea manufacturers, and labourers,—in order to have them available at each garden, when the leaves come into season.

If I were asked, when will this Tea experiment be in a sufficient state of forwardness, so as to be transferable to speculators? I would answer, when a sufficient number of native Tea manufacturers have been taught to prepare both the Black and the Green sort; and that under one hundred available Tea manufacturers, it would not be worth while for private speculators to take up the scheme on a large scale; on a small one it would be a different thing. In the course of two or three years we ought to have that number. Labourers must be introduced, in the first instance, to give a tone to the Assam Opium-eaters; but the great fear is, that these latter would corrupt the new comers. If the cultivation of Tea were encouraged, and the Poppy put a stop to in Assam, the Assamese would make a splendid set of Tea manufacturers and Tea cultivators.

In giving a statement of the number of Tea tracts, when I say that *Tingri*, or any other tract is so long and so broad, it must be understood, that space to that extent only has been cleared, being found to contain

all the plants which grew thickly together; as it was not thought worth while at the commencement of these experiments to go to the expense of clearing any more of the forest for the sake of a few straggling plants. If these straggling plants were followed up, they would in all probability be found gradually becoming more numerous, until you found yourself in another tract as thick and as numerous as the one you left; and if the straggling plants of this new tract were traced, they would by degrees disappear until not one was to be seen. But if you only proceeded on through the jungles, it is ten to one that you would come upon a solitary Tea plant, a little further on you would meet with another; until you gradually found yourself in another new tract, as full of plants as the one you had left, growing absolutely so thick as to impede each others growth. Thus I am convinced one might go on for miles from one tract into another. All my Tea tracts about *Tingri* and *Kahung* are formed in this manner, with only a patch of jungle between them, which is not greater than what could be conveniently filled up by thinning those parts that have too many plants. At *Kahung* I have lately knocked three tracts into one, and I shall most probably have to continue doing the same until one tract shall be made of what now consists of a dozen. I have never seen the end of *Juggundoo's* Tea tract, nor yet *Kujudoo's* or *Ningrew's*. I feel confident that the two former run over the hills and join, or nearly join, some of our tracts in the *Muttuck* country. Nor have I seen the end of *Kahung* tract, all about that part of the country being one vast succession of Tea from *Rungagurra* on the *Debrew*, to *Jaipore* on the *Buri Dehing*. The Tea localities are thickly scattered—those that are known; and they are but a small portion compared to those that are unknown. There is the *Namsong* tract on the *Naga* hills, the largest that has yet been seen, and the extent of which is not ascertained. The tracts on the *Gubind* hills are unknown; and this is likewise the case with *Haut Holah* and *Cheridoo;* so that there is a large field for improvement throughout, to say nothing of the *Singho* tracts, which may be found to be one unbounded link to *Hookum*; and who knows but it crosses the Irrawaddy to China? Many Tea tracts I know have been cut down in ignorance by the natives, to make room for the rice field, for firewood, and fences, but many of these tracts have sprung up again, more vigorous than before. Witness that at *Ningrew*, where the natives say that every thing was cut down, and the land planted with rice, except on the high ground.

With respect to the Tea plant being most productive on high or low

ground, I cannot well say, as all our tracts are on the plains; but from what little I have seen of the hill tracts, I should suppose they were not more productive. In China the hill tracts produce the *best* Teas, and they may do the same here. Almost all my tracts on the plains are nearly on the same level, I should think. *Nudwa* perhaps is a little higher than *Tingri*, and *Tingri* a little higher than *Kahung*, but I believe they are equally productive; although if I leaned towards any side, with my limited experience, I should say that the low land, such as at *Kahung*, which is not so low as ever to be inundated by the strongest rise in the river, is the best. The plants seem to love and court moisture, not from stagnant pools, but running streams. The *Kahung* tracts have the water in and around them; they are all in heavy tree-jungles, which makes it very expensive to clear them. An extent of 300 by 300 will cost from 200 to 300 rupees; i. e. according to the manner in which the miserable Opium-smoking Assamese work. This alone ought to point out the utility of introducing a superior race of labourers, who would not only work themselves, but encourage their women and children to do the same;—in plucking and sorting leaves they might be profitably turned to account for both parties. This I have not been able to instil into the heads of the Assamese, who will not permit their women to come into the Tea gardens. Indeed unless more labourers can be furnished, a larger amount of tea must not be looked for at present. Last season it was with the greatest difficulty that I could get a sufficient number of hands to gather the leaves. The plucking of the leaves may appear to many a very easy and light employment, but there are not a few of our coolies who would much rather be employed on any other job; the standing in one position so many hours occasions swellings in the legs, as our plants are not like those of China, only three feet high, but double that size, so that one must stand upright to gather the leaves. The Chinese pluck theirs squatting down. We lie under a great disadvantage in not having regular men to pluck the leaves; those that have been taught to do so, can pluck twice as many as those that have not, and we can seldom get hold of the same men two seasons running. I am of opinion that our trees will become of a smaller and more convenient size after a few years cultivation; because, trimming of the plants, and taking all the young leaves almost as soon as they appear, month after month and year after year, and the plants being deprived of the rich soil they had been living on from time unknown, must soon tell upon them. Transplanting also helps to stunt and shorten the growth of these plants. The Chinese declared to me, that the China plants now at *Deenjoy* would

never have attained to half the perfection they now have, under ten years in their own country.

I may here observe, that the sun has a material effect on the leaves; for as soon as the trees that shade the plants are removed, the leaf, from a fine deep green, begins to turn into a yellowish colour, which it retains for some months, and then again gradually changes to a healthy green, but now becomes thicker, and the plant throws out far more numerous leaves than when in the shade. The more the leaves are plucked, the greater number of them are produced; if the leaves of the first crop were not gathered, you might look in vain for the leaves of the second crop. The Tea made from the leaves in the shade is not near so good as that from leaves exposed to the sun; the leaves of plants in the sun are much earlier in season than of those in the shade; the leaves from the shady tract give out a more watery liquid when rolled, and those from the sunny a more glutinous substance. When the leaves of either are rolled on a sunny day, they emit less of this liquid than on a rainy day. This juice decreases as the season advances. The plants in the sun have flowers and fruit much earlier than those in the shade, and are far more numerous; they have flowers and seeds in July, and fruit in November. Numerous plants are to be seen that by some accident, either cold or rain, have lost all their flowers, and commence throwing out fresh flower-buds more abundantly than ever. Thus it is not unfrequent to see some plants in flower so late as March (some of the China plants were in flower in April) bearing at once the old and the new seeds, flower-buds, and full-blown flowers—all at one and the same time. The rain also greatly affects the leaves; for some sorts of Tea cannot be made on a rainy day; for instance the *Pouchong* and *Mingehew*. The leaves for these ought to be collected about 10 A. M. on a sunny morning, when the dew has evaporated. The *Pouchong* can only be manufactured from the leaves of the first crop; but the *Mingehew*, although it requires the same care in making as the other, can yet be made from any crop, provided it is made on a sunny morning. The Chinese dislike gathering leaves on a rainy day for any description of Tea, and never will do so, unless necessity requires it. Some pretend to distinguish the Teas made on a rainy and on a sunny day, much in the same manner as they can distinguish the shady from the sunny Teas—by their inferiority. If the large leaves for the Black-Tea were collected on a rainy day, about seven seers, or fourteen pounds, of green leaves would be required to make one seer, or two pounds, of Tea; but if collected on a sunny day, about four seers, or eight pounds, of green leaves, would make one seer, or two pounds, of Tea;—so the Chinamen say. I tried the experiment, and found it to

be correct. Our season for Tea making generally commences about the middle of March; the second crop in the middle of May; the third crop about the first of July; but the time varies according to the rains setting in sooner or later. As the manufacture of the *Syehee* and the *Minge'ee* Black-Teas has never been described, I will here attempt to give some idea how it is performed.

Syehee Black-Tea. The leaves of this are the *Souchong* and *Pouchong*. After they have been gathered and dried in the sun in the usual way (see my former account of Black-Tea) they are beaten and put away four different times; they are then put into baskets, pressed down, and a cloth put over them. When the leaves become of a brownish colour by the heat, they throw out and have a peculiar smell, and are then ready for the pan, the bottom of which is made red hot. This pan is fixed in masonry breast high, and in a sloping position, forming an angle of forty degrees. Thus the pan being placed on an inclined plane, the leaves, when tossed about in it cannot escape behind, or on the sides, as it is built high up, but fall out near the edge close to the manufacturer, and always into his hands, so as to be swept out easily. When the bottom of this pan has been made red hot by a wood fire, the operator puts a cloth to his mouth to prevent inhaling any of the hot vapour. A man on the left of him stands ready with a basket of prepared leaves: one or two men stand on his right with dollahs, or shallow baskets, to receive the leaves from the pan, and another keeps lifting the hot leaves thrown out of the pan into the dollah, that they may quickly cool. At a given signal from the Chinaman, the person with the basket of prepared leaves seizes a handful and dashes it as quick as thought, into the red hot pan. The Chinaman tosses and turns the crackling leaves in the pan for half a minute, then draws them all out by seizing a few leaves in each hand, using them by way of a brush, not one being left behind. They are all caught by the man with the dollah or basket, who with his disengaged hand continues lifting the leaves, and letting them fall again, that they may quickly cool. Should a leaf be left behind in the pan by any accident, the cloth that is held ready in the mouth is applied to brush it out; but all this is done as quick as lightning. The man that holds the basket of leaves watches the process sharply; for no sooner is the last leaf out of the pan, then he dashes in another handful, so that to an observer at a little distance, it appears as if one man was dashing the leaves in, and the other as fast dashing them out again—so quickly and dexterously is this managed. As soon as one basket has received about four handsful of the hot leaves

from the pan, it is removed, and another basket placed to receive the leaves; and so on, until all is finished. A roaring wood fire is kept up under the pan to keep the bottom red hot, as the succession of fresh leaves tends greatly to cool the pan, which ought always to be scrubbed and washed out after the process is over. In China these pans are made of cast iron, and if great care is not taken they will crack in the cooling; to prevent which, one man keeps tapping the inside of the edge of the pan briskly with a wet broom, used in the cleaning of the vessel, while another pours cold water in gently; thus it cools in a few seconds, and is ready for another batch of Tea. The leaves are rolled and tatched the same as the other Teas, and put into the drying basket for about ten minutes. When a little dry, people are employed to work and press the leaves in the hands in small quantities, of about one and a half to two rupees weight at a time, for about half a minute; they are then put into small square pieces of paper and rolled up; after this they are put into the drying basket, and permitted to dry slowly over a gentle fire for some hours, until the whole is thoroughly dry. This Tea is not sold in the China market, it is used principally as offerings to the priests, or kept for high days and holidays. It is said to be a very fine Tea, and there is not one man in a hundred who can make it properly. The *Pouchong* tea is made in the same way as the *Sychee*, with this exception, that it is not formed into balls.

Mingehew Black-Tea. The leaves (*Pouchong*) are plucked and dried in the sun, and are then beaten and dried in the shade for half an hour; this is done three successive times, and the leaves are very much shaken by a circular motion given to them in a sieve, so as to keep them rolling and tumbling about in the centre of it. This treatment continues until they are very soft; they are then allowed to remain for a short time; the contents of the first sieve are then placed in the centre of a close worked bamboo basket with a narrow edge, and the leaves are divided into four equal parts. The contents of the second sieve are placed in another bamboo basket like the former, and this basket is placed on the top of the first, and so on, piling one basket upon another until all is finished;—there may be about two pounds of leaves in each basket. The red hot pan is used the same as in *Sychee*, only now the men cast in one division of the leaves into the basket, and this is tumbled and tossed about in the red hot pan, like a plaything, for about thirty seconds, and then swept out; another division is cast in, and so on, until all the prepared baskets have been emptied. The contents of each basket are still kept separate, by placing the leaves when they come out of the pan in separate baskets. The whole is a brisk and a lively scene,

and quite methodical, every one knowing his station, and the part he has to perform. The baskets are then arranged on shelves to air; the contents are afterwards tatched the same as our Black-Teas, and fired in the drying baskets, but with this difference, that each division is placed on paper and dried. When it is half dry (the same as our Teas) it is put away for the night, and the next morning it is picked, and put into the drying baskets over gentle deadened fires, and gradually dried there; it is then packed hot. This Tea is a difficult sort to make.

Shung-Paho Black-Tea. Pluck the young *(Paho)* leaf that has not yet blown or expanded, and has the down on it; and the next one that has blown with a part of the stalk; put it into the sun for half an hour, then into the shade; tatch over a gentle fire, and in tatching roll the leaves occasionally in the pan, and spread them all round the sides of the same; again roll them until they begin to have a withered and soft appearance; then spread them on large sieves, and put them in the shade to air for the night; next morning pick, and then fire them well. Some Tea makers do not keep them all night, but manufacture and pack the Tea the same day. This Tea is valued in China, as it is very scarce; but the Chinamen acknowledge that it is not a good sort. They prefer the Teas, the leaves of which have come to maturity.

The China Black-Tea plants which were brought into *Muttuck* in 1837, amounted in all to 1609—healthy and sickly. A few of the latter died, but the remainder are healthy, and flourish as well, as if they had been reared in China. The leaves of these plants were plucked in the beginning of March, and weighed sixteen seers or thirty-two pounds. Many of the plants were then in flower, and had small seeds. They are about three feet high, and were loaded with fruit last year, but the greater part of it decayed when it had come to maturity, as was the case with the Assam Tea-seeds, and almost every seed of these wilds, in the past year. The seeds should, I think, be plucked from the plant when thought ripe, and not be permitted to drop or fall to the ground. I collected about twenty-four pounds of the China seeds, and sowed some on the little hill of *Tipum* in my Tea garden, and some in the Nursery-ground at *Jaipore;* above three thousand of which have come up, are looking beautiful, and doing very well. I have since found out that all the China seedlings on *Tipum* hill have been destroyed by some insect.

The Assam and China seedlings are near each other; the latter have a much darker appearance. I have made but few nurseries, or raised plants from seed, as abundance of young plants can be procured, of any age or size, from our Tea tracts. There may be about 6,000

young seedlings at *Chubwa;* at *Deenjoy* about 2,000; at *Tingri* a few; and some at *Paundoouh.* In June and July, 1837, 17,000 young plants were brought from *Muttuck,* and planted at a place called *Toongroong Patar,* amongst the thick tree jungles of *Sadiya.*

In March of the same year six or eight thousand were brought from *Muttuck,* and planted in different thick jungles at *Sadiya*; many of these died in consequence of the buffaloes constantly breaking in amongst them; the rest are doing well, but I am afraid will be killed from the above cause; and now that I have removed to *Jaipore,* they are too far off for my personal superintendence.

In 1838, 52,000 young Tea plants were brought from the *Nemsong Naga* hill tracts, about ten miles from *Jaipore;* a great portion of these have been lately sent to Calcutta, to be forwarded to Madras; should they thrive there, it is my opinion that they will never attain any height, at least not like ours, but be dwarfish like the China plants. *Deenjoy, Chubwa, Tingri,* and *Geela-Jhan* tracts have been filled up or enlarged with plants from the jungle tracts. In transplanting from one sunny tract to another, when done in the rains, very few, if any, die; if the plants be removed from a deep shade to a sunny tract, the risk is greater, but still, if there is plenty of rain, few only will die. If from a deep shade to a piece of ground not a Tea tract, and exposed to the sun—for instance from the *Naga* hills to *Jaipore*—if there be plenty of rain, and the soil congenial, as it is at this place, few will die; if shaded by a few trees, less will perish; if taken from shade, and planted in shade and the soil uncongenial, but there is plenty of rain, the greater portion will live;—witness *Toongroong Patar* at *Sadiya.* If the plants are brought from deep shade, and planted in the sun in uncongenial soil, let them have ever so much rain, not one in fifty will be alive the third year;—witness 30,000 brought to *Sadiya.* I believe the Tea plant to be so hardy that it would almost live in any soil, provided it were planted in deep shade when taken to it. There should be plenty of water near the roots, but the plant should always be above inundation. As soon as it has taken root, which it will soon do, the shade may be removed, and there will be no fear of the plant dying.

The advantage of getting plants from the jungle tracts is, that you can get them of any age or size; nothing more is necessary than to send a few coolies early in March, just as the rains commence, and have the plants of the size required removed to your own garden; and if they are of a moderate size, you may gather a small crop of Tea from them the next year. As these plants are very slender, it would be best to plant four or five close together to form a fine bush. If the plants are

raised from seed, you may expect a small crop of Tea the third year, but they do not come to maturity under six years. It is said they live to the age of forty or fifty years. The Chinese way of digging a hole, and putting in a handful or two of seed, does not succeed so well in this country, as putting two or three seeds on small ridges of earth and covering them over, which I have found to answer better.

In clearing a new Tea tract, if the jungle trees are very large and numerous, it would be as well to make a clean sweep of the whole, by cutting them and the Tea plants all down together; for it would be impossible to get rid of so much wood without the help of fire. The Tea plants, if allowed to remain, would be of little use after they had been crushed and broken by the fall of the large trees, and dried up by the fire; but admitting that they could escape all this, the leaves of trees from twelve to twenty feet high could not be reached, and if they could, they would be almost useless for Tea manufacture, as it is the young leaves, from young trees, that produce the best Teas. But if all were cut down and set fire to, we should have a fine clear tract at once, at the least expense, and might expect to have a pretty good crop of Tea one year after the cutting, or, at furthest, the second year; for it is astonishing with what vigour the plant shoots up after the fire has been applied. And we gain by this process; for, from every old stock or stump cut down, ten to twelve more vigorous shoots spring up, so that in the place of a single plant you have now a fine Tea bush. I think from what I have seen of these plants, that if cut down every third year, they would yield far superior Teas; neither am I singular in this opinion; the Green-Tea Chinamen having told me that they cut down their plants every ninth year, which may be reckoned equivalent to our third year, taking into consideration the size of our trees and the richness of our soil. Our trees, or plants, are certainly more than four or five times the size of theirs, and must consequently yield so many times more produce; theirs is the dwarf, ours the giant Tea. The size of the leaf matters nothing, in my opinion, provided it is young and tender; even their diminutive leaf, if one day too old, is good for nothing.

As the Green-Tea Chinamen have just commenced operations, I will try to give some account of this most interesting process. All leaves up to the size of the *Souchong* are taken for the Green-Tea. About three pounds of the fresh leaves, immediately they are brought in, are cast into a hot pan (sometimes they are kept over night when abundance have been brought in, and we have not been able to work all up); they are then rolled and tossed about in the pan until they

become too hot for the hand. Two slips of bamboo, each about a foot long, split at one end so as to form six prongs, are now used to tumble and toss the leaves about, by running the sticks down the sides of the pan, and turning the leaves up first with the right hand, then with the left, and this as fast as possible; which keeps the leaves rolling about in the pan without being burnt; this lasts about three minutes; the leaves will then admit of being rolled and pressed without breaking. They are now taken from the pan and rolled in dollahs, much the same as the Black-Tea, for about three minutes, in which process a great quantity of the juice is extracted, if they be fresh leaves; but if they have been kept over night, very little juice can be expressed from them in the morning, on account of its having evaporated. The Chinamen say, this does not matter, as it makes no difference in the Tea. The leaves are then pressed hard between both hands, and turned round and pressed again and again, until they have taken the shape of a small pyramid. They are now placed in bamboo-baskets or dollahs with a narrow edge, and the dollahs on bamboo frame-work (see fig. 2 of my former account of Black-Tea) where they are exposed to the sun for two or three minutes, after which these pyramids of Tea are gently opened and thinly spread on the dollahs to dry. When the Tea has become a little dry, (which will be the case in from five to ten minutes if the sun be hot) it is again rolled, and then placed in the sun as before; this is done three successive times. But should the weather be rainy, and there is no hope of its clearing, all this drying is done over the fire in a small drying basket, the same as with Black-Tea. The Green-Tea makers have as great an aversion to drying their Tea over the fire, as the Black-Tea makers. The third time it has been rolled and dried, there is very little moisture left in the Tea; it is now put into a hot pan, and gently turned over and over, and opened out occasionally, until all has become well heated; it is then tossed out into a basket, and while hot put into a very strong bag, previously prepared for it, about four feet long, and four spans in circumference. Into this bag the Tea is pressed with great force with the hands and feet; from fourteen to twenty pounds being put in at one time, and forced into as small a compass as possible. With his left hand the man firmly closes the mouth of the bag immediately above the leaves, while with the right hand he pommels and beats the bag, every now and then giving it a turn; thus he beats and turns and works at it, tightening it by every turn with one hand, and holding on with the other, until he has squeezed the leaves into as small a compass as possible at the end of the bag. He now makes it fast by turns of the cloth where he held on, so that it may

not open; and then draws the cloth of the bag over the ball of leaves, thus doubling the bag, the mouth of which is twisted and made fast. The man then stands up, holding on by a post or some such thing, and works this ball of leaves under his feet, at the same time alternately pressing with all his weight, first with one foot and then the other, turning the ball over and over, and occasionally opening the bag to tighten it more firmly. When he has made it almost as hard as a stone, he secures the mouth well and puts the bag away for that day. Next morning it is opened out and the leaves gently separated and placed on dollahs, then fired and dried until they are crisp, the same as the Black-Tea, after which they are packed in boxes or baskets. In China the baskets are made of double bamboo, with leaves between. The Tea may then remain on the spot for two or three months, or be sent to any other place to receive the final process. This first part of the Green-Tea process is so simple, that the natives of this country readily pick it up in a month or two.

The second process now commences by opening the boxes or baskets, and exposing the Tea on large shallow bamboo baskets or dollahs (see former account, fig. 1) until it has become soft enough to roll; it is then put into cast iron pans, set in brick fire-places, the same as described in making the *Syehee* Black-Tea. The pan is made very hot by a wood-fire, and seven pounds of the leaves are thrown into it and rubbed against the pan, with the right hand until tired, and then with the left, so as not to make the process fatiguing. The pan being placed on an inclined plane the leaves always come tumbling back towards and near the operator, as he pushes them up from him, moving his hand backwards and forwards and pressing on the leaves with some force with the palms, keeping the ends of the fingers up, to prevent their coming in contact with the hot pan. After one hour's good rubbing the leaves are taken out and thrown into a large coarse bamboo-sieve, from this into a finer one, and again a still finer one, until three sorts of Tea have been separated. The first, or largest sort, is put into the funnel of the winnowing machine, which has three divisions of small traps below, to let the Tea out. A man turns the wheel with his right hand, and with the left regulates the quantity of Tea that shall fall through the wooden funnel above, by a wooden slide at the bottom of it. The Tea being thrown from the sieves into the funnel, the man turns the crank of the wheel, and moves the slide of the funnel gradually, so as to let the Tea fall through gently, and in small quantities. The blast from the fan blows the smaller particles of Tea to the end of the machine, where it is intercepted by a circular moveable board placed

there. The dust and smaller particles are blown against this board, and fall out at an opening at the bottom into a basket placed there to receive it. The next highest Tea is blown nearly to the end of the machine, and falls down through a trough on the side into a basket; this Tea is called *Young Hyson*. The next being a little heavier, is not blown quite so far; it falls through the same trough, which has a division in the middle; this of course is nearer the centre of the machine. A basket is placed beneath to receive the Tea, which is called *Hyson*. The next, which is still heavier, falls very near to the end of the fan, this is called *Gunpowder* Tea; it is in small balls. The heaviest Tea falls still closer to the fan, and is called *Big Gunpowder;* it is twice or three times the size of *Gunpowder* Tea, and composed of several young leaves that adhere firmly together. This sort is afterwards put into a box and cut with a sharp iron instrument, then sifted and put among the *Gunpowder*, which it now resembles. The different sorts of Tea are now put into shallow bamboo baskets, and men, women, and children are employed to pick out the sticks and bad leaves; this is a most tedious process, as the greatest care is taken not to leave the slightest particle of any thing but good Tea. But to assist and quicken this tiresome process beautiful bamboo sieves, very little inferior to our wire ones, and of various sizes, are employed. The different Teas are thrown into sieves of different sizes, from large Gunpowder to Dust Tea: they are shaken and tossed, and thrown from one person to another in quick succession, making the scene very animating; in this way a great portion of the stalks are got rid of. After the Tea has been well sifted and picked, it is again put into the hot pans and rubbed and rolled as before, for about one hour; it is then put into shallow bamboo baskets, and once more examined, to separate the different Teas that may still remain intermixed, and again put into the hot pan. Now a mixture of sulphate of lime and indigo, very finely pulverized and sifted through fine muslin, in the proportion of three of the former to one of the latter, is added; to a pan of Tea containing about seven pounds, about half a tea-spoonful of this mixture is put and rubbed and rolled along with the Tea in the pan for about one hour, as before described. The Tea is then taken hot from the pan and packed firmly in boxes, both hands and feet being used to press it down. The above mixture is not put to the Tea to improve its flavour, but merely to give it a uniform colour and appearance, as without it some of the Tea would be light and some dark. The indigo gives it the colour, and the sulphate of lime fixes it. The Chinese call the former *Youngtin*, the latter *Acco*. Large Gunpowder Tea they call *Tychen;* little Gunpowder *Cheocheu;* Hyson,

Chingcha; Young Hyson, *Uchin;* Skin-Tea, or old leaves in small bits, *Poocha;* the fine dust, or Powder-Tea, *Chamoot.*

The leaves of the Green-Tea are not plucked the same as the Black, although the tree or plant is one and the same, which has been proved beyond a shadow of doubt; for I am now plucking leaves for both Green and Black from the same tract and from the same plants; the difference lies in the manufacture, and nothing else. The Green-Tea gatherers are accommodated with a small basket, each having a strap passed round the neck so as to let the basket hang on the breast. With one hand the man holds the branch, and with the other plucks the leaf, one at a time, taking as high as the *Souchong* leaf; a little bit of the lower end of the leaf is left for the young leaf to shoot up close to it; not a bit of stock must be gathered. This is a very slow and tedious way of gathering. The Black-Tea maker plucks the leaves with great rapidity with both hands, using only the forefinger and thumb, and collects them in the hollow of the hand; when his hand is full he throws the leaves into a basket under the shade of the tree; and so quickly does he ply his hands that the eye of a learner cannot follow them; nor see the proper kind of leaf to be plucked; all that he sees, is the Chinaman's hands going right and left, his hands fast filling, and the leaves disappearing. Our coolies, like the Green-Tea Chinamen, hold the branch with one hand, and deliberately pluck off the leaf required, then the next, and so on, by which process much time is lost, and a greater number of hands are wanted. Not having a regular set of pluckers is a very great drawback to us; for the men whom we teach this year we see nothing of the next; thus every year we have to instruct fresh men. This difficulty will be removed when we get regular people attached to the Tea plantations; or when the natives of these parts become more fixed and settled in their habitations, and do not move off by whole villages from one place to another, as they have of late years been doing; and when the aversion they have throughout Assam to taking service for payment, has been overcome. They seem to hold this as mean and servile; preferring to cultivate a small patch of ground which barely yields a subsistence. I can perceive, however, that there is a gradual change taking place in the minds of the labouring class of people, or coolies; for occasionally some good able-bodied men come forward for employment. The generality of those that have hitherto offered themselves, has been from the very poorest and the most worthless in the country. In the cold season, when the men have nothing to sow or reap, two or three hundred can be collected; but as soon as the rains set in, all but those that have not bonds, or are not

involved in debt, go off to their cultivations, at the very time when our Tea operations commence. As long as things continue in this state, the price of Tea will be high; but if this drawback were removed, there is nothing to prevent our underselling the Chinese, except the experience of a few more years.

But let us return to our Teas, and take a comparative view of the qualities of the Black and Green-Teas, which may nearly be as follows: *Paho* Black-Tea leaf would make Green-Tea, some Gunpowder, and some Young Hyson. *Pouchong*, although classed as a second Black-Tea, on account of the price it fetches in the market, is a third-rate leaf, for it is rather larger than the *Souchong*. Some of it would make Young Hyson, and some Skin-Tea. *Souchong* would make Hyson and Young Hyson. *Toychong* would make Skin-Tea.—I will hear mention the different kinds of Black-Teas, to make the matter more clear to those who take an interest in the subject. *Thowung Paho* (the *Sung fa* is the same leaf as this) is the downy little leaf not expanded, and the one next to it that has just unfolded a little. This Tea when made appears full of small white leaves, which are the little downy leaves just mentioned. *Twazee-Paho* is from the second crop, and nearly the same kind of Tea, only a little older; the leaf next the small downy one (being a little more expanded) and the small leaf below this, are taken, making three in all; this has also numerous white leaves, but not so many as the former. *Souchong* is the next largest leaf; this is well grown, but embraces all the leaves above it. When the upper leaves have grown out of season for *Thowung-Paho*, and *Twazee-Paho* they are all plucked for the *Souchong* from the third and fourth of the upper leaves. From *Souchong* leaves, the *Minchong* and *Sychee* Teas are made in the first crop, and no other. *Pouchong* is the next largest leaf; it is a little older and larger than the *Souchong*. From this leaf the *Sychee* and *Minchong* Teas can be made in the first crop only. The *Pouchong* is never made in the second crop, on account of its not having a good flavour: many of the *Souchong* leaves are mixed up in this Tea. The *Toychong* leaves are those that are rejected from the *Souchong* and *Pouchong*, as being too large and not taking the roll. When the Teas are picked, these leaves are put on one side. The Chinese often put them into a bag, and give them a twist, something in the Green-Tea way, and then mix them up with the *Souchong* to add to the weight. This leaf (*Toychong*) becomes worse in the second and third crops;—it is a cheap Tea and sold to the poor. All the Black-Teas that are damaged have the flower of what the Chinese call *Qui fa*, and another called *Son fa*, mixed up with them. One pound of the flowers is put to each

box of Hyson Tea. After the Teas have been well sifted and mixed up with other sorts, these leaves give them a pleasant fragrance. The *Son fa* plant is about two feet high, and kept in flower pots: it is propagated from the roots. The *Qui fa* plant is from three to four feet high; one pound of the flowers is put to a box of Tea. This plant was seen in the Botanical Gardens at Calcutta by our Chinese interpreter. The flowers of this plant are considered finer than those of the *Son fa*. I annex a rough drawing of each of them, as given to me by the interpreter; the dots in the drawings are intended for small flowers.*

The Black-Tea makers appear to me to be very arbitrary in their mode of manufacture; sometimes they will take the leaves of the *Thowung-Paho*, or perhaps *Twaz e-Paho*: but if it has been raining, or there is any want of coolies to pluck the leaves quickly, or from any other cause, they will let the leaves grow a few days longer, and turn all into *Souchong*; which it must be remembered, takes all the small leaves above it. If it is the first crop, the *Souchong* and *Pouchong* leaves may all be turned into *Souchong* Tea; but even if it is the second crop, when the *Pouchong* leaves ought not to be gathered, they are nevertheless plucked and mixed up with the *Souchong* leaves. Almost all our Black and all the Green Teas have just been made from one garden. When the Green-Tea makers complained that the leaves were beginning to get too large for them—that is, they were fast growing out of *Souchong* and running into *Pouchong*—the Black-Tea makers took up the manufacture, plucked all the leaves, and made excellent *Pouchong*; so that between the two, there is not a leaf lost. When the Black-Tea makers have a garden to themselves they are cruel pluckers, for they almost strip the tree of leaves for the *Souchong*, and are not at all nice in the plucking; the third and even the fourth leaf on a tender twig is nipped off in the twinkling of an eye; they then look about for more young leaves, and away go the *Pouchong*, and *Toychong* too, which is the largest leaf of all. But the Green-Tea men pluck quietly, one by one, down to *Souchong*. The Black-Tea men separate all their Teas into first, second, third, and fourth crop; but the Green-Tea

* These two sketches are not deemed sufficiently instructive to be added here. One of them is entitled *Qui fa* which is the name of the Olea fragrans, or Sweet-scented Olive, the flowers of which are said to be used for perfuming Teas. But it is more like the Aglaia adorata, a very different plant, which is also supposed to be applied in China for a similar purpose. This last, however, is called *Tejulang* by the Chinese, according to Rumpf, and *Sam seip lan* according to Roxburgh. The other sketch, entitled *Lan fa*, seems to be intended for a liliaceous, or at any rate an endogenous plant. I am unable to offer any conjecture about it.—N. W.

manufacturers make no distinction; they prepare all the Tea they can, throughout the season, box or basket it up, and when the season is over, they set off for Canton with their produce; at least all those who do not wish to sell their Tea on the spot. The different merchants go in quest of it there. It now indiscriminately undergoes the second process; that is, the different crops are all mixed up together. No old leaves can be mixed in the Green, as in the Black-Teas; for the long rolling in the pan crushes them, and the fan blows them away, so that only the young leaves are left.

We shall now take a comparative view of the number of men required by the Black and the Green-Tea makers for one pair of pans.

For the Black-Tea makers there will be required,

to tatch,	2	men
— roll,	4	„
— attend to the fire,	1	„
— dry,	1	„
— beat and put in the sun,	2	„
Total number of men	10	

To keep these men fully at work, from twenty-five to thirty coolies will be required to pluck leaves, and they will turn out about two boxes of Tea per day, (weighing one maund, or 80 pounds) if the weather be fine and sunny; but scarcely half that quantity if it be rainy, on account of the coolies not plucking so much on a rainy, as they would on a fair sunny day. As the people of the country become acquainted with the gathering and manufacturing, three boxes, of forty pounds each, may be expected in fine weather, adding perhaps a few men to the number of coolies.

A pair of pans for the Green-Tea makers would require during the first process,

to tatch,	2	men
— receive the Tea from the pans,	1	„
— roll,	8	„
— attend to the fire,	1	„
— put the leaves in the sun and turn them,	4	„
Total number of men,	16	

Thirty coolies would be required to keep these men in full play, and they would turn out two boxes of twenty-three seers, or forty-six pounds each, per day; in all ninety-two pounds of Tea. If the weather be rainy, of course the produce is much less: as the gatherers then do only

half work. Thus the difference between Black and Green is, that the former requires six manufacturers less; and that when the Black-Tea is finished, boxed, and ready for exportation, the Green has only undergone the first process, and is but half finished; although it is ready for exportation to any appointed place to receive the final and troublesome, as well as most expensive part of the process. Nevertheless the first part of the Green-Tea preparation is easily learnt by the natives of this place in about two or three months. In speaking of the trouble and expense attending the second process of the Green-Tea making, I beg to observe that it appears to me, from what little I have seen of it, that machinery might easily be brought to bear; and as Assam is about to become a great Tea country, it behoves us to look to this. The Tea half made, as above described, I am informed by the Green-Tea Chinamen now with me, is put either into boxes or baskets, with bamboo leaves between; it has to make in this state a long journey by land and water, and then to go one or more months in a boat by sea, before it reaches Canton, where it is laid aside for one or two months more, before it undergoes the second process; making in all about five months from the time it was first prepared. All that is required is to keep it dry. Now if all this be true, which I have no doubt it is, I see no reason why we could not send it to England, and have it made up there. I rather see every thing in favour of such a plan, and nothing against it. After a year's instruction under Chinamen, it might be left to the ingenuity of Englishmen to roll, sift, and clean the Tea by machinery, and, in fact, reduce the price of the Green-Tea nearly one-half, and thus enable the poor to drink good unadulterated Green-Tea, by throwing the indigo and sulphate of lime overboard. At all events the experiment is worthy of a fair trial, and the first step towards it would be to manufacture the Tea at Calcutta; or perhaps it would be better to let the China Green-Tea makers go direct to England along with it, and have it manufactured there at once.

Now for a word about the Lead-canister maker, who is a very important man in our establishment; for without him, we could not pack our Teas.—On two tiles about an inch thick and sixteen inches square, is pasted, on one side, a sheet of very fine thick paper, said to have been made in Cochin-China, over this another sheet is pasted only at the edges. The paper must be very smooth, and without any kind of hole, knob, or blemish. To make it answer the purpose better, fine chalk is rubbed over it. The tiles thus prepared are laid one over the other and moved backwards and forwards, to ascertain if they work smoothly.

The lower tile rests on two pieces of wood, about four inches in thickness, and the exact length of the tile. The room where the sheets of lead are made must be very smooth and level, as the tiles are apt to break when there is any unequal pressure on them. In the corner of the room there is a sunken brick fire-place, the upper part of which rises just a little above the floor; into this fire-place is inserted one of the cast iron pans used for making Tea, and in one corner of the masonry is a vent hole on which in general a Tea-kettle stands. The pan is heated by a wood fire; an iron ladle with a handle, about six or eight inches long, answers the purpose of taking the lead out of the pan when required. The pan may hold about twenty pounds. There is also another ladle with a long handle, and holes at the bottom, to take the dross off. When lead for the sides of the boxes is required, the proportion of one mound of lead to five seers of tin is put into the pan. When well melted and freed from dross, the two tiles above mentioned are placed on the two pieces of wood, one piece being nearly under the centre, and the other at the edge of the lower tile; the upper tile is placed on the lower tile even and square, projecting perhaps a little backward towards the operator. The tiles being thus placed near the melted lead, the Chinaman squats down on them, placing his heels near the edge, with his toes towards the centre; while with his left hand he lays hold of the corner tile, and with the right holds the short ladle, which he dips into the boiler, and takes out about half a ladleful of the molten metal, tipping up the upper tile with the left hand about three inches, at the same time assisting this operation by pressing on his heels and gently lifting his toes. The upper tile being thus raised he dashes in the contents of the ladle between both, lets go with the left hand, and presses on with his toes, which brings the upper tile with some force to its former position over the lower one, and occasions the superfluous lead to gush out right and left and in front. The upper tile is then raised like the lid of a box, while the lower one rests on the piece of projecting wood underneath, and a fine thin sheet of lead, nearly the size of the tiles, is taken out, and thrown on one side; the upper tile is then gently lowered down, another ladle of hot lead dashed in, and so on in quick succession, about four sheets of lead being made in one minute. The lower tile projecting a little beyond the upper one assists the man to lay the ladle on, and pour in the metal firmly and quickly. To vary the operation, the man sometimes stands up and places one foot on the upper tile, working with his heel and toes, the same as if both feet were on, and just as quickly. Many interruptions take place, such

as examining the papers on the tiles, rubbing them with chalk, turning them round, and reversing them. Sometimes half a split bamboo is placed in front and under the tiles, with a piece of paper on it, to receive the lead that falls down, so that it may not come in contact with the ground. This lead is every now and then taken up and put back into the boiler. A maund of lead may make about twelve or thirteen boxes, which will hold forty pounds. There are also two other tiles, about a cubit square: these are used for making the tops of the canisters, which are generally of tin only, but can also be made from the above mixture. It is necessary in making this sheet-lead, to hold the sheets up and examine them; for if not properly prepared, there are sometimes a number of very fine holes in them, which are not perceptible when lying on the ground or table. On this account the first twenty sheets of lead are thrown aside and rejected, even without any examination. When the tiles have become nice and warm, it is then the fine and even sheets, without holes, are obtained. Before a sheet-lead canister can be made, it is necessary to have a model box made to fit into the wooden box, that is to hold the sheet-lead canister: on this box or shell the sheet lead canister is made. It has a hole at the bottom to prevent any suction in putting it in, or drawing it out of the box or canister; and instead of a top it has a bar of wood across, by which it is drawn out. For soldering, tin, with the eighth or twelfth part of quicksilver, and some resin are used. The wood part of some of the boxes is covered with paper pasted on and dried in the sun. To give the paper on the boxes a yellow colour, a mixture of paste with pulverized and sifted saffron is laid on and dried. The paper on the corners of the boxes is ornamented by means of a wooden block with flowers carved on it; on this bit of wood very thin paper, cut to its size, is placed, and a mixture, consisting of pulverized saffron, indigo, and water, having a deep green colour, is laid singly on each bit of paper with a brush made of coco-nut fibres. These slips of paper are put one above the other, twenty thick, or as long as the paper takes the impression of the carved wood below. When the corners of the boxes have been ornamented with this paper and dried, another mixture, about the proportion of four seers of oil to three seers of rosin, boiled together, is applied with a coco-nut brush over all the boxes as a finish; after these are dry they are ready for the Tea.

The following table will shew the size and produce of the Tea tracts now worked, and the probable amount of Tea for this and the next season.

Names of Tea tracts fully worked in 1838.	Length and breadth of Tea tracts.	Number of plants in each Tea tract.	Average produce of single Tea plants.	Produce in 1838.	Remarks.
No. 1 Tringri,	267 by 90	5,000	4 Sa. Weight,	260 Seers	
No. 2 Tringri,	155 by 70	2,340	3-12 Sa. Weight,	150 ,,	
No. 1 Kahung,	480 by 210	1,36,000	4 Sa. Weight,	680 ,,	
No. 1 Chubwa,	200 by 160	8,000	4 Sa. Weight,	410 ,,	
Deenjoy,.....	223 by 171	8,400	2 Sa. Weight,	210 ,,	The plants are small in this tract including China plants.
				1,720	
From Shady Tracts, ..	..	..	..	390	
				2,110	
The probable increase of the above Tracts for 1839.				527	
Probable produce of 1839.....				2,637 Seers	5,274 lbs.

Names of the tracts to be worked in 1840.	Length and breadth of Tea tracts.	Number of plants in each Tea tract.	Probable produce of one Tea plant.	Probable produce in 1840	Remarks.
No. 2 Kahung,	192 by 114	4,720	3 Sa. Weight,	177	
No. 3 Do.	215 by 70	3,440	3 Sa. Weight,	129	
No. 2 Chubwa,	160 by 70	2,120	3 Sa. Weight,	90	
Nowhulea,	476 by 160	16,480	3 Sa. Weight,	618	
Tipun,	344 by 331	24,640	3 Sa. Weight,	922	The plants in these tracts now small will not yield a good crop for two years.
Jugundoo,	400 by 200	17,800	3 Sa. Weight,	648	
Ningrew,	300 by 189	12,260	3 Sa. Weight,	459	
The Probable produce of the above 7 tracts.....				2,943	
Add the probable produce of the other 5 tracts.....				2,637	
Probable produce of all the tracts in 1840.....				5,580	11,160 lbs.

It should be borne in mind that this is a rough calculation, and I can only give the probable amount. Most of these plants are very young, or have been recently cut down; a few years hence the plants may yield twice the above quantity. The first table exhibits the absolute produce of 1838. Now let us suppose a new settler were to take land in these parts; what would be his expenses if he were only to cultivate Tea, and had to clear forest land (in the vicinity of the Tea) ten times the size of *Nourholeah*, which is, say 400 by 200 yards, and which would cost him 200 Rupees to clear. Ten such tracts would cover 8,00,000 square yards. Now, to cover this surface of ground with Tea plants, and the plants six feet apart each way, 3,55,555 plants would be required; but if two plants were to be placed together, as I would recommend, then 7,11,110 plants

would be required. The cost would probably be at the rate of five annas for 300 plants; thus:

The clearing of 10 tracts, each 400 by 200 yards,.....	2,000	0	0
7,11,110 Tea plants, at 5 annas for 300,.....	740	11	8
Planting the above,.....	474	0	0
Weeding each tract 3 times each year, at 30 Rs. each tract,	900	0	0
5 Tea houses, at 50 Rs. each,.....	250	0	0
200 Hoes at 1 Rupee each,.....	200	0	0
100 Axes at 1 Rupee each, ...	100	0	0
100 Daws at 1 Rupee each,.....	100	0	0
Dollahs, Challonis, &c., bamboo apparatus,.....	200	0	0
8 Saws at 5 Rupees each,.....	40	0	0
Charcoal and firewood for baking the Tea,.....	200	0	0
40 Cast-iron pans, at 4 Rs. each,.....	160	0	0
Paper for Tea boxes,.....	100	0	0
Chalk and Indigo,.....	50	0	0
3 Maunds of Nails of sizes, at 10 Rs. per maund,.....	30	0	0
2 Elephants at 150 Rs. each,.....	300	0	0
2 Elephant mahoots at 6 Rs. each per month, ...	144	0	0
2 Elephant mates at 4 Rs. each per month,.....	96	0	0
Rice for 2 Elephants,.....	96	0	0
Lead for 888 boxes, at 3 seers per box containing 20 seers, at 8 Rs. per maund,.....	532	12	9
A Cooly sirdar at 10 Rs. per month,.....	120	0	0
10 Duffadars, or Overseers of coolies at 3 Rs. per month,...	360	0	0
Coolies to collect leaves, 30 to each tract, 20 days to each crop; for 3 crops, or 60 days, at 3 Rs. for each man per month,.....	1,800	0	0
4 Native carpenters, at 12 Rs. ditto,.....	576	0	0
8 Sawyers, at 4 Rs. ditto,.....	384	0	0
2 Native Lead-canister makers, at 12 Rs. ditto,.....	288	0	0
Coolies to bring in timber for Sawyers.....	150	0	0
5 Chinamen at 30 Rs. each per month,.....	1,800	0	0
120 Native Tea makers at 5 Rs. each, for 5 months, or one season,.....	3,000	0	0
Freight to Calcutta,.....	400	0	0
Ditto to England,.....	1,000	0	0
Total outlay for 10 tracts, Co's. Rs...	16,591	8	5

Deduct charges that are not annual, viz.—

Clearing of tracts,	2,000	0	0			
Purchase of Tea plants,	740	0	0			
Planting ditto,	474	0	0			
Building Tea houses,	150	0	0			
Purchase of Hoes,	200	0	0			
Do. Axes,	100	0	0			
Do. Daws,	100	0	0			
Do. Saws,	40	0	0			
Do. Bamboo apparatus,	200	0	0			
Do. Elephants,	300	0	0	4,304	0	0
Total annual outlay on 10 tracts,				12,287	8	5
Average produce of 3,55,555 tea plants at 4 Sa. Wt. each plant, is 444 Mds. or 17,777 Srs. or 35,554 lbs. at 2*s*., or 1 rupee, per pound would be,				35,554	0	0
Annual profit on 10 tracts, Co's. Rs.				23,266	7	7

Annual outlay	Co's. Rs.	*Annual profits*	Co's. Rs.
For 10 tracts,	12,287	On 10 tracts,	23,266
For 100 tracts,	1,22,870	On 100 tracts,	2,32,660
For 1000 tracts,	12,28,700	On 1000 tracts,	23,26,600

N. B.—The deduction of 4304 Rs. not being annual outlay is not included in this calculation above 10 Tracts.

	Tea tract.	Duffadars.	Takelah.	Coolies.
Required for	1	1	10	30
„ for	10	10	100	300
„ for	100	100	1000	3000

It must be remembered that this calculation has been made on 3,55,555 plants, not on double that number as I proposed, viz. to plant them in pairs, which would certainly, on the lowest calculation, increase the profits thirty per cent. It should be borne in mind also, that 4 sicca weight is not the full produce of each plant; when full grown it will yield double that, or 8 sicca weight,and some even as high as 10 to 12 sicca weight. I have calculated at the rate of 4 sicca, which was absolutely produced in 1838. The plant will, I should think, produce 25 per cent more this year, and go on increasing to what I have above mentioned. But then, on the other hand, the items which I have set down, are not all that will be required to carry on this trade on an extensive scale. The superintendence, numerous additional artizans that will be required, and a thousand little wants which cannot be set down now, but which must

necessarily arise from the nature of the cultivation and manufacture, will go far to diminish the profits, and swell the outlay; but this of course will last but a few years, until the natives of the country have been taught to compete with Chinamen. It should also be remembered, that the calculation I have made on ten tracts is on a supposition that we have a sufficient number of native Tea-makers and Canister-makers, which will not be the case for two or three years to come. It is on this point alone that we are deficient, for the Tea plants and lands are before us. Yes, there is another very great drawback to the cultivation of Tea in this country, and which I believe I before noticed, namely the want of population and labourers. They will have to be imported and settled on the soil, which will be a heavy tax on the first outlay; but this, too, will rectify itself in a few years; for, after the importation of some thousands, others will come of themselves, and the redundant population of Bengal, will pour into Assam, as soon as the people know that they will get a certain rate of pay, as well as lands, for the support of their families. If this should be the case, the Assamese language will in a few years be extinct.

I might here observe, that the British Government would confer a lasting blessing on the Assamese and the new settlers, if immediate and active measures were taken to put down the cultivation of Opium in Assam, and afterwards to stop its importation, by levying high duties on Opium land. If something of this kind is not done, and done quickly too, the thousands that are about to emigrate from the plains into Assam, will soon be infected with the Opium-mania,—that dreadful *plague*, which has depopulated this beautiful country, turned it into a land of wild beasts, with which it is overrun, and has degenerated the Assamese, from a fine race of people, to the most abject, servile, crafty, and demoralized race in India. This vile drug has kept, and does now keep, down the population; the women have fewer children compared with those of other countries, and the children seldom live to become old men, but in general die at manhood; very few old men being seen in this unfortunate country, in comparison with others. Few but those who have resided long in this unhappy land know the dreadful and immoral effects, which the use of Opium produces on the native. He will steal, sell his property, his children, the mother of his children, and finally even commit murder for it. Would it not be the highest of blessings, if our humane and enlightened Government would stop these evils by a single dash of the pen, and save Assam, and all those who are about to emigrate into it as Tea cultivators, from the

dreadful results attendant on the habitual use of Opium? We should in the end be richly rewarded, by having a fine, healthy race of men growing up for our plantations, to fell our forests, to clear the land from jungle and wild beasts, and to plant and cultivate the luxury of the world. This can never be affected by the enfeebled Opium-eaters of Assam, who are more effeminate than women. I have dwelt thus long on the subject, thinking it one of great importance, as it will affect our future prospects in regard to Tea; also from a wish to benefit this people, and save those who are coming here, from catching the plague, by our using timely measures of prevention.

Monthly outlay of the present standing Establishment.

	Co.'s	*Rs.*	
Superintendent,	500	0	0
1st Assistant to Do.	100	0	0
2d Do. Do.	70	0	0
1 Chinese Black-Tea maker,	55	11	6
1 Ditto Assistant to Ditto	11	1	6
1 Ditto Tea-box maker,	45	0	0
1 Ditto Interpreter,	45	0	0
1 Ditto Tea-box maker,	15	8	6
2 Ditto Green-Tea makers, at 15: 8: 6 each,	31	1	0
1 Ditto Tea-box maker,	33	4	6
1 Ditto Lead-canister maker,	22	3	0
24 Native Black-Tea makers, at 5 each,	120	0	0
12 Native Green-Tea makers, at 5 each,	60	0	0
1 Native Carpenter,	4	0	0
1 Coolie Sirdar,	10	0	0
4 Mahouts, at 6 each,	24	0	0
4 Ditto Mates, at 4 each,	16	0	0
Rice for 4 Elephants per month,	18	0	0
4 Sawyers, at 4 each,	16	0	0
2 Dâk runners, at 3: 8: 0 each,	7	0	0
4 Duffadars, at 3 each,	12	0	0
Fixed monthly expenditure in Assam,	1,215	14	0
Cash paid to Chinese families in China,	131	2	6
Total monthly expenditure,	1,347	0	6

or 16,000 a year, not including coolies and other items. It should be remembered that this establishment has been confined to a few tracts as

an experiment, and has never been fully worked. The Chinese Green-Tea makers, Canister-makers and Interpreter, have lately been added to the establishment; their services have not as yet been brought into account. We are just now availing ourselves of them by making Green Tea; and as the natives at present placed under them become available, large quantities of excellent Green-Tea will be manufactured. I suppose two Chinamen might qualify twenty-four natives for the first process; the second, as I have already recommended, might be performed in England, which in my humble opinion would effect a great saving, by getting machinery to do the greater part of the work. At all events, it never could be manufactured in Assam without a great expense, and this for want of labourers. However, it is gratifying to see how fast the Chinese acquire the Assamese language; for, after they have been a year in the country, they begin to speak sufficiently well for all ordinary purposes, so that an interpreter can very well be dispensed with. Our Chinamen can speak the Assamese language much better than the interpreter can the English language. They are a violent, headstrong, and passionate people, more especially as they are aware we are so much in their power. If the many behave as do the few, a Thannah would be necessary to keep them cool.

With respect to what are called the *Singpho* Tea tracts, I am sorry to say we have not been able this year to get a leaf from them, on account of the disturbances that have lately occurred there; nor do I believe we shall get any next year, unless we establish a post at *Ningrew*, which I think is the only effectual way to keep the country quiet, and secure our Tea. The Tea from these tracts is said by the Chinamen to be very fine. Some of the tracts are very extensive, and many may run for miles into the jungles for what we know; the whole of the country is capable of being turned into a vast Tea garden, the soil being excellent, and well adapted for the growth of Tea. On both sides of the Buri-Dehing river the Tea grows indigenous; it may be traced from tract to tract to *Hookum*, thus forming a chain of Tea tracts from the Irrawaddy to the borders of China, east of Assam. Ever since my residence at Sudiya this has been confirmed year after year by many of my Kamtee, Singpho, and Dewaneah acquaintances, who have traversed this route. It is therefore important for us to look well to our Eastern frontier, on account of our capability to extend our Tea cultivation in that direction. England alone consumes 31,829,620 lbs. nearly four laks of maunds, annually. To supply so vast a quantity of Tea, it will be necessary to cultivate all the hills and valleys of Assam; and on this very account a post at *Ningrew* becomes doubly necessary. A few

years hence, it may be found expedient to advance this frontier post to the top of the *Patkai* hill, the boundary line of our eastern frontier. Any rupture with Burmah would add to our Tea trade, by taking from them *Hookum* and *Munkoom*, and having the Irrawaddy as our boundary line. These countries are nominally under the Burmese, as they pay a small annual tribute; but this can never be collected without sending an armed force. They are said to be thinly inhabited, the population being kept down by the constant broils and wars, which one petty place makes upon another for the sake of plunder. All the inhabitants drink Tea, but it is not manufactured in our way; few, it is said, cultivate the plant. I have for years been trying to get some seeds or plants from them, but have never succeeded, on account of the disturbed state in which they live. The leaves of their Tea plants have always been represented to me as being much smaller than ours.

Muttuck is a country that abounds in Tea, and it might be made one extensive, beautiful Tea garden. We have many cultivated experimental tracts in it; we know of numerous extensive uncultivated tracts, and it appears to me that we are only in the infancy of our discoveries as yet. Our Tea, however, is insecure here. It was but a month or two ago that so great an alarm was created, that my people had to retire from our Tea gardens and manufacture at Deenjoy and Chubwa, which will account for the deficiency of this year's crop. Things must continue in this state until the government of the country is finally settled; for we are at present obliged, in order to follow a peaceful occupation, to have the means of defending ourselves from a sudden attack, ever since the unfortunate affairs at Sudiya. Before the transfer of the Tea tracts in this country can be made, it will be necessary, in justice to all parties, to know if *Muttuck* is, or is to become, ours or not. The natives at present are permitted to cultivate as much land as they please, on paying a poll-tax of two rupees per year; so that if the country is not ours, every man employed on the Tea will be subject to be called on for two rupees per annum, to be paid to the old Bura Senaputy's son, as governor of the country. This point is of vital importance to our Tea prospects up here. Many individuals might be induced to take Tea grounds, were they sure, that the soil was ours, and that they would be protected and permitted to cultivate it in security.

In looking forward to the unbounded benefit the discovery of this plant will produce to England, to India,—to Millions, I cannot but thank God for so great a blessing to our country. When I first discovered it, some 14 years ago, I little thought that I should have been spared long enough to see it become likely eventually to rival that of China

and that I should have to take a prominent part in bringing it to so successful an issue. Should what I have written on this new and interesting subject be of any benefit to the country, and the community at large, and help a little to impel the Tea forward to enrich our own dominions, and pull down the haughty pride of China, I shall feel myself richly repaid for all the perils and dangers and fatigues, that I have undergone in the cause of British India Tea.—*Journal of the Asiatic Society of Bengal, No. 90.—June* 1839.

JAIPORE, *10th June*, 1839.

LITERARY AND SCIENTIFIC INTELLIGENCE.

Adverting to the merited eulogium passed by Mr. JERDON at page 63 of this Number, on B. H. HODGSON, Esq. British Resident at the Court of Nipal, we regret to find from the former gentleman that difficulties lie in the way of the publication of the projected work on the Zoology of Nipal, as may be gathered from the following passage of a letter received by Mr. JERDON from Sir WM. JARDINE:—"About 200 species of birds from Nipal are now in my possession, one half of which are new; but I am pledged not to describe any of them, except in a general and entire work; and, notwithstanding the large list of Indian Subscribers, we cannot get a bookseller to run the risk of publishing, on account, they say, of the difficulty of collecting the Indian money."

The publication will not, however, with such admirable materials in existence, be permitted ultimately to fail for want of pecuniary means, we are sure, but the delay is deeply to be regretted.

ORIENTAL TRANSLATION FUND.—The committee of the Oriental Translation Fund being desirous of submitting to the Subscribers a general summary of their proceedings for the past year, believe they cannot do so more clearly than by giving the subjoined notice, extracted from the Report of the Royal Asiatic Society, delivered at the anniversary meeting of that Society on the 11th of May, the materials for which notice were furnished to the Council by the Secretary of the Committee, as has been customary for several years past. And to these Reports the Committee take the present opportunity of referring the Subscribers of the Fund, as exhibiting succinct, and they trust satisfactory statements of the operations in which they have been engaged in carrying into effect the designs of the institution confided to their management,

EXTRACT.—" In adverting to the condition of the Oriental Translation Fund,—an institution, the success of which must be a matter of interest to every Member of the Royal Asiatic Society, the Council are happy to state that it continues to enjoy the support of a large number of the patrons of Oriental literature, both at home and abroad; and that its operations are carried on with a zeal and activity fully commensurate to its means. The most recent of its publications are two valuable Sanscrit works, with Latin translations, one translated by Dr. Stenzler, and entitled the 'Kumára Sambhava,' being an ancient Sanscrit poem attributed to Kalidása, who flourished a century before the Christian era; the other entitled the 'Rig Veda Sanhita,' a collection of sacred hymns from the Vedas, translated and edited by the lamented Dr. Rosen. To his translation the editor designed to add extensive critical annotations, but only a few sheets of them were finished at the time of his decease. The work is consequently deprived of the valuable additions contemplated by the learned Doctor; but, as it is, it remains a monument of his great philological acquirements, and of his laborious ardour in the study of this highly polished and classical language of India. The disappointment of the expectations of the Committee occasioned by this melancholy event will however be obviated by the kindness of Professor Wilson, who has undertaken to prepare a translation of the entire work into English, with notes illustrative of the peculiarities of the language of the original text, and of the religious system of the Vedas.

" The loss sustained both by the Royal Asiatic Society, and the Oriental Translation Committee, in the decease of Dr. Rosen will long be deplored, and his merits as a man and a scholar long remembered. The Committee recorded upon their minutes, and communicated to his father, the expression of their deep regret; and many Members, both of the Society and the Committee, readily subscribed a sufficient sum to erect a marble monument over his grave, as a small but due tribute to his memory.

" Another volume of the Arabic Bibliographical Dictionary, edited and translated into Latin by Professor Flügel, will appear in a few weeks; as will also the first volume of M. Garcin de Tassy's 'Histoire de la Littérature Hindoui et Hindoustani,' containing notices of many hundred Eastern authors and their writings, evidencing much acute and laborious research. Besides these, the printing of Mr. W. F. Thompson's translation of the Akhlák-i-Jalály, from the Persian of Fakír Jány Muhammad Asäad, is completed. Mr. Thompson has entitled his work 'Practical Philosophy of the Muhammadan People, exhibited in its professed connexion with the European, so as to render either an intro-

duction to the other;' and to it are appended numerous explanatory notes and references. This translation cannot fail to be highly appreciated by all who take an interest in metaphysical and ethical studies.

"Among the works in the course of printing by the Fund may be mentioned the 'Vishnu Purana,' translated by our Director, a member of the Oriental Translation Committee, whose well known attainments in Sanscrit are a sufficient guarantee for saying that the task could not have fallen into hands more competent to do justice to this curious mythological work of the Hindus.

"The History of Mohammedan Dynasties in Spain, translated from the Arabic of Ahmed Ibn Muhammad Al-makári, by Señor P. de Gayangoz, is also in the press.

"A complete history of the Muhammedan empire in Spain has long been a desideratum in our historical literature, which will now be supplied. The work under notice comprises a narrative of events during a period of nine centuries, that is, from the time of the invasion of Spain in 710 of our era, to the final expulsion of the Moriscoes in 1610, and contains ample details of the manners, customs, and literature of the Western Arabs.

"Of the works in the course of preparation for the press we may notice an interesting History of the Ghaznavides, and of the Conquests of Sultán Mahmúd of Ghazna, translated by the Rev. James Reynolds, from the Arabic work called 'Kitáb-al-Yamíní, by Abú Nasár Muhammad Ibn Al-Jabbár Al-Utbí;' also a translation by Professor Julien, of the 'Li-ki,' a celebrated and standard Chinese work on morals.

"The Committee have recently received a proposal from Baron Mac Guckin de Slane, of Paris, to translate into English Ibn Khallikan's Lives of Illustrious Men of Islámism, the text of which has recently appeared under the editorship of the Baron.—Dr. Sprenger has proposed a translation of Ali-Souithi's History of the Khalifs. The list of manuscripts announced for translation under the auspices of the Committee contains many other desirable works.

"The Council are also aware that the Committee have received several other proposals from eminent scholars of translations of valuable works, which they are precluded from accepting only because of their being already engaged in printing to the full amount of the funds at their disposal. It deserves remark that the list of books published by the Committee now comprises fifty-three works, most of which, it is probable could never have been presented to the public but for the institution of this Fund."

ROYAL ASIATIC SOCIETY'S HOUSE,
14, *Grafton Street, Bond Street,*
24th May, 1839.

VIII.—*Horary Meteorological Observations made agreeably with the suggestions of Sir* John Herschel.

1st.—At the Madras Observatory.—By T. G. Taylor, Esq. *H. E. I. C. Astronomer.*

Date.	Time.	Barometer.	Thermometer	Wet bulb.	Direction of wind.	Strength of wind	Remarks.
June							
21	6 A. M.	29,756	81,3	76,0	S W	0	Breeze clear.
	7	29,772	83,0	78,0	S W	0	Calm do.
	8	29,804	85,5	78,5	S W	0	Gentle wind do.
	9	29,817	87,7	78,2	S W	0	Do. do. do.
	10	29,816	90,0	78,0	W	0	Do. do. do.
	11	29,800	89,7	79,7	S	1	Do. do. do.
	12	29,772	89,9	80,2	E. S E	2	Moderate wind do.
	1 P. M.	29,752	89,5	80,2	E	2	Strong wind do.
	2	29,728	89,5	80,4	S E	2	Do. do. do.
	3	29,707	88,6	80,7	E. S E	3	Do. do. do.
	4	29,702	88,4	80,5	E. S E	3	Do. do. do.
	5	29,700	86,8	79,0	E. S E	4	Do. do. do.
	6	29,718	85,0	80,3	S E	2	Do. do. do.
	7	29,726	84,6	80,1	S E	3	Do. do. do.
	8	29,744	83,8	80,8	E. S E	3	Do. do. do.
	9	29,766	83,5	80,7	S E	2	Moderate wind—quite clear, and lightning to the west.
	10	29,794	83,6	81,6	S	2	Do. do. haze do. do.
	11	29,790	84,0	82,0	S. S E	2	Do. do. fl.cl. do. to the N.
	12	29,796	84,0	81,5	S W.by W	1,2	Gentle wind, cloudy, vivid lightning to the NW&SW.
	1 A. M.	29,794	84,0	81,5	S W.by W	1,2	Gentle wind, drizzling, vivid lightning to the NW.
	2	29,790	83,8	80,5	S W	1,2	Gentle wind, cloudy, vivid lightning and thunder to the NW.
	3	29,762	83,0	80,0	S W. by S	3	Strong wind, clear, vivid lightning to the west.
	4	29,762	82,8	79,0	S W. by S	5	Very do. do. do. do. do.
	5	29,762	82,6	78,7	S W. by S	5	Do. do. do. fl. cl. do. do. to the NW.
	6	29,784	81,5	77,2	S	1	Moderate wind and thick haze
	7	29,810	83,3	78,1	S. S W	1	Do. do. do do.
	8	29,832	85,2	78,1	S W	1	Do. do. clouds in the N. horizon.
	9	29,834	87,4	79,4	S W	1	Gentle wind, flying clouds.
	10	29,828	88,4	79,4	S W	1	Gentle breeze, haze.
	11	29,812	89,0	81,7	S E	1	Do. do.
	12	29,802	88,7	81,7	S E	2	Moderate wind do.
	1 P. M.	29,780	89,0	81,8	S E	2	Do. do. do.
	2	29,760	88,4	81,0	S. S E	3	Strong do. thick haze.
	3	29,738	87,4	81,0	S. S E	3	Do. do. do. do.
	4	29,724	87,2	81,5	S. S E	3	Do. do. do. do.
	5	29,730	85,9	80,0	S. S E	3	Do. do. do. do.
	6	29,744	84,0	81,0	S	3	Do. do. do. do.

2.—*Horary Meteorological Observations made at the Summer Solstice* 1839, *at the Trevandrum Observatory.*—*By* G. SPERSCHNEIDER, *Superintendent.*

Date.	Hour.	Newman's Standard bar. corrected for 32° and for capillarity.	Standard thermometer.	Depress. of wet bulb thermometer.	Temp. of dew point.	Direction of wind.	Velocity of the wind.	Solar radiation.	Clouds, aspect of the sky and remarks.
June									
21	6 A.M.	29.608	74.5	2.4	71.00	NW by W	5	——	Drizzling—gentle wind.
	7	.621	75.2	2.5	71.58	N W	1	2.5	Zen. clear cum. stratus about hor. wind just perceptible.
	8	.629	77.8	4.1	71.91	do	2	4.0	Cloudy do.
	9	.635	79.3	4.5	72.91	do	3	1.7	do. gentle wind.
	10	.624	82.2	6.5	73.52	do	4	2.0	do. do.
	11	.598	83.6	7.7	72.71	do	3	7.8	Flying clds. in the zen. cum. about horizon—do.
	Noon.	.555	86.0	9.6	72.45	do	4	5.9	Zenith clear do. do.
	1 P.M.	.534	86.9	9.6	73.47	do	5	8.5	do. do. pleasant wind.
	2	.504	88.5	10.6	73.71	do	4	3.3	Sky rather clear do.
	3	.506	87.3	11.1	71.54	do	6	5.5	Light clouds rising up do.
	4	.515	85.6	10.0	71.34	NWby W	6	0.5	Flying clouds in the zen. do.
	5	.519	84.6	9.3	71.31	N W	1	2.1	Sky getting clear light air.
	6	.541	81.9	7.4	72.40	do	2		do. do.
	7	.573	81.4	5.8	73.21	do	1		Sky very clear do.
	8	.595	80.5	4.6	74.04	NWby N	1		do. do.
	9	.611	79.5	4.6	73.97	do	1		Light clouds in the zen. do.
	10	.621	78.0	4.7	71.50	do	,,		do. halo round the moon—calm.
	11	.594	76.9	3.7	71.56	N by W	1		Sky clear—wind hardly perceptible.
	Mid.	.583	76.2	3.1	71.72	do	1		do. do.
,, 22	1 A.M.	.560	76.3	3.3	71.53	do	,,		do. nearly calm.
	2	.542	76.2	2.9	72.03	do	,,		do. at 2h. 30m. drizzling—do.
	3	.534	76.1	2.7	72.22	N	4		do. gentle wind.
	4	.547	75.6	2.8	71.54	do	,,		do. calm.
	5	.549	75.0	2.7	71.07	N	2		do. wind just perceptible.
	6	.562	75.6	2.9	71.39	do	,,		do. haze about horizon—calm.
	7	.591	77.1	3.2	72.52	N	1	cly.	Hazy light air.
	8	.603	81.1	5.5	73.34	N W	2	do	Cloudy do.
	9	.624	83.7	6.1	75.24	NWby W	2	2.0	do. do.
	10	.638	83.5	6.8	74.35	N W	1	cly.	Very cloudy do.
	11	.632	84.6	7.5	74.14	W	1	5.5	do. do. at 11h. 48m. drizzling
	Noon.	.615	83.4	6.0	75.13	N N W	1		Overcast at 0h.30m. drizzling—lt.air.
	1 P.M.	.612	80.8	4.8	74.06	W	4		Heavy rain gentle wind.
	2	.602	77.8	3.3	73.11	do	4		do. continued do.
	3	.585	77.7	2.7	73.91	do	2		do. do. wind just perceptible.
	4	.581	75.5	2.9	71.31	do	1		do. do. nearly calm.
	5	.578	76.5	0.9	75.24	do	1		Drizzling do.
	6	29.605	77.3	2.2	74.20	do	1		Rain just ceased, still threatning, do.

No observation. Heavy rain.

June 21st fall of rain from 6 A. M. to 6 P. M. None.
do. 6 P. M. to 6 A. M. None.
June 22d do. 6 A. M. to 6 P. M. 2.5675

Total 2.5675

The Instruments are the same—and situated exactly as before.

METEOROLOGICAL REGISTER KEPT AT THE MADRAS OBSERVATORY, FOR THE MONTH OF APRIL, 1839

Days.	Barometer at 10 A. M.	Barometer at 4 P. M.	Barometer at 10 P. M.	Ther. at 10 A. M.	Ther. at 4 P. M.	Ther. at 10 P. M.	Wet Bulb. 10 A. M.	Wet Bulb. 4 P. M.	Wet Bulb. 10 P. M.	Rain Sun-rise.	Rain Sun-set.	Evaporation.	Direction of Wind. 10 A. M.	Direction of Wind. 4 P. M.	Direction of Wind. 10 P. M.	Weather. 10 A. M.	Weather. 4 P. M.	Remarks. 10 P. M.
1839	Inch.	Inch.	Inch.	o	o	o	o	o	o									
Apl. 1	30,052	29,968	30,022	83,1	86,0	82,4	7,1	9,0	6,5	.....	.....	.....	S E	S E	S E	Clear	Haze	Thick haze.
2	,100	,990	,099	84,6	86,0	82,3	6,4	7,2	4,8	.....	.....	.....	S	S. S E	S E	Fl. cl.	Th. hz.	Clear.
3	,086	,996	,082	83,0	86,5	83,9	5,6	7,6	4,8	.....	.....	3,066	N E	S E	S E	Fl. cl.	Do.	Do.
4	,062	,946	,014	84,9	87,0	83,8	6,4	7,3	6,3	.....	.....	.....	S	S E	S E	Haze	Do.	Do.
5	,008	,906	29,960	84,6	87,8	83,8	7,0	8,8	4,4	.....	.....	.....	N W	S E. E	S E	Fl. cl	Clear	Do. lightning.
6	29,988	,878	,930	85,2	87,8	84,0	9,6	9,3	7,4	.....	.....	.....	S	S E. E	S E	Clear	Do.	Clear
7	,968	———	,920	84,8	—	84,0	6,1	—	4,4	.....	.....	.....	S	———	E	Fl. cl.	———	Do.
8	,944	,844	,924	85,0	88,0	82,1	6,4	8,5	3,6	.....	.....	.....	N E	E	N E	Fl. cl.	Clear	Do.
9	,928	,862	,926	87,0	88,0	84,6	7,5	8,3	4,7	.....	.....	.....	N E	N E	N	Fl. cl.	Fl. cl.	Fl. cl. lightning.
10	,922	,844	,920	85,6	86,0	85,8	4,9	4,5	3,2	.....	.....	3,051	N W	N E	S E	Fl. cl.	Clo.	Drizzling rain, loud thunder and vivi lightning throughout the night.
11	,948	,868	,944	84,5	85,8	84,0	4,5	4,5	3,4	0,577	.....	.....	S W	E	S E	Fl. cl.	Do.	Clear—lightning.
12	30,024	,920	,976	85,7	85,8	83,6	5,2	5,3	3,5	.....	.....	.....		S E. E	Calm	Clo	Do.	Fl. cl. do.
13	,018	,920	30,032	85,3	87,-	84,9	4,7	4,6	4,6	.....	.....	.....	S W	S E	S. SE	Fl. cl.	Clear	Clear do.
14	,008	———	,018	85,8	—	84,5	9,8	—	4,2	.....	.....	.....	S W	———	S E	Fl. cl.	———	Do. lightn ing.
15	,018	,904	29,970	86,0	88,0	84,8	5,5	5,0	3,9	.....	.....	.....	S W	S. S E	S E	Haze	Clear	Do.
16	,048	,882	,974	87,7	89,6	84,3	7,8	7,6	2,7	.....	.....	.....	S	S	S	Fl. cl.	Do.	Do lightning.
17	29,960	,858	,900	88,1	89,0	84,2	9,7	7,1	4,4	.....	.....	2,466	S	S. S E	S	Clear	Do.	Do. do.
18	,932	,850	,920	89,7	88,5	84,3	11,1	6,5	3,8	.....	.....	.....	S W	S. S E	S	Do.	Do.	Do. do.
19	,948	,852	,940	88,1	88,5	85,3	6,2	5,6	3,1	.....	.....	.....	S E	SE. E	S	Do.	Do.	Fl. cl. do.
20	,968	,866	,960	86,5	88,0	84,3	6,7	5,1	5,0	.....	.....	.....	S	S E	S E	Do.	Do.	Haze do.
21	30,002	———	,990	85,3	—	84,9	6,7	—	6,4	.....	.....	.....	E	———	S	Do.	———	Cloudy—do. and thunder.
22	,000	———	,980	83,3	—	85,2	4,0	—	5,5	.....	.....	.....	S W	———	E	Clo.	———	Do lightning.
23	29,968	,876	,960	83,9	86,0	84,8	6,9	5,5	4,2	1,047	.....	.....	S E	S E	S	Do.	Fl. cl.	Fl. cl thunder and lightning.
24	,934	,846	,922	85,7	86,5	84,4	5,9	6,0	3,8	.....	.....	2,808	S W	S E	S	Fl. cl.	Clo.	Clear do.
25	,924	,842	,902	85,3	89,0	85,0	7,0	8,0	4,1	.....	.....	.....	S W	S. S E	S. S E	Clo.	Clear	Do. do.
26	,898	,816	,872	86 7	89,0	85,9	6,9	7,0	3,9	.....	.....	.....	S W. W	S E	S	Fl. cl.	Do.	
27	,878	———	,868	87,7	—	86,8	7,5	—	—	.....	.....	.....	S W	.....	.....	Fl. cl.	.....	
28	———	———	,854	—	—	84 8	—	—	—	.....	.....	.....	.....	.....	.....	Clear	.....	
29	———	———	,878	—	—	87,3	—	—	—	.....	.....	.....	.....					
30	———	———	,880	—	—	87,6	—	—	5,7	.....	.....	.....	.....					
Mean	29,984	29,888	29,950	85,6	87.0	84,6	6,8	6,7	4,5	.....	.....	.....	.....					

METEOROLOGICAL OBSERVATIONS KEPT AT THE MADRAS OBSERVATORY, FOR THE MONTH OF MAY, 1849.

METEOROLOGICAL REGISTER KEPT AT THE MADRAS OBSERVATORY, FOR THE MONTH OF JUNE, 1839.

Days.	Barometer at 10 A. M.	Barometer at 4 P. M.	Barometer at 10 P. M.	Ther. at 10 A. M.	Ther. at 4 P. M.	Ther. at 10 P. M.	Wet Bulb. 10 A. M.	Wet Bulb. 4 P. M.	Wet Bulb. 10 P. M.	Rain. Sun-rise.	Rain. Sun-set.	Evaporation.	Direction of Wind. 10 A. M.	Direction of Wind. 4 P. M.	Direction of Wind. 10 P. M.	Weather. 10 A. M.	Weather. 4 P. M.	Remarks. 10 P. M.
1839	Inch.	Inch.	Inch.	o	o	o	o	o	o									
June1	29,818	29,732	29,784	87,8	91,0	86,1	12,3	11,5	5,2	.....	.....	.....	W	W	SW	Cloudy	Cloudy	Cloudy—thunder and lightning.
2	,836	——	,816	86,5	—.	86,7	11,5	—.	8,6	0,130	.....	.....	W	——	SW	Cloudy	——	Cloudy—lightning.
3	,842	,730	,750	86,3	91,0	85,5	11,4	12,5	7,6	.....	.....	.....	W	W	S. SW	Cloudy	Cloudy	Haze, strong wind, at night lightning.
4	,778	,680	,736	87,1	94,2	90,3	11,5	19,2	14,7	.....	.....	.....	W. SW	W	W.SW	Haze	Cloudy	Haze, very strong wind, at night light.
5	,784	,692	,746	89,5	94,6	89,3	11,9	13,1	11,8	.....	.....	4,035	W. SW	W	W. NW	Haze	Haze	Haze, strong wind, at night lightning.
6	,786	,668	,766	89,3	94,8	90,3	12,7	16,3	9,0	.....	.....	.....	W	W	S	Haze	Cloudy	Cloudy—lightning.
7	,814	,712	,816	90,3	98,0	89,8	14,0	21,0	8,4	.....	.....	.....	W	W	S	Clear	Cloudy	Cloudy—thunder and lightning.
8	,816	,746	——	89,9	95,0	—	13,5	11,5	—	.....	.....	.....	W	E	——	Cloudy	Cloudy	—— thunder and lightning.
9	,872	,762	——	89,6	90,0	—	12,1	8,5	—	0,217	.....	.....	W	SE	——	Clear	Cloudy	—— thunder and vivid lightning.
10	,874	,768	——	86,5	92,2	—	6,5	8,3	—	1,831	.....	.....	SW	S. SE	——	Cloudy	Cloudy	—— thunder and lightning.
11	,910	,782	——	86,9	89,6	—	9,9	9,7	—	0.047	0,027	.....	W	S. SE	——	Haze	Fl. cl.	—— thunder and lightning.
12	,910	,794	29,860	86,7	90,4	87,2	10,2	10,4	6,8	0,027	.....	4,233	W	E	S	Haze	Haze	Flying clouds—lightning.
13	,850	,744	,834	88,0	91,0	88,0	11,9	8,3	5,5	.....	.....	.....	W	SE	S.S W	Clear	Haze	Clear.
14	,866	,778	,882	88,7	90,2	87,8	10,3	8,2	5,5	.....	.....	.....	W	SE	S. SW	Clear	Fl. cl.	Cloudy—vivid lightning and thunder.
15	,918	,810	,914	87,7	89,8	87,5	7,9	6,9	6,9	.....	0,177	.....	SW	SE	SW	Cloudy	Cloudy	Cloudy—thunder and lightning.
16	,920	——	,900	86,3	——	87,5	7,5	—	6,7	.....	.....	.....	W	——	W.S W	Fl. cl.	——	Flying clouds—lightning.
17	,896	,810	,852	88,6	89,8	85,9	12,3	11,3	5,4	.....	.....	.....	W	E	S	Haze	Haze	Haze—lightning.
18	,855	,784	,852	89,2	90,6	87,8	13,2	12,1	7,1	.....	.....	.....	W	S E. E	S	Haze	Haze	Haze—lightning.
19	,856	,762	——	89,1	90,6	—	11,3	8,6	—	.....	.....	3,475	W	S E. E	——	Th. hz.	Clear	Haze—lightning.
20	,852	,742	,816	89,5	90,0	87,7	11,1	7,6	8,6	.....	.....	.....	W	S S.E	SW	Clear	Clear	Clear—lightning and thunder.
21	,816	,702	,791	90,0	88,4	83,6	12,0	7,9	2,0	.....	.....	.....	W	E. SE	S	Clear	Clear	Haze—vivid lightning
22	,828	,724	,828	88,4	87,2	85,6	9,0	5,7	4,0	.....	.....	.....	SW	S. SE	S. SW	Haze	Th. hz.	Haze—lightning.
23	,838	——	,830	87,8	——	86,3	8,3	—	3,7	.....	.....	.....	SW	——	SE	Haze	——	Clear—lightning.
24	,842	,724	,844	87,9	89,0	86,0	5,6	6,5	4,4	.....	.....	.....	SE	SE	S	Clear	Haze	Cloudy—lightning.
25	,850	,750	,834	88,1	88,5	85,9	5,9	6,0	5,4	.....	.....	.....	E	E. SE	SE	Cloudy	Cloudy	Haze, thunder at day time; lightning at
26	,822	,730	,808	86,8	89,6	85,9	8,4	7,7	4,9	.....	.....	3,238	SW	E. SE	SE	Haze	Th. hz.	Cloudy—vivid lightning, [night.
27	,800	,720	,800	88,0	89,2	86,3	9,0	8,2	4,4	.....	.....	.....	NW	E. S E	SW	Clear	Fl. cl.	Flying clouds—lightning.
28	,800	,724	,822	90,0	89,4	83,7	11,0	7,1	7,8	.....	.....	.....	SW	E. S E	W	Fl. cl.	Cloudy	Cloudy, vivid lightning, thunder, rain.
29	,814	,738	,812	87,0	92,2	85,3	8,5	13,8	8,8	.....	.....	.....	SW	W	SW	Th. hz.	Cloudy	Cloudy—lightning.
30	,831	——	,824	85,8	——	83,2	10,4	—	2,8	.....	0,127	.....	SW	——	SW	Haze	——	Flying clouds.
Mean	29,843	29,743	29,821	88,1	91,0	86,8	10,4	10,3	6,6									

The Instruments with which the foregoing observations are made, are placed in the Western Verandah of the Honourable Company's Observatory; at about 5 feet above the surface of the ground, and 27 feet above the level of the Sea; the thermometer was made on purpose for the Observatory, and at 75° (the only point at which a comparison has been made) it was found to differ insensibly from the Royal Society's Standard; the barometer is one of two Standards which I have lately constructed, and may be depended upon to 0,0100 an inch.

T. G. TAYLOR,
H. C. Astronomer.

MADRAS JOURNAL

OF

LITERATURE AND SCIENCE.

No. 25—October 1839.

I.—*A Catalogue of the Species of Mammalia found in the Southern Mahratta Country; with their Synonymes in the Native Languages in use there.*—*By* WALTER ELLIOT, ESQ.

(Concluded from No. 24, page 108.)

Mus.

The different Indian species of this family have hitherto been classed under three groups, *Mus—Arvicola—Gerbillus.*

The species described are—

Mus Giganteus.....Hardwicke.
—— *Decumanus*.....Pallas.
—— *Rattus*.....Lin.
—— *Platythrix*.....Sykes.
—— *Oleraceus*.....Sykes.
—— *Musculus*.....Lin.
Arvicola Indica.....Gray and Hardwicke.
Gerbillus Indicus.....Hardwicke.

None of these, however, except the species common to Europe, seem to have received more than a general description of their outward form, and accordingly, on looking closer into the details of their structure, and particularly to the character of their teeth, a different disposition seems necessary. Of *Arvicola* there is no example; the species characterised by Gray having molars with flat coronals, and strong radicles, in this respect assimilating with the sub-genus *Neotoma*, established by Messrs. Say and Ord in the Philadelphia Journal.

The *Mus Giganteus* of Hardwicke exhibits similar characters, but they both differ from the Florida rat, the type of *Neotoma* (as figured), in having the naked scaly tail of the common rat, whereas in the Florida species it is covered with hair.

The *Gerbillus Indicus* of Hardwicke unites both these characters, the surface of the molars being the same as that of the two Indian species indicated above, while the tail has the same peculiarity as the Florida rat, with the addition of a tuft at the extremity. But it is separated from the latter by the length of the hind feet, and the disposition of the toes, and by the carinated upper incisors; characters peculiar to *Gerbillus*. These common points of resemblance, however, show how intimately the different groups are connected, and how gradually they pass into each other. The remaining species all belong to the group of *Mus* proper, with tuberculated cheek teeth.

Of the other species, not included, that have been indicated by authors, no examples have been observed. These are *Mus Indicus* of Geoffrey, Cat. Mus. Par. Desm. VI. 259, which may perhaps be identified with Gray's *Arvicola*. The *Mus Striatus* of Seba,* adopted by Linnæus, Shaw,† and the French Naturalists,‡ has never been observed; neither has the spiny rat of Pondicherry (M. Perchal).

The species observed in the Southern Mahratta Country were—

With flat molars:

a. scaly tails—short metatarsi (*Neotoma*).

Mus Giganteus.

Arvicola Indica.

b. with hairy tail—long metatarsi (*Gerbillus*).

Gerbillus Indicus.

With tuberculated molars:

a. Covered with soft hair (*Mus*).

Mus Decumanus.....Lin.
Ratlus.....Lin.
Mettade.....New sp.
Golundee.....New sp.
Oleraceus.....Sykes.
Rufus.....New sp.
Musculus.....Lin.

b. Covered with hair and spines.

Platythrix.....Sykes.
Boodaga.....New sp.

* Thes. II. 22. † Zool. VI. t. 133. ‡ Ency. Meth. t. 68. f. 6.

The first division have 3 molars in each jaw, with strong alveolar processes; the anterior or largest one divided into three sections by transverse ridges of enamel; the middle into two, and the third partly, or entirely so, as the centre ridge of enamel extends altogether, or only partly across the surface. In *Giganteus* and *Gerbillus* the enamel of the posterior molar of the upper jaw generally forms only a deep indentation. In *Gerbillus* the incisors are more prismatic, the upper ones divided by a longitudinal furrow passing down the centre. In the other two species the incisors are smooth, rounded, with a longitudinal mark on the worn under surface. The upper incisors in *Gerbillus* also are much more curved downwards than in the other two. In the former the nasal and superior maxillary bones project considerably beyond the incisors; in the latter the incisors extend beyond these bones.

30.—*Mus (Neotoma) Giganteus*, Hard. Lin. Trans.—*Mus Malabaricus*, Pennant, Quad.

Heggin,.....Canarese .....ಹೆಗ್ಗಣ

Pandi koku.....Tel. of the Wuddur caste....పంది కొక్కు.

Ghons .....Dekhuni.....گھوس

The English name, bandicoot, is a corruption of *pandi-koku*, literally pig-rat.

Lives in granaries and stack-yards; feeds entirely on grain. Fierce, bold. Makes a peculiar grunting noise when frightened or angry.

Female with 12 teats. Incisors dark olive green at the base; becoming yellow at the extremities.

31 —*Mus (Neotoma) Providens.—Mus Indicus*, Geoff.—*Arvicola Indica*, Gray.

Kok.....Canarese.....ಕೊಕ್ಕು

It seems necessary to distinguish this species by a new name, that of *Indicus* being too general and indefinite. Geoffroy's animal is not sufficiently particularized to indicate which of the Indian species he meant; and Gray's was given under the supposition that it applied to an *Arvicola*, which he subsequently discovered it did not: Journal Zool. Soc. July 28, 1835, p. 108. The present term seems sufficiently applicable to its habit of laying up a large store of grain for its winter food.

The *koku* is from 13 to 14 inches in length, and weighs upwards of 6 oz. Its figure is thick and strong, with powerful limbs, the head short and truncated, the ears small, sub-ovate or nearly round, and covered with a fine down or small hairs. The tail naked and nearly as

long as the body, whiskers long and full. Fur long and somewhat harsh, brown mixed with fawn, the short fur softer and dusky. The colour generally being something like that of the brown rat, with more fawn or red intermixed, and lighter beneath.

In its habits it is solitary, fierce, living secluded in spacious burrows, in which it stores up large quantities of grain during the harvest, and when that is consumed lives upon the *kuryalee* grass and other roots.

The female produces from 8 to 10 at a birth, which she sends out of her burrow as soon as able to provide for themselves. When irritated, it utters a low grunting cry, like the bandicoot. Incisors entirely of an orange yellow colour.

The dimensions of an old male were as follows:—length of body 7 inches; of tail 6½; total 13½: of head 1 $\frac{8}{10}$; of ear $\frac{9}{10}$ths; of fore palm $\frac{4}{10}$ths; of hind 1$\frac{4}{10}$ths. Weight 6 oz. 5 drs.

The race of people known by the name of *Wuddurs*, or tank-diggers, capture this animal in great numbers as an article of food; and during the harvest, they plunder their earths of the grain stored up for their winter consumption, which, in favourable localities, they find in such quantities, as to subsist almost entirely upon it, during that season of the year. A single burrow will sometimes yield as much as half a seer (about a lb) of grain, containing even whole ears of *jowaree (Holcus sorghum)*. The *Kok* abound in the richly cultivated black plains or cotton ground, but the heavy rains often inundate their earths, destroy their stores and force them to seek a new habitation. I dug up a winter burrow in August 1833, situated near the old one, which was deserted from this cause. The animal had left the level ground, and constructed its new habitation in the sloping bank of an old well. The entrance was covered with a mound of earth like a mole-hill, on removing which, the main shaft of the burrow was followed along the side of the grassy bank, at a depth of about 1 or 1½ foot. From this, a descending branch went still deeper to a small round chamber, lined with roots and just large enough to contain the animal. From the chamber a small gallery ran quite round it, terminating on either side in the main shaft at the entrance of the chamber; and the passage then continued down to the bottom of the bank, and opened into the plain. Near the upper entrance, and above the passage to the chamber, was another small branch, which terminated suddenly, and contained excrement. But these burrows are by no means on a uniform plan. Another occupied by an adult female was likewise examined in the same neighbourhood. It was much more extensive, and covered a space of about 15 feet in length by about 8 in breadth, also in a grassy mound, of which it occupied both sides. Six entrances

were observed, (and there may have been more,) each covered with loose earth. The deepest part of the burrow near the chamber was about three feet from the surface; the chamber raised a little above the shaft, which terminated abruptly and was continued from the upper part of the chamber. The chamber itself was lined with roots of grass and bark of the date-tree. The branching galleries, of which there were six, from the principal shaft, appeared to have been excavated in search of food.

A variety found in the red soil is much redder in colour than the common *Koku* of the black land.

Another variety is said to frequent the banks of nullahs and to take the water when pursued, but the specimens I have seen differed in no respect from the common kind (of which they appeared to be young individuals), except in size.

32.—*Mus (Gerbillus) Indicus*, Hardw.

Billa Ilei....Canarese. ಬಿಳಿಲೆಯಿಲಿ

Yeri yelka } of Wuddurs. ಎಱಿಯೆಲುಕ ತೆಲ್ಲಯೆಲುಕ.
Tel yelka }

This species has already been fully described, and some peculiarities in its cranium have been noticed above. The muzzle appears to be more pointed than stated by General Hardwicke, who characterizes it as "very round," and the colour is always of uniform bright fawn, without any admixture of brown spots, which have never been observed. The incisors are always of a deep yellow colour; the eyes very large and full, the tail longer than the body.

A large adult male measured:—length of body 7 inches; of tail $8\frac{1}{10}$; of head $2\frac{1}{10}$; of ear $\frac{9}{10}$; of fore foot $\frac{5}{10}$; of hind foot 2. Weight $6\frac{3}{4}$ oz.

They are said to be very prolific, bringing from 16 to 20 at a birth but this seems an exaggeration, and the litter probably seldom exceeds 12. It is the common prey of foxes, owls, snakes. Lives in numerous societies, making extensive burrows in the red gravelly soil of the Mulnaad, generally in or near the root of shrubs or bushes. The entrances, which are numerous, are small, from which the passage descends with a rapid slope for 2 or 3 feet, then runs along horizontally, and sends off branches in different directions. These galleries generally terminate in chambers from $\frac{1}{2}$ a foot to a foot in width, containing a bed of dried grass. Sometimes one chamber communicates with another, furnished in like manner, whilst others appear to be deserted and the entrances closed with clay. The centre chamber in one burrow was very large,

which the *Wuddurs* attributed to its being the common apartment, and said that the females occupied the smaller ones with their young. They do not hoard their food, but issue from their burrows every evening, and run and hop about, sitting on their hind legs to look round, making astonishing leaps; and, on the slightest alarm, flying into their holes.

The Wuddurs eat this species also.

33.—*Mus Décumanus*, Lin.

Manei ilei.....Canarese. మనెయిలి

Chooha, and *Ghur ka chooha*. } Dekhani. چوہا گھر کا چوہا

Not so common above the Ghats as below.

34.—*Mus Rattus*, Lin.

Rare.

35.—*Mus lanuginosus*.—New species.

Mettade... .....of the Wuddurs..... మెట్టాది.

Kera ilei,..... ....Canarese.....కీర్ తెలియి

The name adopted to designate the species is taken from the word *mettade*, meaning soft, in allusion to its fur, which is fine and soft—*mettani* meaning soft in Telugu. It is also called *mettan-yelka*, *mettanganda*, from the same cause. It is about half the size of the *kok*, which it somewhat resembles. The head is short, but the muzzle, instead of being square and truncated, is sharp; the ears are larger in proportion and more ovate. The general form is not so stout. The tail is shorter than the body. The colour above is reddish brown, with a mixture of fawn; lighter beneath, close and soft, with a few longer hairs projecting.

A large adult male measured :—length of body, $5\frac{6}{10}$ th inches; of tail, $4\frac{3}{10}$ths; total $9\frac{9}{10}$ths; of head $1\frac{4}{10}$th; of ear $0\frac{4}{10}$th. Weight $2\frac{1}{2}$ oz.

The *mettade* lives entirely in cultivated fields, in pairs, or small societies of five or six, making a very slight and rude hole in the root of a bush, or merely harbouring among the heaps of stones thrown together in the fields, in the deserted burrow of the *kok*, or contenting itself with the deep cracks and fissures formed in the black soil during the hot months. Great numbers perish annually, when these collapse and fill up at the commencement of the rains. The monsoon of 1826 having been deficient in the usual fall of rain at the commencement of the season, the *mettades* bred in such numbers as to become a perfect plague. They ate up the seed as soon as sown, and continued their ravages when the grain approached to maturity, climbing up the stalks of *jowaree*, and

cutting off the ear to devour the grain with greater facility. I saw many whole fields completely devastated, so much so, as to prevent the farmers from paying their rents. The ryots employed the *Wuddurs* to destroy them, who killed them by thousands, receiving a measure of grain for so many dozens, without perceptibly diminishing their numbers.

Their flesh is eaten by the Tank-diggers. The female produces from 6 to 8 at a birth.

36.—*Mus Hirsutus.*—New species.

Gulandi or *Gulat yelka* } Canarese ..... of the Wuddurs.... { ಕಂ ಬಿಂದಿ ಗುಲಕಮೆಲಿಕ.

The *Gulandi* is about the size of the last species, or a little larger—but differs from it in living entirely above ground, in a habitation constructed of grass and leaves, generally in the root of a bush at no great height from the ground, often indeed touching the surface. The head is longer than that of the *Mettade,* but the muzzle is blunt, rounded, and more obtuse, and covered with rough hair. The face and cheeks are also rougher than those of the other rats; the ears round and villose; the eyes moderate; the whiskers long and very fine. The tail naked and scaly, somewhat villose. The colour is an olive-brown above, mixed with fulvous; beneath yellowish tawny; sometimes paler, or light yellowish grey.

A male *Gulandi* measured :—length of body, $6\frac{8}{10}$th; of tail, $4\frac{3}{10}$th; total $10\frac{5}{10}$th: of head, $1\frac{1}{10}$th; of ear, $0\frac{6}{10}$th. Weight nearly 3 oz.

The *Gulandi* lives entirely in the jungle, choosing its habitation in a thick bush, among the thorny branches of which, or on the ground, it constructs a nest of elastic stalks and fibres of dry grass, thickly interwoven. The nest is of a round or oblong shape, from 6 to 9 inches in diameter, within which is a chamber about 3 or 4 inches in diameter, in which it rolls itself up. Round and through the bush are sometimes observed small beaten pathways, along which the little animal seems habitually to pass. Its motion is somewhat slow, and it does not appear to have the same power of leaping or springing, by which the rats in general avoid danger. Its food seems to be vegetable, the only contents of the stomach that were observed being the roots of the *huryalee* grass. Its habits are solitary (except when the female is bringing up her young), and diurnal, feeding during the mornings and evenings.

37.—*Mus Oleraceus*, Sykes.

Meinalka, or *Meina yelka* } Canarese..... of the Wuddurs..... } ಮೀನಿಲಿಕ.

Marad ilei,.....Canarese..... ಮರದಿಲಿ

This species has, by mistake, been designated as *M. Longicaudatus* in the distribution list at page 94, a term applied to it in my notes, some years ago, when I believed it to be undescribed, as in fact it was at the time, but it was subsequently noticed by Mr. Bennet from a specimen taken home by Colonel Sykes.*

Its colour is a bright chesnut above, beneath pure white. Head moderate, muzzle somewhat obtuse, ears ovate, tail naked.

The dimensions of a young female were:—length of body, 3 inches; of tail, $4\frac{8}{10}$ths; total $7\frac{2}{10}$ths; of head, 1; of ear, $0\frac{5}{10}$ths.

The *Meinalka* is extremely active and agile, and difficult to catch. I never procured its nest, but was told by the Wuddurs it lived always in bushes or trees, up which it is able to run with great facility. Colonel Sykes merely observes that "it constructs its nest of leaves of oleraceous herbs, in the fields." Whence the designation he has adopted for it.

38.—*Mus Flavescens*.—New species.

This species somewhat resembles the last, but is nearly double the size, is of a paler yellow colour, and was met with only in out-houses and stables at Dharwar, but there in considerable numbers. Habits social. It has been designated as *Mus Rufus* in the list at page 94; but besides that this term has been appropriated to other species, it does not express the particular colour so well as that now adopted. This is a pale yellowish brown above, and white beneath. The head is long, the muzzle pointed, the ears very large, sub ovate.

Dimensions of an adult male:—length of body $5\frac{1}{2}$ inches; of tail $6\frac{1}{2}$; total 12. Weight $2\frac{1}{4}$ oz.

39.—*Mus Musculus*, Lin.

Manei Buduga, Canarese.....ಮನೆಬುಡಕ

This I always considered to be the common mouse, but Mr. Gray considered a specimen given to the British Museum to differ from the European species.

* Proceedings, Zool. Soc. July 26, 1833.—P. 121.

Spiny Rats.

40.—*Mus Platythrix*, Sykes.

Leggyade } of Wuddurs..... ತಗ್ಗಾಡಿ-
Ral ye'ka } ರಾಳ್ಯಲುಇಕ.

Kul ilei Canarese..... ಕಲ್ಲಿಲಿಗಿ

The *leggyade* has also been described by Mr. Bennet from Colonel Sykes' specimen.* I had proposed to call it *M. Saxicola* as better expressive of its habits, and as being exactly equivalent to its native name; *platythrix* expressing a generic rather than a specific character.

It has the head long, the muzzle pointed, the ears rather large, oblong, rounded. Incisors yellow. Colour light brown, mixed with fawn; beneath pure white; the white separated from the brown by well defined pale fawn line. The flattened spines are transparent on the back, beneath smaller, and forming with the fur a thick close covering.

The dimensions of an

	Adult Male.	do. Female.
Length of body	3 $\frac{4}{10}$ inch	3 inches
—— of tail	2 $\frac{5}{10}$	2 $\frac{4}{10}$
Total	5 $\frac{9}{10}$	5 $\frac{4}{10}$ or nearly 5½
—— of head	1 $\frac{4}{10}$	1 $\frac{3}{10}$
—— of ear	$\frac{5}{10}$	„
—— of fore palm	„	„ $\frac{4}{10}$
—— of hind palm	„	„ $\frac{7}{10}$
Weight	1 oz.	15 drs.

The *leggyade* lives entirely in the red gravelly soil, in a burrow of moderate depth, generally in the side of a bank. When the animal is inside the entrance is closed with small pebbles, a quantity of which are collected outside; by which its retreat may always be known. The burrow leads to a chamber, in which is also collected a bed of small pebbles, on which it sits, the thick close hair of the belly protecting it from the cold and asperity of such a seat. Its food appears to be vegetable. In its habits it is monogamous and nocturnal.

In one earth which I opened, and which did not seem to have been originally constructed by the animal, but to have been excavated by ants, I found two pairs; one of which were adults, the other young ones

* Proceedings Zool. Soc. 26th June 1832, p. 121.

about three parts grown. The mouth of the earth was very large, and completely blocked up with small stones; the passage gradually widened into a large cavity, from the roof of which some other passages appeared to proceed, but there was only one communication with the surface, viz. the entrance. The old pair were seated on a bed of pebbles, near which, on a higher level, was another collection of stones, probably intended for a drier retreat. The young ones were in one of the passages likewise furnished with a heap of small stones.

41.—*Mus Lepidus.*—New species.

Buduga, Canarese.....ಬುದುಕ

Chitta burkani,
Chit yelka,
Chitta ganda, } Tel. of Wuddurs. చిత్తబుర్కాని- చిట్టెలుక- చిట్టగంద.

This pretty little species resembles the preceding, but is only about one third of the size. The colour is similar, but paler, and it has the same pure white under surface, separated from the upper by an exact line. The spines are small, fine, transparent, and of a dusky tinge, tipt with fawn. The head is very long, being nearly one third the length of the body, and the muzzle pointed. The ears are large, ovate, naked. Incisors white. Tail naked, scaly. Limbs rather long, fine; the 3 middle digits of the hind foot produced, as in *Gerbillus*, the two outer ones much shorter and nearly equal.

The dimensions of an old male were—length of body $2\frac{9}{10}$th inch; of tail, $2\frac{7}{10}$th; total $5\frac{6}{10}$th; of head $\frac{9}{10}$th; of ear $4\frac{1}{2}$-10th; of fore palm $2\frac{1}{2}$-10th; of hind palm $\frac{6}{10}$th; weight 6 drs., but in general it does not exceed a $\frac{1}{4}$ of an oz. (or 4 drs.).

Lives generally in pairs in the red soil, but sometimes a pair of young ones is found in the same burrow with the old ones. Does not produce more than 4 or 5 at a birth.

42.—*Sciurus Palmarum*, Gmel.—*Rat Palmiste*, Brisson.

a. common variety.

b. darker coloured, peculiar to the Ghats.

Alalu.....Canarese.....ಅಳಲು

Gilheri.....Dekhani.....گلهري

Urta.....of the Wuddurs....ఉరత.

The common species is sufficiently well known; the other, found only in the forests of the Ghats, is darker, the front and the back between the stripes reddish brown, the stripes small, narrower than in the common kind, and not extending the whole length of the back.

The size of both is the same.—Length, 13 to 14 inches; weight of males, 4 oz. 12 drs; females 4 oz. 11 drs.

The young are born without any hair, but three dark lines are visible along the back indicating the position of the future stripes.

43.—*Sciurus Maximus*, Gmel.—*S. Elphinstonii*, Sykes.

Shekra,.....Mahratta ... } of the Ghats.. }

Kes Annalu.....Canarese..... } of the Halapyks. } ಕೆಸ್ಸರಲು

I have observed the same uniformity of colour in the Ghat variety that has been described by Colonel Sykes; but it seems doubtful whether mere difference in colour, constitutes sufficient grounds for the formation of a new species. I have had both the black and the red kinds alive, and tame, in my possession, for months together, and I observed the most perfect similarity in their habits, cry, and in every particular except in that of colour.

Though I never met with individuals of the *S. Maximus* in the forest, I have often obtained them from the people of the country, who said they caught them in the Southern parts of the mountain range. The same disposition to vary in the shade and distribution of colour has been remarked by Dr. Horsfield in the Java congener of the Indian species, the *Jeralang*, or Leschenaults squirrel, a specimen of which has been described by Geoffroy as *S. Albiceps* from a casual difference of this kind. These varieties probably depend on locality, and have given rise to a great multiplication of species. Thus we have the *S. Macrurus* of Gmel., identified by Cuvier with *S. Maximus*: *S. Ceylonensis* of Ray; *S. Indicus* said to come from Bombay, &c. Fischer makes the distinction between *S. Maximus*, and *Macrurus* to consist in the former having the cheek stripe terminating simply, while in the latter it is forked. J. B. Fisch. Syn. p. 363.

44.—*Pteromys Philippensis?*—New species?

Pukhya..... } Mahratta..... }
or
Pakya..... } of the Ghats..... }

Mr. Gray designated the specimens of this species presented to the British Museum by the specific name of *Philippensis*, and showed a for-

mer description of them under this title, the source of which I have mislaid. I cannot however find any such species indicated in Griffith's Synopsis, in Fischer's Mammalia, nor in any work to which I have access.

The length of the male is 20 inches, and the tail 21 = 41 inches: that of the female 19, and the tail 20 = 39 inches.

The colour above is a beautiful grey, caused by the intermixture of black with white and dusky hairs; beneath it is white, the legs and posterior half of the tail black. The male is distinguished by an irregular patch of rufous on the sides of the neck, which in the female is a sort of pale fawn. It is very gentle, timid, and may be tamed; but from its delicacy is difficult to preserve. Lives in the holes of trees in the thickest part of the forest.

45.—*Hystrix Leucurus*, Sykes.

Yed Canarese..... ಬಿದಿರು

Sirsel, *Sayal*, *Sahi ?* Dekhani ..... سرسل ..... سايل ..... ساهے

Salendra Mahratta of the Ghats.

Saori or *Chaodi* of Guzerat

46.—*Lepus Nigricollis*, Fr. Cuv.

Malla, Canarese..... ..... ಮೊಲ

Sassa, Mahratta.....

Khargosh, Dekhani .... خرگوش

47.—*Manis Crassicaudata*, Griffiths—*M. Pentadactyla*, Lin.—*Pangolin à Queu Courte*, Cuv.—*Broad-tailed Manis*, Pen.

Kowli Mah, Mahratta of the Ghats...

Thiriya do. .....

Alavi, *Alawa*, of the Wuddurs .....ಅಲವಿ

Shallama, *Shalma* of the Baüris.. .....

burrow with earth, when in it, so that it would be difficult to find them; but for the peculiar track they leave.

A female that I kept alive for some time, slept during the day, but was restless all night. It would not eat the termites or white ants put into its box, nor even the large black ant (*Myrmex indefessa*, Sykes) though its excrement at first was full of them. But it would lap the water that was offered to it, and also conjee or rice water, by rapidly darting out its long extensive tongue, which it repeated so quickly as to fill the water with froth.

When it first came it made a sort of hissing noise, if disturbed, and rolled itself up, the head between the four legs, and the tail round the whole. The claws of the forefeet are very strong, and in walking are bent under, so that the upper surface is brought in contact with the ground; its gait is slow, and the back is curved upwards.

After its death a single young one was found in it (Sept. 15th), perfectly formed, and about 2 inches long. The marks of the future striated scales were distinctly visible, and its long tongue was hanging out. The tongue of the old one was 12 inches in length, narrow, flat, fleshy to the tip, the muscle along the lower surface very strong.

The length of the animal was 40 inches. The weight 21-lbs.

48.—*Elephas Indicus*, Cuv. *Mem. de l'Inst.*

Anei, Canarese.....ಆನೆ

Hathi, Dekhani.....ہاتھی

The elephant is rare above the ghats, but occasionally a stray male makes his way up, and does much mischief to the rice-fields and gardens.

49.—*Sus Scrofa*, Lin.

Handi, *Mikka*, *Jevadi*, Canarese.... ಹಂದಿ, ಕಿರಿಮಿಕ, ಜೀವಾದಿ

Bûra Janwar, *Sûr*, Dekhani.....سور براجانور

Dûkur, Mahratta.

The Indian wild hog differs considerably from the German. The head of the former is longer and more pointed, and the plane of the forehead straight, while it is concave in the European. The ears of the former are small and pointed, in the latter larger and not so erect. The Indian is altogether a more active looking animal; the German

has a stronger heavier appearance. The same differences are perceptible in the domesticated individuals of the two countries.

50.—*Moschus Memina*, Erxleben.—*Memina*, Knox.—Ceylon p. 21.—*Pissay*, Ham. Voy. E. Ind. I. p. 261.

Berka, *Burka*, Canarese... ಬರ್ಕ

Pisei, *Pisuri*, Mahratta..... of the Ghats.....

Common in the forest and even occasionally seen in the Mulnad.

51.—*Cervus (Rusa) Hippelaphus*, Cuv.

Kadavi.....Canarese..... ಕಡವಿ

Samber..... Mahratta and Dekhani ساميبر

Bara Sinha..... Erroneously of Mahomedans

Meru.....Mahratta of the ghats.

There is only one species of *Rusa* found in the Western forests, which is common also to all the heavy jungles of Southern India. None of the descriptions given by Hamilton Smith to the different Indian species, under the names of *Hippelaphus*, *Aristotelis*, *Equinus*, apply exactly to it: but I have little doubt that all three are only varieties of the great Indian stag, originally described by Aristotle under the designation of *Hippelaphus*, and discriminated as such by M. Duvancel, in the Asiatic Researches, vol. xv. p. 174; to which it is not improbable the *C. Unicolor* or *Gona* of Ceylon, is also referrible.

The points of distinction that have been noticed are, the characters of the horns, size, colour, absence or presence of a disk on the buttocks, canine teeth, and minute distinctions in the proportions of the bones of the skull.

The horns of different individuals present great diversities of form. The only common characters are those of a basal antler, springing directly and equally with the beam from the burr; and the beam terminating in a bifurcated extremity, formed by a branch or snag separating posteriorly and pointing obliquely to the rear. But I have met with instances of medial antlers, of trifurcated extremities, and in one case, with the extremity showing a fourfold division, as in the annexed sketch of a *Samber* killed by Captain Green, Madras Engineers, in the Bellarungin Hills between Mysore and Coimbatore. Plate 4 fig. 1.

The size of the Southern *Rusa* is large, sometimes exceeding 14 hands in height. The colour varies from dark brown to dark greyish black or slate-black; with the chin, the inner sides of the limbs, the under part of the tail, and the space between the buttocks, yellowish white, passing into orange yellow, but never extending into a large circular disk on the buttocks. In several instances I have met with the hinds of a pale yellow or light chesnut colour. These were young individuals, but the *shikaries* always declared them to be the same as the common kind, and no other difference was perceptible. The cranium of one of these light coloured females presents no structural differences from that of a young black female. Both sexes have canine teeth in the upper jaw, springing from the suture between the maxillary and intermaxillary bones. The neck and throat are clothed with a long mane. The suborbital sinus is very large. When the animal is excited, or angry, or frightened, it is opened very large, and can be distended at pleasure. The new horns are soft and tender during the monsoon, from June to September, about which time the rutting season commences. The stags are then fierce and bold. I have seen one, when suddenly disturbed, face the intruder for a moment, shaking his head, bristling his mane, distending the suborbital sinus and then dashing into the cover.

52.—*Cervus Axis*, Erxleben.

Sarung.... } Canarese ಸಾರಂಗ
Saraga.... } ಸಾರಗ

Chital .... { Mahratta and Dekhani چيتل

53.—*Cervus Muntjak*, Zimmermann.

Kankuri.....Canarese ಕಾಕರ ಕುರಿ

Jungli Bukra..Dekhani .... جنگلي بکرا

Bekra..... Mahratta

This animal does not seem to differ in any respect from the *Kijang* of the Eastern Islands.

A young male of this species was in my possession for many months, and was quite tame. It was of a deep chesnut colour, which becomes browner as the animal grows older. On the face appeared the plaits or ribs of skin between the eyes, running up to the fore-head and ending in a triangular patch of stiff hairs of a dark brown colour, at the upper side of which the horn afterwards sprouted, making its first appear-

ance in the month of August. It had white spots in front of the fetlocks of all the four legs, and a little white likewise on the chin, upper throat, inside of arm-pits and thighs, and under the tail, but none on the lower part of the throat or on the belly. It used to lick its face with its tongue, which was remarkably long and extensible, reaching back over the eyes and the whole face, and frequently uttered a short, small cry, sharper than that of a kid.

It obtains its Canarese name from its habit of frequenting the *Kans*, or natural forest gardens.

54.—*Antilope Cervicapra*, Pallas.

Chigri	Canarese.	ಚಿಗರಿ	
Mriga	Sans.	ಮೃಗ	
Hurn	Mahratta and Dekhani	ھرن	The Buck.
Kalweet	Mahratta and Dekhani.	كالويت	
Phundayat	Mahratta.		
Hurneen	Mahratta and Dekhani.		The Doe. ھرني
Alali, of the Baöris,*		the Buck.	
Gundoli,	ditto	the Doe.	

Frequents the black plains, in herds of sometimes 20 or 30 ,each, of which has only one buck of mature age, the others being young ones. The buck of the herd always drives off the others, as soon as they begin to turn black, in the course of which desperate combats ensue, by which their horns are often broken.

The horns of the male in the Southern Mahratta Country seldom exceed 9 or 20 inches. The longest I have seen of a great number of specimens is 22 inches, with 4 flexures in the spiral twist; but I have seen a pair of horns from Hyderabad, 24 inches long,with 5 flexures and 50 rings or annuli; and another pair from Kattewar which were 25 inches.

The rutting season commences about February, or March; but fawns are seen of all ages, at every season. During the spring months the

* The *Baorees* or *hurn shikarees*, called also *Arari-Chinchers*, are a singular nomade tribe, who live entirely by capturing antilope by means of springes, in which they are very successful. They also catch the Chita (*Felis Jubata*) for the *Meer Shikaries*. They wear a dress of a sort of brown coloured cloth peculiar to themselves, and speak a dialect of Hindu with a very singular intonation.

buck often separates a particular doe from the herd and will not suffer her to join it again, cutting her off and intercepting every attempt to mingle with the rest. The two are often found alone also but on being followed always rejoin the herd.

When a herd is met with, the does bound away for a short distance and then turn round to take a look—the buck follows more leisurely, and generally brings up the rear. Before they are much frightened they always bound or spring, and a large herd going off in this way is one of the finest sights imaginable. But when at speed the gallop is like that of any other animal.

Large herds are found about Hookerry, and thence towards the Kistna, keeping to the high rocky basaltic eminences, called by the Natives *mal.* It is remarkable that the gazelle is rare on these situations so well adapted to their habits. Some of the herds are so large, that one buck has from 50 to 60 does and the young bucks driven from these large flocks are found wandering in separate herds, sometimes containing as many as 30 individuals of different ages.

They show some ingenuity in avoiding danger. In pursuing a buck once into a field of toor, I suddenly lost sight of him and found after a long search that he had dropt down among the grain and lay concealed with his head close to the ground. Coming, on another occasion, upon a buck and doe with a young fawn, the whole party took to flight, but the fawn being very young, the old ones endeavoured to make it lie down. Finding, however, that it persisted in running after them, the buck turned round and repeatedly knocked it over in a cotton field until it lay still, when they ran off endeavouring to attract my attention. Young fawns are frequently found concealed and left quite by themselves.

55.—*Antilope Arabica*, Hemprich and Ehrenberg Fischer's Synopsis *b.* 5. p. 460.—*A. Bennettii*, Sykes.

Budari,	Canarese of southern talooks.	ಬುದರಿ
Mudari,	Canarese of northern talooks.	ಮುದರಿ
Tiska,	Canarese	ತಿಸಕ
Chikara,	Dekhani	چکارا
Porsya,	of Baöris, the Buck.	
Chari,	ditto. Doe.	

The Indian gazelle always appeared to me to be new and undescribed, until I met with the Arabian species on the Southern and Eastern shores of Arabia in 1833; a careful examination of several individuals, both in a state of captivity, and that had been shot, convinced me that they were identical with the Indian species. And in this, I was confirmed by the opinion of M. Rüppell, formed on inspection of a stuffed skin taken home by me. They abound also in the islands of the Red Sea, particularly in Dhalak, and on the western shores about Massowa, and probably all along the Abyssinian Coast. The gazelle of the Hauran and of Syria, appeared also to be of this species; but I never had an opportunity of examining one closely. If this be the case, the *Chikara* possesses an additional interest, in being the same animal as the roe and the roe buck of Scripture. The modern name for the gazelle in Yemen is ظبي Dabi or Dzabi which is the same as the Hebrew word translated "Roe." Deut. 14, 5. It is likewise the gazelle of the Arabian poets, as appears from the common saying احور من كل الظبي "The eyes of the Dabi are the most beautiful of all."

It is found on the red sandy plains, or among stony open hills, and abounds in the basaltic formation of the Dekhun, in the valleys of the sandstone formation, and generally among the jungles of the red soil to the eastward of the Southern Mahratta Country. It is never seen on the black plains, nor among the western jungles, nor in the Mulnad.

It is found frequently in herds of three, generally a buck with two does; also of 5, 6, or 7, or more. The young expelled bucks are also found in separate herds like those of *A. cervicapra*. When two bucks fight they butt like rams, retiring a little and striking the foreheads together with great violence. When alarmed it utters a sort of hiss by blowing through the nose and stamps with the fore-foot, whence its Canarese name of *Tiska*.

The dimensions of an adult male procured at Dumbal in the Southern Mahratta Country, the skin of which is now in the British Museum, were as follows: height at the shoulder 2 feet, 2 inches: at the croup 2 feet 4½ inches; length from the nose to insertion of the tail 3feet, 5½ inches: of tail 8½ inches; of ear 6 inches; of horns 11 in.; of head 9 in. Weight 48-lbs.

But these are by no means the largest dimensions observed. At Deesa in Goozerat, where it is much more common, I measured three crania, the dimensions of the horns of which were

Length,	10½ in.	10¾ in.	11½ inches.
Distance between the points.	6½	6½	5
Number of annuli	14	16	18

including the two imperfect ones near the tip. The third or largest

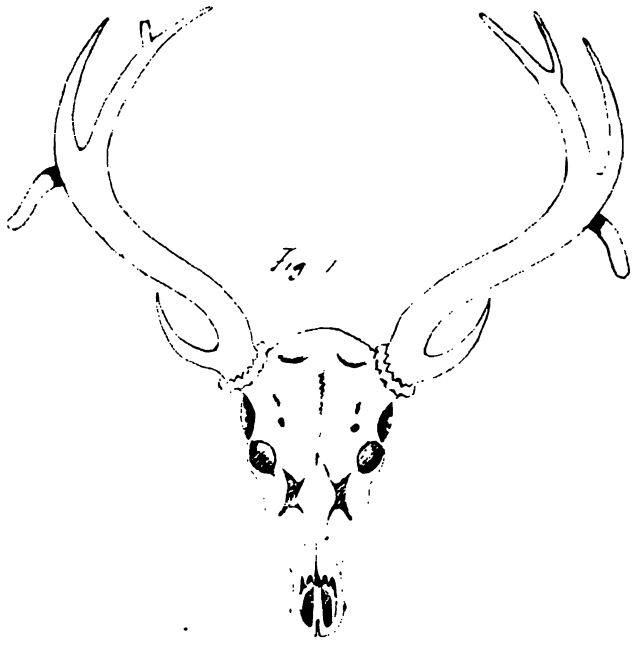


Fig 1

Fig 2

1. Cranium of Cervus Hippelaphus.

2. Head of Antilope Sect 4. cornutus.

were very little lyrated; the 2d were the strongest and thickest. I have also killed the buck weighing 51-lbs., the does weigh from 35 to 40-lbs. This is about half the weight of *Cervicapra* which varies from 90 to 100-lbs.

The adult female has the horns inclining more to the rear, curved backwards, the tips forwards, slightly wrinkled at the base, the rest smooth and black, and nearly equidistant.

In both the lachrymatory sinus is small and black. There is a dark spot on the nose, and a line from the eyes to the mouth surmounted by a light one. Knee-brushes, tail and fetlocks behind, black; chin, breast, and buttocks behind, white. Rest of the body, dark fawn deeper where it borders the white on the sides and buttocks. Ears long, 3 ridges of hair along the inner surface.

Inguinal pores, 2 mammæ. Horns of the female sometimes with a few imperfect annuli, and never corresponding with each other.

56.—*Antilope Sub-4-Cornutus ?*—New species ?—*Antilope Chikara*, Hardwicke.—*Brown Antilope*, Sykes.

Kondguri,	Canarese.	ಕೊಂಡಗುರಿ
Junglibukra,	Dekhani.	جنگلي بكرا

It is not improbable that the *chikara* (a name, by the way most incorrectly applied to this species, being restricted by all natives to the preceding one), the *Quadricornis* of Blainville, and the *Striaticornis* of Leach—all refer to the same animal. But the descriptions being only from isolated individuals, have not been sufficiently discriminated to determine the point.

The detailed description of General Hardwicke in the Linnæan Transactions, differs in many important particulars from the characters of the Dekhan species. This is much larger, and the colour varies considerably both from the Hindostan *chikara*, in which it is of a "uniform bright bay," and in the shades of individuals of different ages in the Dekhan. The spurious horns are so small, as rarely to be met with in adult individuals, and are situated on two osseous bumps or risings (strongly marked in the cranium) from which they seem to be easily detached. These osseous risings are immediately in front of the true horns, between the orbits, rather in front of a line drawn across the forehead through the centre of the eyes, and become covered with black callous skin, after the loss of the corneous tips. The true horns are situated behind the eyes or between the eyes,and the ears, inclining backwards with a scarcely perceptible curve forwards, straight, parallel, round, smooth, thick, and strong at the base which has a few wrinkles

and tapering to a point, their colour black. Those of a very old male were 4¾ inches in length and had 3 strong wrinkles, and one imperfect one at the base. Plate iv. fig. 2

The dimensions of a young adult male were :

Height at the shoulder, 2 feet 1½ inch ; croup 2 feet, 3 inches, length from the muzzle to the insertion of the tail, 3 feet, 6 inches; of tail 5 inches ; ear 4½ ; horn 4 ; from the muzzle to the base of the horn, 6 ; of head 8 ; leg 1 ; foot 5 inches. Weight 43 lbs.

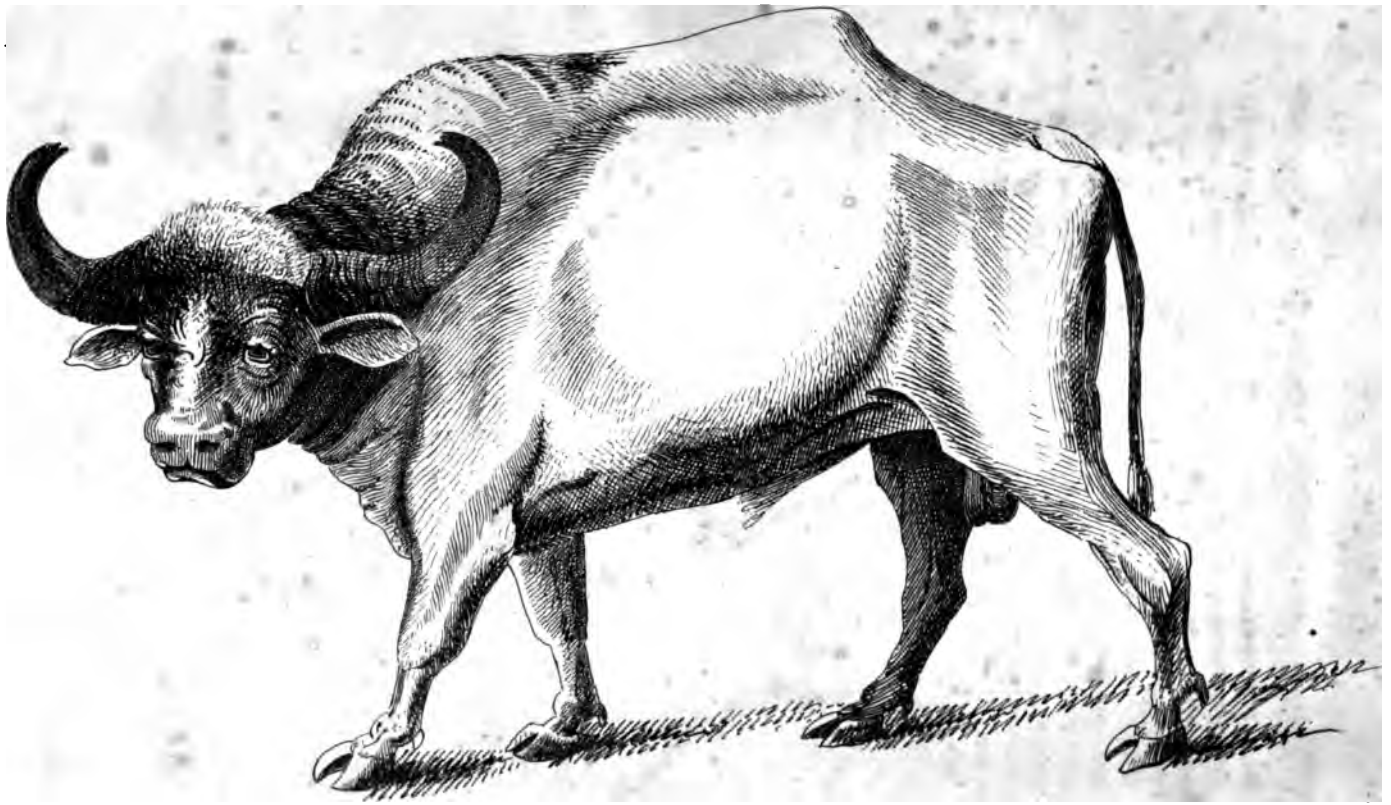
But I have found them even heavier. The doe is about the same size and has no horns, nor any bony projection above the eyes. The mammæ are four in number. The colour is brown, of various shades, not bright, but sometimes so light as to approach a dull fawn, darker than the *Cervicapra*, but not so bright and deep as in the gazelle. The shade is browner on the hind quarters, and darkest on the middle of the back. It becomes lighter on the sides till it passes gradually into white in the middle of the belly, without the well defined dark line of separation, observable in the other two species. The forelegs, particularly above the knee, the inside of the fetlocks, the nose and edge of the ears, are very dark. A narrow line between the fore-legs which gradually widens towards the hinder flanks, the inside of the arms and thighs, are white as is the inside of the ear, in which the hairs are long, and arranged in indistinct ridges. The lachrymatory sinus is long, narrow and parallel with the line of the nose.

In its habits, it is monogamous, and is always found in pairs, frequenting the jungles among the undulating hills of the Mulnad. It is never found in the open country, or among the hills on the eastern side of the district, neither does it ever penetrate into the western forests. The droppings are always observed in heaps in particular spots. It is said to be fond of licking the salt efflorescence of the soil, from which habit the incisors of old individuals are often found to be much worn, and sometimes wanting altogether.

57.—*Damalis Risia*, Hamilton Smith.—*Antilope picta*, Pallas.—*Neelgao*, Buffon and Shaw.

Maravi,	Canarese.	ಮರವಿ
Roj'h,	Dekhani.	
Ruhi,	Mahratta.	

It is found in the thick low jungles of the Rone and Chudi Pergunnahs, in those of Goonjeehal near the Sungam of the Kistnah and Ghatparba rivers in the Mubiluhal talook, and in the Moolwar Nala towards Beejapoor, but never in the open black plains, the Mulnad, or the Ghat



Bos Caffer

forests. It is comparatively rare, and is becoming more so, every day. The country people are apt to confound it with the *Sambur*; but the localities frequented by the two animals are totally different. The *Sambur* is impatient of heat, and requires shade and deep cover, the *Neelgao* is indifferent to the sun, and in the open plains, at noon, it requires a good horse and a long run to come up with it. I had a tame female of each kind for a long time in the same paddock. The *Neelgao* used to drop on its knees to feed, and attacked and defended itself by butting with the head. The *Sambur* on the other hand never knelt, and when irritated, used to rise on its hind legs, and strike with the fore-feet. In Goozerat the *Neelgao* is found in the open, grassy plains; the herd marches in a line, the bull leading with 8 or 10 cows following.

58.—*Bos (Bibos) Carifrons*, Hodgson—Journal Asiatic Society Bengal, vol. VI. (1837) pp. 223, 499, 745.

Bos Gaurus, Griffiths.—*Gour*, Geoff.

Kar kona, Canarese.....

Jungli khoolga, Dekhani..... جنگلي کهولگا

Gariya, Mahratta.....

It is somewhat remarkable that one of the largest animals of the Indian Fauna, frequenting all the extensive forest tracts from Cape Comorin to the Himalayas, should only have been indicated distinctly, within the last two years. I have seen specimens from Tinnevelly, and likewise from the whole range of the Syhadree mountains up to Mahableshwar, and I know that the animal has been killed near Vellore, in the Sherwaroyah hills near Salem, at Aseergurh, in Kandes, Rajahmundry, and I doubt not that it will likewise be found in all the deeper recesses of the eastern ghauts, and on the banks of all the great rivers passing through them. An imperfect cranium which seems to belong to a female of this species, in the United Service Museum, is labelled thus "Head of a Bison from Kuddah, Straits of Malacca, presented by Lieutenant Colonel Frith, Madras Artillery."

The following memoranda were made in 1833 in the Southern Mahratta Country at a time when I had frequent opportunities of seeing the animal. "It is called *Gaviya* by the Mahrattas, *Jungli khoolga* and *Urna* by the Mahommedans (though it has not the slightest affinity with the buffalo to which both of these names apply), and *Karkona* by the Canarese, which is of similar import, from *Kadu*, a forest, and *Kona* a buffalo.

It differs also very remarkably from the common ox, and though it approaches considerably more to the descriptions of the bison, the name

generally applied to it by English sportsmen, it exhibits marked structural differences excluding it from the Bisontine group as defined by Cuvier. These consist in the plane of the fore-head being "flat and even slightly concave," and in the possession of only 13 pair of ribs. It is not improbable that it will be found to constitute a connecting link between the Bisontine and Taurine groups. The most remarkable characters in the animal are an arched coronal, or convex bony ridge, surmounting the frontal bone, and projecting beyond it so as to make the line from the vertex to the orbit a concave sweep; the continuation of which from the orbit to the muzzle is slightly convex. The other distinctive mark is the prolongation of the spinous processes of the vertebræ of the back, from the withers to the loins where they cease abruptly. These processes are 12 in number and their prolongation gives the animal a very extraordinary appearance.

The largest individual I met with, was killed in an island of the Kala Nuddee in the district of Soonda, in 1827. A noted shikaree, the Potel or head-man of Alloor (a Hubshee or negro descendant of some of the numerous African slaves imported in the 15th century by the Mahommedan kings of Beejapoor, and who still exist as a distinct race, in this district), called us at day light and promised to show us one of the animals described by him as a wild buffalo. Crossing the river in a canoe, we struck into the forest and soon came upon a track, which he pronounced to be that of a large bull. On this he proceeded with the steadiness and sagacity of a blood hound, though it was often imperceptible to our eyes. At times when a doubt caused us to stop, he made a cast round and on recovering the track summoned us to proceed by a loud whistle, or by imitating the cry of the spotted deer, for not a word was spoken, and the most perfect silence was enjoined. As we advanced he pointed silently to the broken boughs or other marks of the passage of a large animal, and occasionally thrust his foot into the recent dung, judging by its warmth of the vicinity of the game. We followed his steps for three miles to the river, then along the banks towards Dandelly, where the animal appeared to have passed to the other side. Wading across, we ascended the bank of a small island covered with thick underwood, and some large trees, amongst which it had lain down, about fifteen yards from where we stood. The jungle was so thick that we found it difficult to distinguish more than a great black mass among the underwood. On firing the animal got on his legs, received two balls more, and rushed into the jungle where he became very furious, and we were obliged to shelter ourselves behind the trees, to avoid the repeated charges he made, though one ball through the shoulder which had broken the bone above the elbow, pre-

vented his moving with facility. He then became exhausted and lay down snorting loudly and rising to charge when any one approached. A ball in the forehead caused him to roll over the precipitous bank into the river. Still however he was not dead and several balls were fired into his forehead behind his ear and the junction of the head and neck without life becoming extinct, one ball which had struck the vertebræ of the neck was taken out almost pulverized.

When drawn ashore and examined more minutely, the first sentiment produced in all present, was astonishment at his immense bulk and size; but on measuring his height we found him much taller than his breadth at first led us to imagine.

The head is very square and shorter than in the common ox, the forehead ample, the bony ridge rising about five inches in height from the plane of the frontal bone over which it inclines. When viewed behind it rises suddenly and abruptly from the nape of the neck, from whence to the vertex it measures seven inches, the horns make a wide sweep in continuation of the arched bony ridge, and turn slightly backwards and upwards forming an angle of about 35° with the frontal bone, the whole of the head in front, above the eyes, is covered with a coat of close short hair of a light greyish brown colour which below the eyes is darker approaching almost to black. The muzzle is large and full, and of a grayish colour, the eyes are smaller than in the ox, with a fuller pupil of a pale blue colour, the ears are smaller in proportion than in the ox, the tongue is very rough and covered with prickles, the neck is short thick and heavy, the chest broad, the shoulder very deep and muscular, the forelegs short, the joints very short and strong, the arm exceedingly large and muscular. Behind the neck and immediately above the shoulder rises a fleshy gibbosity or hump, the same height as the dorsal ridge, which is thinner and firmer, rising gradually as it goes backwards and terminates suddenly about the middle of the back. The hind quarters are lighter and lower than the fore, falling suddenly from the termination of the ridge, the tail very short, the tuft only reaching down to the hocks.

The dimensions of this individual were carefully noted as follows :—

	feet	Inches.
Height at the shoulder	6	1½
Do. at the rump (taken from hoof to insertion of tail)	5	5
Length from the nose to the insertion of the tail	9	6½
Do. do. to the end of the tail which was 2 ft. 10 in.	12	4½
Do. of dorsal ridge including the hump	3	4
Height of do. do.	0	4½
Girth (taken behind the forelegs)	8	0

Breadth of the forehead	1	3½
From the muzzle to the top of the arched bony ridge	2	1½
Distance between the points of the horns	2	1
Circumference of horn at base	1	7½
Between the roots of horns	0	13½
Length of the ear	0	10½
Circumference of the neck	4	4
Depth of the shoulder (from the elbow to the end of the spinal ridge)	4	2½
From the elbow to the knee (i. e. the fore-arm)	1	5½
From the elbow to the heel	2	7
Circumference of the arm	2	6

The skin on the neck and shoulders and on the thighs is very thick being about two inches in this one, which has already shrunk from lying in the sun. It is used for making shields which are much prized. On examining the skeleton picked clean by the vultures, we could only distinguish thirteen pair of ribs.

The cows differ from the male in having a slighter and more graceful head, a slender neck, no hump, a less defined dew-lap and the points of the horns do not turn towards each other at the points, but bend slightly backwards, the horns are smaller too, and the frontal bone narrower, but the coronal or ridge is distinctly marked. The bulls have the forehead broader in proportion to their age. In the young bull it is narrower than in the cow and the bony ridge scarcely perceptible. The horns too in the young specimen turn more upwards.

The general colour is dark brown, the hair thick and short but in old individuals the upper parts are often rather bare. That on the neck and breast and beneath is longer, the skin of the throat is somewhat loose giving the appearance of a slight dew-lap. The legs are white with a rufous tint on the back and side of the forelegs. The skin of the under parts when uncovered is a deep ochrey yellow. The cow has the legs of a purer white.

The breeding season is said to be early in the year and the calves are born after the rains. The bulls are often found separate from the herd which consists generally of from ten to fifteen cows and a bull. They generally feed during the night browzing on the young grass and the tender shoots of the bamboos of which they are very fond. In the morning they retire to some thicket of long grass, or young bamboos where they lie down to ruminate. When disturbed the first that perceives the intruder stamps loudly with its foot to alarm the rest, and the whole rush

through the forest breaking down every obstacle and forcing their way with a terrific crash,

——— dat euntibus ingens
Silva locum, et magno cedunt virgulta fragore.
Æn. vii. 676.

When suddenly approached in the night they start off with a loud hissing snort.

In 1831 I saw a young Bison calf in the possession of some Gowlees the owners of large herds of buffaloes in the Hangul talook. It was caught when just dropt, in the month of May, and, when I saw it, was seven months old, very tame and gentle, though timid, licking the hands of the Gowlees and frisking about with the buffalo calves. It was the same colour as the old animal, very dark brown with white legs. The head small, the forehead wanting the breadth so remarkable in the adult, and the bony ridge of the crown was hardly perceptible. The horns were just beginning to sprout, the ears were larger and rounder than those of the buffalo, the eyes a pale grey or cerulean colour. The hair on the throat was long and the dew-lap slightly indicated. No hump was perceptible, but the dorsal ridge was distinctly marked.

The Gowlees say they see great numbers of Bison when pasturing their herds in the neighbouring forest. They describe them as very timid and watchful, more so than any other wild animal, always reposing in a circle with their heads turned outside, ready to take alarm. They add that they see most calves from June to October but the greatest number about August. They do not know how long the cow goes with calf, but suppose the period of gestation to be the same as that of the buffalo, or ten months and ten days. The old male drives the others from the herd at the breeding season, and the single ones seen in the jungle are young males of this description, and it is probable the very old bulls are sometimes expelled also by younger and stronger males."

For the following particulars derived from the observation of the animal in the Shervaroyah hills, I am indebted to Mr. Fischer, of Salem: "The Bison ordinarily frequents the hills, seeking the highest and coolest parts, but during the hottest weather, and when the hills are parched by the heat, or the grass consumed by fire, the single families, in which they commonly range the hills, congregate into large herds, and strike deep into the great woods and valleys; but after the first showers, and when verdure begins to re-appear, they again disperse, and range about freely. In wet and windy weather, they again resort to the valleys, to escape its inclemency, and also to avoid a species of fly or gnat which harasses them greatly. In the months of July and August, they regularly descend to the plains, for the purpose of licking the earth impreg-

nated with natron or soda, which seems as essential to their well-doing as common salt is to the domestic animal when kept in hilly tracts.

The chief food of the Bison seems to be the following grasses and plants,

Yadanjān cody .....

Vallaum pilloo .....*A species of Sacharum, used for thatch.*

Odeserengan pilloo .....

The cottay moottoo leaf.....*Ricinus Communis. Castor oil Plant.*

Mullum pilloo.....*Anthystiria polystachia, Roxb.*

Canavum pilloo.....*Sorghum muticum. Wild Cholum.*

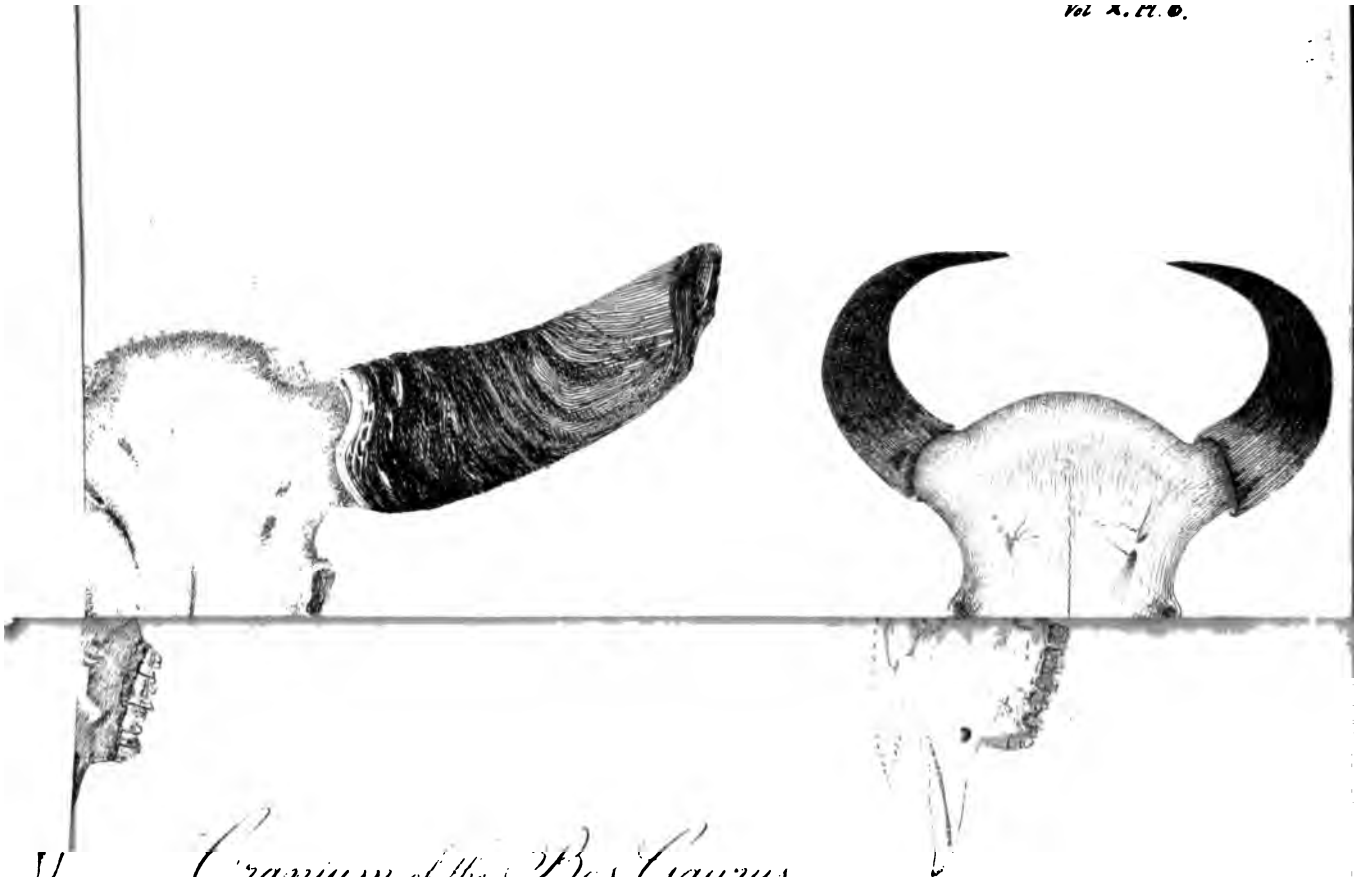
Cheevum pilloo..... .....*Broom grass.* (*Aristida*).

Cattoo Corangan leaf..... .*A species of Convolvulus. Ipomœa Staphylina?*

but they will eat with avidity every species of grain commonly cultivated on the hills or plains, as the ryots find to their cost. The Bison particularly is so fond of the *avaray cottay* (*Dolichos Lablab*, Ainslie),* when in blossom, that they will invade, and destroy fields of it, in open daylight, in despite of any resistance the villagers can offer. In other respects it is a very inoffensive animal, very rarely attacking any one it encounters, except in the case of a single bull driven from the herd. Such a one has occasionally been known to take up his location in some deep bowery jungle, and deliberately quarter himself on the cultivation of the adjacent villages. The villagers, though ready to assist Europeans in the slaughter of Bison, will not themselves destroy them (the inviolability of the cow extending to the Bison); and so bold does this free-booting animal become in consequence, that he has been known to drive the ryots from the fields, and deliberately devour the produce. But in general it is a timid animal, and it is often difficult to get within gun-shot of them.

The period of gestation is with the Bison the same as with the domesticated animal; they drop their young in the months of September and October. I once had one brought to me so young, the navel string was still unseparated. I should think it was then about the size of a common country cow's calf of four months old. It seems a slow growing animal. A calf I had for three years was evidently in every respect still a mere calf. They seem very difficult to rear. I have known it attempted at different ages, but never knew the animal to live beyond the third year. Mr. Cockburn has tried it in vain, in its native climate, the Sherwaroyah hills, and I have made the attempt at Salem repeatedly. At one time I had five in my farm-yard; one lived for three years: but this one, with all the others, died suddenly in the same week from some disease, marked by refusal of food, running from the nose, and an abomina-

* Country bean.



Cranium of the Bos Gaurus.

ble stench from the mouth. A similar disease, it may be noted, prevailed, I was informed, at the same time, among the Bison of the Sherwaroyah, Shandamungalum and Neilgherry hills. The calves I had, never became in any degree domesticated: the domesticated cow could never be induced to suckle them."

I may add, that the persevering ferocity of the Bison of the Sub-Himalayan range, described by Mr. Hodgson, is quite foreign to the character of the animal in the southern forests. When wounded, it is true, it charges its assailant with determined courage, and many instances have come to my knowledge of its doing so with fatal effect, among which I may cite those of two officers within the last few years, both of whom were killed at the Mahabaleshwar hills; but in general it will always seek its safety by flight, if permitted.

The figure at Plate 5 is taken from an indifferent sketch made of the very old bull, described at page 229, and gives a tolerable idea of the character of such an animal, though not quite correct in all its details. The dorsal ridge is too prominent; the expression of the head, particularly about the muzzle, is too heavy, and the hoofs of the hind feet are too large, these being in reality only half the size of those on the fore-feet.

Plate 6 shows the crania in front and profile of another very old bull, killed on the Neilgherry hills, now in my possession; and of a young cow. The difference produced in the shape of the horns by age is distinctly shown. The great expansion of the bull's horns is entirely the effect of age, in the young males they are more erect, and the points turned to each other, while in this individual they are altogether divergent, one being half broken off, and the point of the other worn and ragged, which is always found to be the case with adult bulls. The dimensions of this cranium are—

Height from the end of the maxillary bone to the vertex...Inches.	22
Breadth of front between the edges of the horns.....	13 to 14
Length of horn from base to point in a straight line.....	21
Do. do. along the curve.....	30
Diameter (longest section) inside.....	6½
Do. (broadest do.).....	4¾
Circumference at the base.....	18½
Distance between the points.....	39

The above catalogue being confined to the animals of a single province, does not comprise the whole number of species found in Southern India; but, from the very diversified character of its surface, it includes by far the greatest proportion. In a future number, I propose adding a supplementary list of species peculiar to the Carnatic, and so to complete the fauna of Southern India.

II.—*Catalogue of the Birds of the Peninsula of India, arranged according to the modern system of Classification; with brief Notes on their Habits and Geographical Distribution, and description of new, doubtful and imperfectly described Species*:—*By* T. C. Jerdon, *Assistant Surgeon, 2d Madras Light Cavalry.*

(*Continued from No. 24 page* 91.)

Supplement to Raptores.—*By* Walter Elliot, Esq.

Since the publication of the first portion of Mr. Jerdon's Catalogue, I have been enabled to add another beautiful accipitrine bird to his list. It belongs to Genus Nisætos, Hodgson; and should follow immediately after *N. Nivosus?* No. 12 in the Catalogue.

12½. *N. Circaetella*, Temm. Pl. Col. p. 282.—*Shah Baz*, H.

Adult male of 1st year—Total length 24 inches; length of tail, $11\frac{2}{10}$; of bill, straight to gape, $1\frac{7}{10}$; tarsus from the angle of the outer bend to the sole $1\frac{4}{10}$ths; central digit 2; do. claw $1\frac{1}{10}$th; hind digit $1\frac{2}{10}$ths; do. claw $1\frac{4}{10}$; of wing close 16 inches; two central crest feathers, 4; two next, $2\frac{1}{4}$: colour brown; beneath, brown intermixed with white; each feather being brown with a white edge, which increases with successive moultings until the brown is reduced to a mere line. Crest dark brown, approaching to black. Quills barred transversely with darker brown. Tail with 4 well defined bands, the last forming the tip, and an imperfect one near the base making a fifth. Feathers of the tarsi with a slight fawn tinge spotted with brown.

Sits on the tops of the highest trees, on the watch for hares, pea-fowl, jungle-fowl, on which it swoops from its elevated perch. Solitary. Shot in the Rampoor jungle, inland from Nellore, at the foot of the eastern ghats.

I have now before me a living specimen of the species distinguished as *Nisætos Niveus*, and two skins of the same bird. The corresponding dimensions of an adult male of several moultings are—total length, 26 inches; length of tail 11; of bill, straight to gape, 2; tarsus, from the angle of the outer bend to the sole, 4; central digit $2\frac{4}{10}$ths; do. claw $1\frac{2}{10}$ ths; hind digit $1\frac{2}{10}$ths; do. claw $1\frac{3}{10}$ths; wing closed 18 weight 3-lb. $13\frac{3}{4}$ drs.

The *Mhorungee* is not crested. It is stronger and altogether more powerful than the *Shah Baz*. Tarsus shorter; talons more powerful.

Beneath whiter, because older, the brown being reduced to the shafts of the feathers only. Tail with 7 bars, the last forming a broad dark band at the tip, the others narrower, indistinct, particularly those next the tip. Quills dark brown, not banded. Cere and legs, pale yellow; bill plumbeous at the base, black at the tip.

There is little doubt this is a new species. Temminck's bird is only 25 inches, and the wings have a band, and the tips of the quills brown.

In habits it differs much from the last, seeking its prey more frequently on the wing, hunting in pairs and stooping on hares, pea-fowl, &c.

The living one was caught at the rocky mountain of Awulkondah in the Arcot district, where a pair of them were used to resort, by baiting some falconer's springes with a fowl, on which they both descended. One was caught in the snares, the other alighted on a tree in the neighbourhood and was shot. The female measures 28 inches in length.

Order II. INSESSORES.

Tribe DENTIROSTRES.

Family LANIADÆ.—*Shrikes.*

Sub Family LANIADÆ.—*True Shrikes.*

Genus LANIUS, Auct.—Collurio, Vig.—*Shrike* or *Butcher Bird.*

48.—*L. Hardwickii.—Coll. Hardwickii,* Vig—Gould Cent.—*Pechanuk,* H.—*Bay backed Shrike.*

This handsome little shrike is the most abundant of the Indian species, and is tolerably common in every part except the West Coast. It frequents gardens, hedges and cultivated ground, but chiefly delights in low, thorny, but open, jungle—feeds on locusts, grasshoppers, and also on small birds.

Bill black—Irides hazel brown; length about eight inches; tail nearly four.

49. *L. lahtora.—Coll. lahtora,* Sykes.—*L. excubitor,* var. *C. Lath.—Doodhea latora,* H.—*Large grey Shrike.*

Generally spread, except on the Western Coast, where it occurs rarely,

if at all—more abundant on the table land than below the ghauts—frequents open baubul jungle, or single trees on the open plain, or cultivated ground. Seldom approaches villages or cantonments, as the last does, but has the same habits and food.

Irides hazel brown—bill and legs black—length 9½ inches; tail 5.

50. *L. erythronotus.*—*Coll. erythronotus*, Vig.—*Latora*, H.—***Rufous-backed Shrike.***

This shrike is a rare bird in the Carnatic, less so in the Deccan, common on the West Coast, and most abundant on the Neilgherries. It prefers a more wooded country than the two last species—frequents low bushy ground or open spaces in the jungle, and has similar manners and food to others of the genus.

Length 10 inches; tail 4½; irides hazel brown—bill and legs black.

51. *L. nigriceps.*—*Coll. nigriceps*, Frank.—***Black headed Shrike.***

I have hitherto only observed this species in Goomsoor, perched on trees, at the edges of thick jungle.

Irides deep brown—length 10¼ inches; tail 5.

Sub Family DICRURINÆ.

Gen. TEPHRODORNIS, Swainson.

I think that this genus rather belongs to the *Thamnophilinæ*, or bush shrikes, judging from its manners; but as Swainson looks upon it as the union of the two families, it may retain its place among the 'swallow shrikes.'

52. *T. Sylvicola.*—New sp.?—*Pharee Latora*, H.—***Jungle wood shrike.***

This apparently undescribed species inhabits the dense and lofty forests of the Western Coast and ghauts. I have found it on the Coonoor pass, as high as 5000 feet. It climbs and hops about the larger boughs of trees, seeking for and picking insects of various kinds, but chiefly coleopterous, off the bark, and occasionally making a swoop at one it has

spied on a branch at a short distance. Seen singly, or in small flocks, when they generally keep up a noisy and harsh chattering.

Descr.—Above, slaty cinereous—an eyeband, extending from nostrils to half an inch behind the eye, black—rump and beneath white, the breast with a tinge of reddish cinereous—wings and tail dusky brown. Length $8\frac{1}{2}$ inches; tail $3\frac{1}{4}$; wing $4\frac{3}{4}$; tarsus $\frac{7}{10}$ths; bill (to gape) $1\frac{9}{10}$ths; irides greenish or wax yellow.

53. *T. superciliosus*, Sw.—*Lan. muscicapoides*, Frankl.—*L. Keroula*, Gray—Gray and Hardwicke, Ill. Ind. Zool. (bad figure).—*Common wood shrike.*

This species has been lately accurately described by Swainson,* but without the synonymes, of which he was probably unaware. It is generally spread throughout Southern India, but in no place abundant, though it is far from being rare in some parts of the country. I have seen it most numerous in Goomsoor, and in the Wulliar jungle (in the gap of Coimbatore). Colonel Sykes says it is rare in the Deccan—this is to be expected, from the bareness of the country. Though never found in dense jungle like the preceding one, the wood shrike is found in open jungle, in open spaces on the borders of thick forests, woody nullahs, topes, avennes, and even thick hedges occasionally. It has similar habits with the last; slowly traversing the branches of the trees it frequents in search of insects, chiefly coleoptera. Like it also it hunts in small flocks, or singly.

Length $6\frac{1}{2}$ inches; wing $3\frac{1}{2}$; tail $2\frac{3}{4}$.—Irides greenish wax yellow (as in the last).

Gen. OCYPTERUS, Cuv.—*Swallow Shrike.*

54. *O. leucorhynchos.*—*Ash-coloured Swallow Shrike.*

Appears to be universally spread over India; but is by no means common, and I have had very few opportunities of observing it. It prefers a wooded country, and always I believe takes its food, which consists chiefly of soft winged insects, in the air. I saw a flock once flying over an open space in the Wulliar jungle like swallows; again near Palamcottah, in a palmyra tope, a small flock of them, one every now and then darting

* *Two Centenaries and a Quarter of Birds, either new, or hitherto imperfectly described.—Animals in Menageries*, Part 3, No. 9:—Lardner's Cabinet Cycl.

from its perch on the top of a palm-tree,and making a short circuit in the air after insects, reseating itself, though not generally on the same tree. On another occasion I saw it in Travancore skimming over the surface of a tank, and returning to rest on a low bough over-hanging the water. Its flight is rapid, elegant, and remarkably like that of the swallow.

Length about 7 inches; wing 5; tail 2 $\frac{3}{10}$ths; bill light cinereous, darker at tip; legs slate colour.

GEN. DICRURUS, Vieill.—EDOLIUS, Cuv.

Drongo Shrike.—Fork tailed Shrike.—King Crow of Europeans in India.

55. *D. balicassius*, Vieill.—*Common King Crow.—Kolsah* or *Bojunga*, H.—Sometimes also called "*Cotwal.*"

This is the most common and abundant species of *Dicrurus*, and is to be met with in every part of the country, and inhabits alike the open country and wooded districts, but is never found in dense jungle. The king crow may be seen perched on a tree or hedge, the top of a low bush on the plain, or a stack of grain—frequently also on the top of a wall or old building, the bank of a paddy-field, or even a clod of earth,or ant hill—and it is by no means uncommon to see one on the back of cattle, sheep or goats,while grazing. From this perch it watches eagerly for the stirring of an insect below—on observing one, flies rapidly to the spot, and, generally alighting for an instant on the ground, seizes its prey—frequently however the devoted grasshopper, or other insect, being also on the look-out, makes an attempt to escape, but is closely pursued by the king-crow, who either snaps it up on the wing or just as it has alighted. Having secured it, the *kolsa* flies off generally, but not always to its former perch, devours it at leisure, and then uttering its usual cry is again ready for a fresh capture. Such is the usual mode of feeding of this bird. It very frequently, however, captures various mall insects on the wing, from the top of a tree or some lofty branch, sometimes ascending almost perpendicularly for several feet—occasionally whips one off a blade of grain, or from the surface of a pool of water. On the issuing of the winged termites from a nest in a hedge row, or near the bottom of a tree, there are generally several assembled to partake of the feast, together with the crows and minas. This bird gets its popular name of king-crow from its general habit of following crows most clamorously and persevering, every now and then pouncing

down on them, though it seldom strikes. It pursues kites and various other birds also, whence one of its common Hindostanee names (*cotwal*). In the bare Deccan I have often seen one or two king-crows high in the air, traversing the country, but apparently not hunting.

The usual cry of this shrike is a sort of crow or chuckle, succeeded by two or three sweeter notes, but it has several other cries. It is the first bird whose song is heard in the morning, often long before sunrise, and sometimes on moonlight nights throughout the whole night. Its flight is in general undulating, not very rapid, performed with few flappings; but when it exerts itself after a crow or other bird, it is capable of great speed, and always overtakes its enemy with ease. It occurs singly or in small families. I once found its nest, in the month of August, in the Carnatic, situated in the fork of a banian tree, at a moderate elevation—it was composed of twigs and roots, carelessly put together, and without any lining, and contained three eggs, white, sparingly spotted with purplish red. Its chief food is grasshoppers of various kinds, also bees, moths and other insects, chiefly coleopterous. Mr. Elliot in his notes says, it migrates from the Southern Mahratta Country during the monsoon. In the Carnatic I never observed any diminution in its numbers at any season, but in the northern part of the Deccan (at Jaulnah) it certainly becomes much more rare at that time, and indeed is hardly met with. The *kolsa* is occasionally tamed, and will perch on the head or hand of its master, and fly down after a grasshopper or other insect.

Length 12 inches; tail 6¼; wing 5¾; 4th quill perceptibly larger than the 3d and 5th, which are about equal—tarsus a little more than $\frac{7}{10}$ of an inch.

56. *D. cœrulescens*, Vieill.—*Lan. Fingal*, Shaw.—*E. leucogaster.*—*Pharee Bojunga*, H.—*White bellied king-crow.*

This species appears to be generally spread, but no where plentiful. It frequents open though lofty jungle, and well wooded districts, but is occasionally met with in topes and avenues in the Deccan and Carnatic. I have seen it most numerous in the Wulliar jungle, and the Segour pass of the Neilgherries, where I found it at a considerable elevation. It almost always captures its insect prey on the wing (sometimes however picks one off the ground): it perches near the top of a high tree, whence it pounces on its prey generally at no great distance. It has a sweet

song, not to be compared, however, to that of one of the genus hereafter mentioned. Irides blood-red.

Length 9½; tail nearly 5; wing 4¾; tarsus nearly $\frac{7}{10}$, much weaker than that of *balicassius*.

57. *D. Macrocercus*, Vieill.?

This is the rarest of all the Indian *Dicruri*. I have hitherto only seen it in the Segour pass, and on the summit of the Neilgherries, in both places on lofty and tolerably dense jungle. I observed it in the former place sally from its perch near the summit of a lofty tree, and make a considerable circuit, apparently capturing several insects, and then re-seating itself on some other tree. Several birds were thus engaged together, though at some distance from each other, and returning separately each to its own perch. In this respect it makes a nearer approach than any other Indian species to the manner of the African Drougo shrikes, as described by Le Vaillant, hunting in flocks like swallows, and mentioned by Swainson as being the general habits of the genus. Flight of this species similar to that of *balicassius*, but more rapid and elegant.

As I cannot be certain of this being the species indicated by Vieillot, I add a description. Above, glossy bluish black—beneath, dusky, blackish, with a faint gloss of bluish; wings and tail brownish black, with a faint gloss of bluish also—under tail coverts (in my specimen) edged with white—bill and feet black—bill more depressed than in *balicassius*, somewhat similar to that of *D. cærulescens*, but differs also from that.

Length nearly 11 inches; tail very nearly 5½; wing 5; tarsus about half an inch; tail feathers more slender than in either *balicassius* or *cærulescens*. The chief peculiarity of this species is its short and feeble tarsus and foot.

58. *D. æneus*, Vieill.—*D. muscipetoides*, Hodgs.—*Bronzed Drougo Shrike.*

This species is always found in the most dense and lofty jungle. I have only seen it in the forests of the Western Coast, and have met it at an elevation of 4000 feet. It is generally found in small parties—stations itself near the top of some lofty tree, whence it makes frequent short sallies after insects, exactly like the flycatchers, and returns generally to the same branch. It sings most charmingly, being perhaps

only surpassed by the *Gryllivora longicauda*. Its food consists of various insects, both hard and soft winged. The name of *Muscipetoides*, given by Mr. Hodgson (Indian Review No. viii), is peculiarly appropriate, as well from the form of the bill, which is weak and highly depressed, as from the similarity of its habits to those of the flycatchers; and, if there is any doubt as to its being the *æneus* of Vieillot, should be adopted at once.

Length 9 to 9½ inches; tail 4½; wing 4¾; tarsus ½ inch; irides dark brown; bill and legs black.

59. *D. retifer.—Lan. Malabaricus*, Shaw.—*Bherm* or *Bhring raj* H.—*Kate-ongal*, Mahr.—*Racket tailed Drougo Shrike.*

This splendid bird is tolerably abundant in many of the lofty jungles of the west of India, both above and below the ghauts, it being very plentiful in the Wynaud district. It appears to wander more in search of its food than other of the *Dicruri*, flying from tree to tree at no great elevation, making an occasional swoop at an insect on the wing, or whipping one off a branch; frequently, however, it feeds like its congeners from a fixed station.

It generally hunts singly or in pairs, occasionally, however, it is seen in small parties. Its food is chiefly large coteopterous insects, also large bees and wasps. It has a very peculiar cry, consisting of two parts, the first a sort of harsh chuckle, ending in a peculiar metallic sound, something like the creaking of a heavy wheel. Mr. Elliot says on this subject "its general note is a deep sonorous cry something like *tse-rung, tse-rung, tse-rung*." It has many other notes besides this; all of which however, have more or less clangor or metallic sound. I have seen it pursue a bird of prey (*Hæmatornis undulatus*, Gould) in the same manner as the common king-crow. It moults about September. Although it chiefly inhabits lofty jungles, I have seen it in comparatively low jungle, and I am informed that it often enters gardens in the cantonment of Cannanore. The *Bherm-raj* is occasionally taken and tamed: it used to be very frequently in former days, and sold for a very high price at Hyderabad. It is said to imitate the notes of all other birds, and hence is also called the '*Huzar Dastan*,' or bird of a thousand tales.

Length to end of true tail, 14 inches; length of ordinary tail 6¾; long tail feathers beyond 12, or more, even; irides dark hazel brown; wing 6¼; tarsus $\frac{9}{10}$ or nearly an inch; bill and legs black.

Sub Family CEBLEPYRINÆ, Swainson.—*Caterpillar catchers.*

Genus CEBLEPYRIS, Cuv.—*Spiny rumped Shrike.*

60.—*C. Papuensis.*—*Graculus Papuensis*, Temm.—*Large spine rump.*

This bird prefers well wooded situations, though not a denizen of thick jungle; hence is most abundant in the Western Coast. It is also found in the other ports of India in topes, avenues, palm groves, and occasionally even enters gardens. It lives partly on insects, chiefly mantides, grylli, caterpillars, and soft insects, which it searches for among the foliage of large trees; and partly on fruit, especially the fig of the banian tree. It is rather a shy and wary bird; flying before you from tree to tree, uttering, as it alights, two or three rather sweet and mellow notes; but it has also a very harsh rattling scream. It flies in an undulating manner, with few vibrations of its wings. Its flesh is eaten and esteemed by some of the natives.

Irides fine lake red; length about 12 inches; of wing 6½; tail 5; tarsus nearly an inch.

61.—*C. fimbriatus*, Temm.—*Smaller spine rump.*

This, like the last species, is most abundant in woody country, and therefore on the West Coast, but is also found in the other parts of the country in avenues or thick hedges, gardens, &c. It is to be met with at all seasons on the Western Coast, but I think only repairs to the Carnatic (I speak particularly of the country about Trichinopoly), after the commencement of the rainy season there, in October or November: at all events it is much more numerous then. This spine rump hunts singly, or in small families of both sexes, flying from tree to tree, slowly and carefully examining the foliage, prying searchinglyall around, and under the leaves, to discover a suitable morsel. It continues its search hopping, flying from branch to branch, till the tree has been well inspected, when the flock flies off together to another tree. Its favourite food is caterpillars, pupæ, grubs, and soft insects, but also ants and coleopterous insects. My specimen, both of male and female, correspond pretty exactly with the description in Lesson '*Manuel d'Ornithlogie.*' The females appear much more numerous than the males, but *this* may partly be accounted for by the *young males* being clothed in the female garb.

Irides reddish dark brown; length about 7½ inches; of wing 4; tail 3; tarsus about $\frac{7}{10}$ths.

62.—*C. Canus.*

I have not hitherto been fortunate enough to meet with this species of *spine rump*, and there is such a contrariety of description in the published accounts I have met with, that I wish Colonel Sykes had given a description of his species, which I suspect after all only to be the adult male of the last.

GENUS PHŒNICORNIS, SW.—*Red bird.*

63.—*Ph. princeps*, Vig.—Gould Cent.—*Large red bird.*

I shot one specimen of this splendid bird in a dense and lofty jungle in Goomsoor, hopping about the upper branches of high trees, and only once again observed it. At this time, which was just before the commencement of the hot season, and when insects were least abundant, it descended to the ground to pick up an insect, and returned immediately. This habit, I, on several occasions about the same time, saw resorted to by other birds, from whose usual manners it was equally foreign, viz. true flycatchers (*M. Banyumas* and *M. Melanops*); on the same tree was a grey and yellow bird of the same size, which, judging from analogy, was the female. In the stomach of the one I killed were the remains of various insects chiefly coleopterous.

Length of my specimen 9 inches; of wing 4 $\frac{8}{10}$ths; tail 4; tarsus nearly $\frac{9}{10}$ths.

This splendid species differs from *P. flammeus*, which sometimes nearly approaches it in size, in the length of the wing and tarsus, as well as in the infinitely richer hue of the red.

64. *P. Brevirostris*, Vig.—Gould's Cent.—*Short billed red bird.*

I was also fortunate enough to meet with this well marked and distinct species in Goomsoor, and procured three individuals, an adult male, a young male and a female. It had the same manners as the last, frequenting the tops of high trees—on one occasion, however, I observed a flock of the females hunting together over a thick hedge. In the stomach of those I killed fragments of coleopterous insects only were observed.

The short billed red bird has been most justly separated from *P. flammeus*, as well from its deeper shade of plumage as from various structural points of difference. The female does not differ from that of *P. flammeus*, except in the structural points, and a somewhat duller shade of yellow. The young male I possess has the grey upper plumage of the female—beneath white with a reddish tinge, and the red marks on the wings and tail nearly developed.

Length 8 inches; tail 4; wing 3½; tarsus less than $\frac{7}{10}$ of an inch; feet much smaller than *P. flammeus*. I see that Swainson supposes this species to be synonymous with *P. miniata*.

65. *P. flammeus.*—*Musc. flammea*, Auct.—*Pharee Boolal Chusm* H.—*Common red bird.*

This species of red bird is tolerably abundant in most of the lofty jungles of the Western Coast—both above and below the ghauts: and I have seen it as high as 5000 feet on the Coonoor ghaut of the Neilgherries. It is, I think, more abundant on the table land of the Wynaad, than in most other places I have observed it in. It is a restless bird, wandering from tree to tree, examining the loftiest branches in search of various insects and their larvæ, which constitute its favourite food. It is either found singly or in small parties of three or four, and the sexes are generally seen apart from each other.

Irides dark brown; length 8 to 8½ inches; of wing, 3 $\frac{7}{10}$; tail 3½ to 4; tarsus not quite $\frac{7}{10}$.

66. *Phœnicornis peregrinus*, Vig.—Gould Cent.—*Parus peregrinus*, Auct.—*Boolal Chusm*, H.—*Small red bird.*

This pretty and lively little bird is more numerously and extensively spread than any of its congeners, and is to be found in most woody situations even in the dry Carnatic, in jungle and in thick hedges and avenues occasionally, and in some of the larger topes in the Deccan it may also be occasionally seen. It is, however, most abundant on the West Coast. It is a restless and active little creature, ever engaged in diligently examining the extreme branches of trees, gleaning among the foliage, and hanging from the slender twigs like a titmouse. It feeds upon various larvæ (which are its favourite food) and small insects.

Irides brown; length 6 inches: of tail 3.

FAM. MERULIDÆ.—*Thrushes.*

SUB-FAM. BRACHYPODINÆ.—*Short legged thrushes, or Bulbuls.*

GEN. HYPSEPETES, Vig.—*Drougo or black Bulbul.*

67.—*H. Ganeesa*, Sykes Cat. No. 49.

I have not yet been fortunate enough to meet with this bird (which I see has been lately figured in Jardine's Illustrations of Ornithology, new series No. 1), so transcribe part of Colonel Sykes' account. "Flight very rapid, found only in the dense woods of the ghauts, stony fruit found in the stomach."

68.—*H. Neilgherriensis.*—New species.—*H. psaroides*, Vig.—Gould Cent. H. B.—*Neilgherry Black Bulbul.*

This species of *Hypsepetes*, though very strongly allied to the Himalayan species, I am inclined to consider distinct, as it varies permanently in size and some markings.

Descr.—It has the same glossy black lanceolate feathers of head and hind neck, the same grey tint of the body, and blackish tail; but differs in having the quills entirely black, instead of being grey, tipped only with black; wants the small black streak running back from the eye, and has the under tail coverts edged with white.

Length about 10 inches; of wing 5; tail $\frac{4}{10}$; tarsus $\frac{6}{10}$; bill and legs orange red; irides brownish red.

If new, it may be named as above from its locality, or it might be named *Atripennis*, in contradistinction to the Himalayan species it so much resembles. I have hitherto only found this bird on the summit of the Neilgherries, in the dense woods of which it is very abundant. It lives in small flocks, feeding on various berries and fruit, generally on the top of trees. I on no occasion found any thing but fruit of different kinds, but chiefly stony, in its stomach. It usually keeps up a lively and agreeable warbling, which it continues during its occasional flight from one tree or patch of wood to another. Its flight is undulating, and not very rapid. Its manners on the whole much resemble those of the bulbuls, with which they have been classed, and justly so, I think by swainson.

GENUS BRACHYPUS, Swainson.

69.—*B. rubineus.*—New species.— *Inos concolor*, Temm.?—*Ruby throated Bulbul.*

This species approaches in colour the *Turdus dispar*, Horsf. (or *T. concolor*, of Temm. P. C. 137), a native of Java, but appears, from the description I possess, to be distinct, and if so may be named as above. I have only met with the ruby throated bulbul in the forests of Malabar, and even here it is rare; it frequents the more open spaces of the jungle, and generally prefers thickets in the neighbourhood of waters. It lives in small families, is sprightly and active, hopping about the smaller branches of trees, uttering now and then its pleasant twitter, much in the manner of the common crested bulbuls. It lives on various fruit and berries.

Descr.—Head and cheeks pure glossy black; plumage above yellowish green; chin spot black; throat of a beautiful shining ruby red: the feathers much divided and somewhat bristly; rest of the plumage beneath yellow; quills with a tinge of dusky on their inner webs: feathers of the back loose and discomposed; irides light yellow; bill black; legs greenish dusky. Length about 6½ inches; of wing 3; tail 2¾; tarsus rather more than ½ an inch.

70. *B. prioccphalus.*—New species.—*White eyed Bulbul.*

Descr.—Crown of head, occiput and throat bluish grey—forehead siskin green. Backwings and beneath, oil green, lighter towards the vent. Rump feathers light yellowish green, broadly streaked with black, as in '*B. entilotus*,' Jard. Tail, with centre feathers greenish, broadly edged with grey, lateral do. black, also broadly terminated with light grey. Under tail coverts light grey; irides bluish white; bill and legs of a green horn colour; length 7 inches; wing 3; tail 2 $\frac{5}{10}$; tarsus about half an inch.

I only once saw and obtained a specimen of this bird near the foot of the Peria pass in Malabar. Its manners and food are similar to the last. It very much resembles in colouring a new species lately figured in Jardine's New Ser. of Ill. of Ornith. *B. entilotus*, an inhabitant of Malacca, especially in the markings of the rump feathers, but is less, and otherwise varies. Stony fruit found in its stomach.

GEN. CHLOROPSIS, Jard. and Selby.—*Emerald or green Bulbul.*

71. *C. Aurifrons*, Jard. and Selby.—*T. Malabaricus.*—*C. Sonnerati* Jard. female.—*Golden fronted green Bulbul.*

I have only found this elegant species in the forests of Malabar and other parts of the West Coast. On the Coonoor pass I have seen it above 4000 feet high. It hops and flies actively about the branches of trees, frequently at no great height, and lives on both fruits and insects, chiefly the latter, which it seizes on the branches or leaves. It is generally found in pairs or singly, occasionally three or four together. Irides light yellowish brown: bill blackish; legs cinereous.

The female, which either appears to be undescribed, or to be the *C. Sonnerati?* of the proposers of this well marked genus, differs from the male in wanting the golden forehead, and in the black gorget and blue maxillary streak, being somewhat smaller. Bill rather more lengthened than in next species. Length 7½ to 8 inches; wing 3 $\frac{8}{10}$; tail nearly 3; female somewhat smaller.

72. *C. Cochinsinensis.—Melliphaga Javanica*, Horsf.—*Common green Bulbul.*

This species is much more generally dispersed than the former one, being found wherever there is thick or lofty jungle. I have seen it in Goomsoor, and the Tapoor pass on the eastern side of India, and it is far from being uncommon on the West Coast, even in wooded cultivated ground and gardens. Its habits are similar to the last. I have seen it, while feeding on insects, take an occasional flight of a foot or two, to secure an insect that was attempting to escape. Its most usual food however, is fruit of different kinds. As there appears to be some doubt of the plumage of both sexes, I shall here briefly describe their differences.

Male, with chin, throat and gorge deep black, surrounded by a greenish yellow band, which extends through the eyes to the forehead—maxillary streak, hyacinth blue.

Female, with parts black in male of a light bluish green, surrounded (as in the male) with the yellowish band—maxillary streak light azure. Length 7¼ inches; wing 3½; tail 2¾. Irides light brown; bill dusky; legs cinereous.

GENUS IORA, Horsf.

73. *I. tiphia.—Motac-typhia*, Brown, Ill. Zool. pl. 36.—*Show Bheegah*, or *Show Bheegee*, H.

This is one of the most common Indian birds in most part of the country, daily to be seen in almost every garden. Its habits are even still more active and restless than those of any others of this family, being much like those of the titmouse. It may be seen diligently and carefully searching the smaller branches and twigs of trees, climbing actively among them, peering under the leaves, and occasionally hanging, like a titmouse, from a slender twig, all the while keeping up a loud warbling strain, or a low querulous sort of note, very different from each other. It is not confined to cultivated ground, but is also an inhabitant of the open spaces of jungles. Its flight is performed by a succession of quick vibrations of the wing, and causes a loud whining sound. Its food consists of various insects, and their larvæ, spiders, &c. I have only found the male bird at certain seasons in its full plumage of black and yellow, and even then you seldom meet with two clothed exactly alike. On this account, I am inclined to think, that it is only in the breeding season that the black plumage is put on, and that the *Iora scapularis* of Horsfield may be identical with both sexes of this in its ordinary plumage. This supposition, however, needs further enquiry. I once in the West Coast, in the month of Septmber, met with a nest of this species in the fork of a low tree. It was more neatly and carefully made than any other of the few nests I have seen in this country. It contained young ones. It gets its Hindustanee name from its cry, being said to repeat the syllables 'show bheega,' 'show bheega,' before rain.

GENUS TRICHOPHORUS, Temm.—*Bristle necked Thrush.*

74. *T. virescens.—Ixos virescens*, Temm. P. C.—*White browed bristle neck.*

Although I am inclined to think that this species of bulbul may enter into Swainson's genus, *Andropadus* rather than *Tricophorus*, as I have in some cases, though not in all, detected a slight crenation at the tip of the upper mandible, and the bill is shorter than in *Tricophorus*, yet I have for the present kept it in that genus, as its nuchal hairs are very distinct. It is a widely dispersed, though not very common bird,

except in some few localities. It prefers a wooded district. I have found it in Goomsoor in open jungle; in the Carnatic seldom, and only in the vicinity of jungle, in thick hedges and bushy nullahs; in the neighbourhood of Coimbatoor; in low thickets, in the Wulliar jungle, and very abundant in a bushy tract along the West Coast. It flies actively along from bush to bush, hiding itself in the thickets; has a loud clear thrush-like warble, and feeds entirely on fruit of various kinds. Irides blood red; bill black; legs dusky. Length 7½ inches; wing 3½; tail 3½ tarsus nearly $\frac{9}{10}$.

75.—*T. Indicus.*—*Turdus Indicus*, auct.—*Merle olive des Indes*, Vieillot—Encyc. Method. p. 667.

I am not aware whether this well marked species of *Tricophorus* has been named or not, but as it appears to correspond with *Turdus Indicus* of the older authors, I have no hesitation in applying that specific name.

This bristle necked thrush frequents only thick and lofty jungle on the West Coast, being found occasionally as high as 5000 feet. It lives in small flocks, flying from tree to tree, and keeping up a continual, and pleasing bulbul-like warble. In all the specimens I have examined, I have found fruit only in its stomach, but from the strong bristles at the base of the bill, I suppose it may, at certain seasons, partake of insects. I add a brief description.—Above olive green; eye streak extending to the forehead, and beneath yellow; quill feathers dusky on internal web; tail olive, beneath shafts of the feathers yellow*; bill and legs black; irides blood red. Length 7½ to 8 inches; wing 4; tail 3½; tarsus rather more than $\frac{7}{10}$.

Genus HÆMATORNIS, Sw.—*Crested Bulbul.*

76.—*H. Cafer.*—*Lanius Emeria*, Shaw.—*Bulbul*, H.—*Common Bulbul.*

This is one of the most common and abundant birds of India, frequenting both gardens and cultivated ground, and low bushy jungle. It is never found in dense jungle. It is found even on the Neilgherries at Coonoor and Kotagherry at 6000 feet of elevation; but I have not observed it in the more elevated and central parts of the hills. It lives in

* I see a new species from the Himalayas has lately been described by Gould (Proc. Zool. Soc. 1836), which if really distinct differs only in being crested.

pairs, or small families, feeds chiefly on fruit, being destructive to pease and other garden produce, but also occasionally on insects, frequently repeating its usual note while hopping about the branches, and wandering from tree to tree. It flies in a direct manner with a quick flapping of its wings, and usually uttering its note when on the wing. It is very commonly caged in the Carnatic, and kept for fighting, which it does with some spirit, and it is said that the antagonists often seize each other by the red under tail coverts, and endeavour to pull them out. The bulbul is also said to imitate the notes of various other birds in confinement.

77.—*H. jocosus.*—*Lanius jocosus*, L.—*Pharee Bulbul*, H —*Hill or jungle Bulbul.*

This sprightly and pleasing bird is in general found in the Peninsula, only in lofty jungle, as well as on the East Coast (as in Goomsoor), as the West Coast; but I have also seen it in low bushy ground on the sea coast, between Calicut and Tellicherry, and it is most abundant on the summit of the Neilgherries, in gardens, and shrubby ground. It is a most lively and active bird, always on the move, and warbling its pleasant chirruping notes, which are much sweeter than those of the common bulbul. It lives chiefly on fruit and seeds, but also on insects occasionally, which I have seen it picking off the ground. Its flight is like that of the last, steady, but not rapid, and its crest is never erected during flight, but always the moment it alights. A deserted nest was pointed out to me, in a low shrub close to a house in Ootacamund, as that of the hill bulbul. It was very neatly made with moss, lichen, small roots and twigs, and well lined with hair and down.

Irides yellow brown; length varies from 7 to 8 inches. Specimens from the Neilgherries are larger than those from the coast.

Sub-Family MYOTHERINÆ, Swainson.—*Ant Thrushes.*

Genus MYOTHERA, Ill.

Sub Genus BRACHYPTERYX, Horsf.—*Short-wing.*

78.—*B. atriceps.*—New species?—*Black-headed short wing.*

I know not if this little species has been described or not, so shall for the present consider it as new. It is only found, as far as my observations extend, among the thickest underwood in dense lofty jungle. I have seen it in the Trichoor and Wurguncherry jungles, and also on the Coonoor ghaut, and in the Wynaud. It is a restless lively little bird

living in small flocks of five or six, and continually hopping about the low thick bushes and underwood, with an incessant low twittering note, and has much of the general habits of the *Thimaliæ*. In its stomach I found small mantides, grasshoppers and other insects.

Descr.—Head and cheeks black; back, wings, tail, and under tail coverts brownish olive, darkest on tail and wings; below white with a tinge of olive, brown on the sides, and towards the vent; feathers of back and rump much discomposed. Length nearly 5½ inches; of tail 2; of wing 2 $\frac{3}{10}$ths; tarsus $\frac{8}{10}$ths. Irides pale orange buff.

GENUS MYOPHONUS, Horsf.—*Fowl Thrush*, Swainson.

79.—*M. Horsfieldii*, Vigors.—*Large blue Thrush.*

I have hitherto only seen this bird twice: once in the Tricheor jungle, hopping on the ground like a black bird; and again in the Segoor pass of the Neilgherries, flying before me from tree to tree near the ground. I have also seen a specimen shot in the Pulney hills, and several procured in the neighbourhood of Cannanore. Length 12 inches; of wing 6¼; of tail 5; of tarsus 1 $\frac{4}{10}$ths of an inch. Bill and legs black; irides dark brown.

GENUS PITTA, Temm.—*Ant Thrush.*

80.—*P. Brachyura.*—*Nou-rung*, H. (i. e. *nine coloured bird*).

Though by no means common, this bird is occasionally met with in gardens and topes in the Carnatic, as at Madras and Trichinopoly, during the cold weather only, I believe. It however generally frequents high jungle, and is therefore more common on the West Coast than in other parts of the peninsula; I have also seen it in Goomsoor. It feeds on the ground in small flocks, generally, but not unfrequently singly, and readily perches on being disturbed.

In the few instances when I have obtained specimens of the *Nou-rung*, I have not found their food to consist of ants, but of other insects, chiefly coleopterous. Length 6½ inches; of wing 4¼; tail 1½; tarsus 1 $\frac{1}{10}$ths. Irides, hazel brown; bill black; legs yellowish pink.

Sub-Family MERULINÆ.—*True Thrushes.*

Genus PETROCINCLA.—*Rock Thrush.*

81.—*P. Pandoo*, Sykes.—*P. Maal*, Sykes.—*Indian Rock Thrush*—*Shamah*, H.

In accordance with Colonel Sykes' opinion, I place this bird as distinct from the *P. Cyanea* of Europe, which it much resembles. The *Shamah* is a rare bird in the southern part of the Peninsula. I have only seen it on the Neilgherries, near Coonoor and Kotagherry, in bushy and rocky valleys. Towards the more northern parts it becomes more frequent. I observed it several times about the central part of the table land, both in the neighbourhood of villages, and in rocky valleys and hills. About Jaulnah it is far from being uncommon, frequenting chiefly the old mud walls of villages, and rocky hills, and occasionally seen about houses and stables in cantonment, perching now and then on the house tops. I first observed it this year (1839) in the beginning of October, coming in at the same time with many other birds, and it stays here (Jaulnah) till April. It is always solitary, feeds on various insects. I have found the *P. maal*, of Sykes, in the same localities as his *P. pandoo*, and consider it as the young bird or female, which is also the opinion of Mr. Elliot. From his notes I take the following extract:—" very tame, often coming into houses and hopping about verandahs: has a fine song, and is trained and domesticated by faqueers and others; common on the coast from Vingorlah to Cambay." Length 8½ inches; wing nearly 15; tail 3; tarsus 1 inch. Irides deep brown; bill and legs black.

Genus PETROPHILA, Swainson.

82. *P. cinclorhyncha*, Sw.—*Petrocincla cinclorhyncha*, Vigors.—Gould, Cent. pl.

This bird certainly differs from the last in its habits, as well as form, but the generic name adopted by Swainson is, I think, unfortunate, as I have hitherto only met it perched on trees in dense and lofty jungle in the Coonoor pass of the Neilgherries, on the summit of the hills near Coonoor—and once in the jungles of Malabar, at no great elevation above the sea. On one occasion only I observed three or four together; at all other times it was solitary. Its stomach contained various fruit and berries.

A young bird, I possess, is of a brownish olive colour above, with a tinge of blue on the shoulders and tail, rump feathers edged with rusty; beneath white, much tinged with rusty on breast, and the feathers barred transversely with olive brown. Length 7½ inches; wing rather more than 4; tail 2¾; tarsus $\frac{8}{10}$ths of an inch; irides brown.

GENUS TURDUS, L., Auct.—MERULA, Sw.

83.—*T. simillimus.*—New species.—*Neilgherry black bird.*

This black bird, generally considered by residents on the Neilgherries to be identical with the European species, so closely resembles it, that I was unable to decide accurately from the descriptions I possess, till I procured some specimens from home of the British bird. It however differs invariably (besides in other points hereafter to be mentioned) in the colour of its legs, which are always yellow, whilst those of the *T. merula* are brown (I had overlooked this point in the descriptions). The *Neilgherry black bird* has exactly the same habits and song as its European analogue, though I think in this latter respect it is surpassed by the British bird.

I have only observed it on the Neilgherries, in the dense woods of which it is very common, and may be daily heard pouring forth its charming song, especially towards evening, and in cloudy weather. It is found alone or in small families. It lives chiefly on fruit of different kinds, especially of the pleasant Brazil cherry, now so abundant in the woods there; also feeds on worms, caterpillars, and other soft insects. I possess a specimen, given me by Major Campbell, 33d N. I., who shot it on the Pulney hills, which is identical with the Neilgherry ones.

Descr.—Male bird entirely black, conspicuously darkest on the head and back of neck, lightest below, and tinged with dusky brownish. Female of a dark olive brown above, of a much lighter tint below. Bill and edges of eyelids, in both sexes, orange yellow; feet dark yellow, with a tinge of dusky in the female; claws of same colour as toes. Irides dark hazel brown. Length 10 inches; of wing a little more than 5 inches; tail rather more than 4; tarsus nearly 1 $\frac{3}{10}$ths.

The young birds are of a similar colour to the females; the feathers especially of the head, neck and breast, have a central streak of a light brownish yellow. In the European bird, this central streak is of a much darker and more rufous hue. One of the chief points of difference, be-

tween this species and the European bird, is the length of bill, which is considerably longest in the Neilgherry bird. This, with the difference of colour of legs and claws, and the distinct (though slight) variation of the tint of the plumage are sufficient, I should imagine, (independent of its difference of locality), to stamp this as a distinct and independent species. It would be interesting to know if this species was confined to the small, but highly elevated table lands of the South of India, or had a more extended geographical distribution.

84.—*T. cyanotus*, Jard. Ill. Ornith.—46.—*Blue backed Thrush.*

This neatly marked species is found only in dense and lofty jungles. I have seen it in Goomsoor, in the Malabar Coast, and most numerously in the bamboo jungles of the Wynaud, though far from being common even there. It is always found solitary, perched on the lower branches of trees, and its flight is low and rapid. Feeds chiefly on stony fruit. Colonel Sykes says also on *cicadæ* and other insects. I never heard it utter any note. Irides dark brown; length 8 inches; of wing 4½; tail nearly 3; tarsus 1 $\frac{3}{10}$ths of an inch.

85.—*T. varius*, Horsf.—*Elegant Thrush.*

I only once saw and obtained a specimen of this elegantly marked and formed species of thrush, in a small tope close to Rumbah, on the Chilka lake, in the neighbourhood of a high jungle; its flight was very rapid. Its stomach contained various fruit and seeds. Irides dark hazel. Length about 10 inches; of wing rather more than 5½; tail 3¾; tarsus 1 $\frac{3}{10}$ths. The first quill is very small; the second slightly shorter than the fifth, the third longest and perceptibly longer than the fourth. Bill brownish; legs and feet dirty yellow

Sub Family CRATEROPODINÆ, Swains.—*Babblers.*

This sub-family has received a most appropriate name from Swainson, who has, I think, most justly located in it the various Indian genera *Pellorneum*, *Crateropus*, *Pomatorrhinus* and *Thimalia*, which much resemble each other in their manners, though they do not in general evince a partiality for the neighbourhood of water, nor do they inhabit the thickets of reeds and other aquatic plants, as said, in Swainson, to be the general habits of the family. The notes of all the species are loud.

Crateropus Cachinnaus

Laughing Thrush of the Neilgherries.

Drawn on Stone by J. Dempsky

Printed by W. Frederick

GEN. PELLORNEUM, Swains.

86.—*P. olivaceum* ?—New species.—*P. ruficeps*, Sw. N.Z ?—***Red headed Babb'er.***

Descrip.—Above and sides of a dark brownish olive ; head, and back part of neck, rusty red : chin white ; breast and belly white ; many of the feathers, of the breast especially, broadly centred with olive. Irides brick red ; bill above dusky ; below dirty yellow; legs yellow with a tinge of flesh colour. Length 6½ inches; wing 2¾; tail $2\frac{4}{10}$ths; tarsus $1\frac{1}{10}$th.

I have not met with any description of this bird, but as the species given as type of this genus has been called *ruficeps* by its talented founder, I strongly suspect, that, as the name is applicable to this species, it may be the one intended, so have put it as a synonym, till further information is obtained.

I have met this curious little bird in the jungles of Trichoor, Wurguncherry and Manantoddy, but it is by no means common. It associates in small flocks, among the low shrubs and thickets in lofty jungle, descending to the ground, where it hops about in search of various insects, and from thence running up and climbing the small branches, keeping up a continual chattering, and every now and then one of them, perched on a low bough, elevating his head and neck, and giving utterance to a sort of crowing laugh, very similar to that of the *Crateropus* next described. On being disturbed, they retreat through the trees and underwood, at no great height from the ground, and indeed they never appear to climb to any height.

GEN. CRATEROPUS, SW.—XANTHOCINCLA, Gould.—GANULAXIS, Less.

87.—*C. cachinnans*—New species ?—***White browed Babbler.—Laughing Thrush of the Neilgherries.***

Descrip.—Above and under tail coverts of a dark olive, head dusky black, eyebrows and eyelids white, lores and chin black, ears, throat, breast and belly bright rufous. Irides fine lake red ; bill black ; legs dusky greenish. Length about 9 inches; wing $3\frac{7}{10}$; tail nearly 4; tarsus $1\frac{4}{10}$.

This noisy bird is to be met with in all the thick woods on the summit of the Neilgherries, and its loud laughing call is often heard when the bird itself remains unseen. I have met it in no other locality.

Like others of the family it lives in small flocks, forages about the thick brushwood, and densely interwoven woody creepers. On being observed, they hop and climb up the stem and thick branches of the nearest large tree; but they do not appear to ascend to the tops of trees. I occasionally, though rarely, observed them hopping and feeding on the ground. As might be expected from the structure of their wings, they fly heavily, and never to any distance. The cry of the 'laughing thrush' is very peculiar, and once heard cannot be forgotten. It is a sort of cracked, punch and judy laugh, and is no sooner commenced by one, than several others take up the chorus. Their chief food is fruit of various kinds, also caterpillars, grubs and various other insects.

88.—*C. Delesserti.*—New species?

The only specimen I have seen of this bird was in the collection of M. Delessert, who was some time on the Neilgherries. It was killed near Kotagherry, and, if new, may be named in honour of that gentleman, who took home with him large collections.

Descr.—Irides light red; bill yellow at the base of the lower mandible, brown above; head and nape brownish black; chin, throat and breast white, shoulders and back dark rufous, growing lighter towards the tail; wings reddish black; belly and vent light reddish brown; tail black; legs pale reddish. Length about 11 inches; wing $4\frac{5}{10}$ths; tail $4\frac{3}{10}$ths; tarsus $1\frac{4}{10}$ths.

Sub-Genus POMATORHINUS, Horsf.

89.—*P. Horsfieldii*, Sykes.—*Horsfield's Babbler.*

I have seen this bird, but rarely, in Goomsoor, in bamboo jungle, in thick and tangled wood near Manantoddy, and among under-wood in the neighbourhood of Kotagherry. It has a very loud cry which has been well expressed by Colonel Sykes, as, '*hoot whoot, whoot*,' to which the female (when they are in pairs) answers '*hoot, hooee.*' I saw it once in pairs, at other times in small families, keeping up a continual loud call, and climbing about the branches with great facility. It is a remarkably shy and wary bird. Various small insects were found in the stomach of those I procured.

Irides dark red; bill yellow; horn colour at the base of the upper mandible; legs greenish black. Length 9 to $9\frac{1}{2}$ inches; wing $3\frac{6}{10}$ths tail $3\frac{3}{4}$; tarsus $1\frac{3}{10}$ths.

GENUS THIMALIA, Horsf.

90.—*T. Malcolmi*, Sykes.—*Large Babbler.*—*Ghoghoye*, H.—*Gougya*, Can.—*Kokuttee*, M.

This large *Thimalia* has a peculiar distribution. In the South of India it is only found on the elevated table lands. I have observed it on the Neilgherries near Coonoor and Kotagherry, in low bushy ground, and seen specimens from the Shevaroy Hills near Salem. It is not found in the Carnatic, Northern Circars, nor in the more southern parts of the Deccan, but towards the north begins to occur more frequently, and at Jaulnah is very common. The *Ghoghoye* frequents topes in the neighbourhood of villages and cultivation, also occasionally low and open jungle. Lives in small troops, feeding chiefly on the ground, especially around the trunks of large trees. It keeps up a continual chattering, occasionally changed to a louder cry, resembling 'quey, quey, quey, quo, quo,' pronounced very gutturally. Its flight, like that of all the species of *Thimalia*, is feeble and struggling. Mr. Elliot says "when the Shikra (*F. Dukhunensis*) is flown at them they defend each other with great courage, mobbing the hawk, and endeavouring to release the one she has seized." Lives on various grains, seeds, and insects, chiefly grasshoppers: I have seen one attempt in vain to catch a grasshopper on the wing.

Irides light yellow. Length 11½ inches; wing $4\frac{6}{10}$ths; tail 5½; tarsus $1\frac{3}{10}$ths.

91.—*T. Somervillei*, Sykes.—*Jungle Keir or Kayr*, H.—*Jungle grey babbler.*

I have always found this species of *Thimalia* in tolerably dense jungle, and never in open country, like the next one which much resembles it. It is far from being uncommon in most jungles. I have seen it in Goomsoor, in the Tondiman's country, in the Carnatic, and in most of the jungles of the West Coast. I have also lately procured it in a densely wooded nullah in low jungly country in the neighbourhood of Jaulnah. It has similar habits to others of the genus living in tolerably numerous and noisy troops, and feeding on various grains and insects.

Irides pale yellow; bill and feet dirty yellow. Length 9 inches; of wing $4\frac{1}{10}$th, tail 4½; tarsus $1\frac{3}{10}$ths.

I may here remark that my specimens from two localities differ somewhat from each other in the shade of their plumage, and also slightly from Colonel Sykes' description. This may depend on difference of age. A specimen from Goomsoor, however, has a bill remarkably differing from those of the others, in having the edge of both mandibles, especially of the under one, scooped out, as it were, from the centre to the tip of the bill, so as, when they are closed, to leave an open space. I pos-

sess but one specimen from this locality, and so am not aware whether it is an accidental or permanent character. If the latter, it will, with some other slight variations, constitute it a separate species; and from the peculiar distribution of others of this truly Indian genus, and the general similarity of colour, as remarkably shown in the likeness of this to the next species, I am inclined to think that hereafter other species may be separated, closely allied in plumage and general structure, yet differing in some permanent character, both of structure and plumage, as well as in geographical distribution. This, however, deserves further investigation.

92.—*T. grisea.—T. griseus, Lath.—Keyr.* H.—*Kullee Couravee*, Tam. (*Hedge bird*).—*Dirt bird* of some Europeans.—*Fouille-merde* of French in India (Vieillot)—*Common Grey Babbler.*

This species so much resembles the last in its general appearance, that I was long unsatisfied of their distinctness, notwithstanding the striking difference of colour of the irides, and different localities of the two. This is one of the commonest birds of the Carnatic, and may be seen in every garden, and about the hedge rows, avenues, trees and topes throughout that district. I have never seen it above the ghauts, nor in the Northern Circars even, but it occurs sparingly in the more open portions of the West Coast. Like the others of its genus, it lives in numerous families of 6, 8, 10, or more. They feed chiefly on the ground, on which they may be seen to drop one after the other from the tree they may have been perched on—hop briskly about, picking up various seeds and insects, occasionally seeking the latter from heaps of dung (whence they have received their usual denomination, as well from the French as English in India, who on this account are prejudiced against them). On being driven from the ground or leaving it from choice, they fly up successively as they dropped down, and hop and climb up the large branches of the nearest tree, seldom stopping till they have nearly reached the top or the other side, from which if still watched they fly off, one after the other, to another tree. They often appear to pick insects off the bark of trees. They have an incessant loud whispering kind of chatter, which they all repeat at once, especially when feeding, or on being observed by any one. The *Keyr* is a very familiar bird if undisturbed feeding close to houses, but if closely observed or followed becomes circumspect and wary. It is also a very quarrelsome bird. I have seen the nest of this species placed in a tree at no great height. It was made of small twigs and roots most carelessly put together, and contained four bluish eggs. I shall here add a description of the Carnatic bird.

General shade of plumage light brownish grey, head and nape much lighter tint, almost whitish, and appearing so most distinctly at a distance (whence they are vulgarly called by some white headed bobs). Quills and tail brown, obsoletely barred with darker bands, central tail feathers lighter at the base, feathers of the back darkish, lightest in the shaft and at the edges, rump feathers pale fawn, much discomposed. Feathers of the chin and throat dark in the centre, at the base and extremity of a bluish white. This gives a bluish appearance to this gular band, which is distinctly separated from the surrounding plumage. Breast, belly and under tail coverts pale yellowish fawn colour, most of the feathers are bluish at the base.

Length 9½; wing 4; tail 4; tarsus 1 $\frac{3}{10}$ths; irides silver white; bill and legs yellow. It differs from the last species structurally in the form of the bill, which is shorter and more elevated at the base, and in the hind toe also, which is shorter than in *T. Somervillei.*

Mr. Elliot has in his notes the description of a *Thimalia*, met in the Southern Mahratta Country, which appears nearly to correspond with this, the only difference I can detect from his description is in the bill and legs, which he calls "whitish." If identical it would mark a curious distribution, as I have seen it in no situation above the ghauts.

Plumage above, chin and throat, brown cinereous, shafts of the feathers lighter; head and nape, whitish, rump cinereous; tail brown, with indistinct darker bars; belly whitish like the head. Irides silver white, bill and legs white. Length 9¼ inches.

93.—*T. subrufa.*—New species.—*Junglee Keyr*, H.—*Rufous bellied Babbler.*

This apparently undescribed species is only found in thick jungle. I have hitherto only seen it in the bamboo jungles of the Wynaad near Manantoddy. It has similar manners to the others, feeding on the ground, and on being disturbed retreating to the thick clumps of bamboos, through which they make their way with much adroitness, chattering all the while, and generally contrive to conceal themselves from view. Their note is similar in character, though quite distinct from any of its congeners. Its colours mark an approach to the *Crateropi.* Mr. Elliot mentions this species in his notes as found in the jungles of the Southern Mahratta Country; so it is probably found in most of the elevated jungles along the range of the ghauts, though not as far as I have seen found below the mountains.

Descr.—Above darkish brown olive, below rufous, darkest on the neck and breast; forehead pale bluish ash colour; frontal feathers rigid; bill brown above, yellow below. Legs yellow, irides bright yellow. Length 9½; wing 3 $\frac{7}{10}$ths; tail 4¼; tarsus 1 $\frac{3}{10}$ths.

94.—*T. Chatarœa*, Frankl. Cat.—Gen. *Malacocircus*, Swainson?—*Doomree*, H.—*Hoonee*, Tam. ?—*Striated Babbler.*

Before entering on the account of the bird, I may here introduce some excellent remarks of Mr. Elliot. He says, speaking of the *Thimaliæ* "there is another group, the *Doomrees*, differing somewhat in habit, less noisy, still in companies and flying along woody nullahs, hedge rows, bushes, &c. where they ensconce and conceal themselves." In the three species next described there is certainly a slight difference both in structure and habits from the more typical species of *Thimaliæ*. Whether this is sufficient to entitle them to sub generic distinction or not cannot be satisfactorily determined, till a complete analysis has been made of the whole family of the *Crateropodinæ*, of which Swainson confesses that enough is not yet known to enable him to arrange them perfectly.

The *Doomree* is found all over the peninsula, in the open plains when covered with a few scattered bushes, or in low but thin jungle. It is a shy and wary bird, flying before you from bush to bush, and having a whistling sort of cry which it is frequently heard repeating. It flies low, and like others of the genus, alternately with a few rapid beats of the wing, and a sailing with outstretched wings. Feeds on various insects, caterpillars and grubs. Irides reddish brown; bill brownish; legs dirty yellow. Length 9 to 9½; wing about 3; tail 4; tarsus 1.

95.—*T. hypoleuca*, Frankl.—*White bellied or singing Babbler.*—*Shukur Doomree*, H.?

This neatly clothed little *Thimalia*, is far from being common towards the south of the Peninsula. I have seen it in a bushy tract at the edge of the Wulliar jungle; also in hedges on low jungly districts near the base of the Shaudee mungalum hills in the Salem district, and again at Royacottah in similar situation. Near Jaulnah it is generally to be met with in the low jungle in the neighbourhood, also in woody nullahs and thick hedges. It is not unfrequently to be seen alone, but generally in small parties of four or five, which fly before you, and manage to conceal them-

selves in some thick bush. They have a low chattering when together, neither loud however, nor often heard. I have on several occasions heard a single one perched conspicuously on a bush or hedge, pour forth a remarkably sweet song. Feeds on ants and various other insects, &c. Irides deep brown, surrounded by a narrow circle of buff; bill black; edges of the nostrils and naked skin round eye, orange yellow; legs deep yellow. Length 6½ to 6¾; wing 2 $\frac{7}{10}$ths; tail 3½; tarsus 1 $\frac{1}{10}$th.

96.—*T. Hyperythra*, Frankl. Cat.—*Shah Doomree*, H. ?—*Smallest babbler*.

This small species, but for its high and strongly compressed bill, might readily be mistaken for a *Prinia* or some other of the warblers. I have seen it but very seldom, once at the top of the Tapoor pass in thick jungle, and in the neighbourhood of Jaulnah, in jungly district, in thick hedges, and thick wooded nullahs. From the dense nature of the bushes &c. it frequents, it is with difficulty observed and obtained. I have generally seen it in parties of five or six, occasionally giving out a low and indistinct sort of chattering. Fragments of various insects were found in the stomachs of those I procured. Irides yellowish brown; bill horn colour; legs flesh coloured with tinge of yellow. Length 5½; wing 2 $\frac{3}{10}$ths; tail 2¼; tarsus, nearly $\frac{9}{10}$ths.

Sub Family ORIOLINÆ.—*Orioles.*

Genus ORIOLUS, L.—*Oriole.*—*Mango Bird* of Europeans in India.

97.—*O. aureus*, Gmel.—*O. Galbula*, Sykes' Cat.—*O. Kundoo*, Sykes—*Young bird*—*Peebeck*, H.—*Indian Oriole or Mango bird.*

This species, generally considered to be identical with the European, *O. Galbula*, differs in the black eye-streak extending to some distance above the ear coverts, and in its shorter wing.

Colonel Sykes says of this bird "very abundant in the Deccan just before the rains." In the Carnatic it is most abundant, I think, during the cold weather, disappearing or nearly so during the hot months. This corresponds with the period of their greatest abundance in the Deccan. It is most numerous in the West Coast, and well wooded situations; frequents topes, gardens, avenues and large single trees, feeding on various fruit, especially the fig of the banian tree. It is not met with in thick forest jungle. Its flight is undulating. It has a loud

mellow plaintive cry, something resembling *pee-ho.* Length 9½: wing 5½; tail 3½; tarsus $\frac{8}{10}$ths; bill brownish red; irides fine lake red; feet slate colour.

The *O. kundoo*, of Sykes I consider the young bird.

98.—*O. melanocephalus*, L.—*Black headed Mango bird or Oriole.*

This species is in general only met with in thick and lofty jungle, but in parts of the West Coast, as about Palghaut and Trichoor, it is common in topes, avenues and gardens. I have seen it also in Goomsoor in open jungle, but not in the Carnatic. Like the last, it is seen singly, or in pairs. Length 9 inches; wing 5; tail 3½.

99.—*O. Chinensis*, Gmel.—*O. hippocrepis*, Wagler.—*O. Maderaspatanus*, Frankl. Cat., Young bird?—*Black-naped Oriole.*

I have not myself observed this species of *Oriole*, but find it recorded in Mr. Elliot's notes, as occurring sparingly in the jungles of the Southern Mahratta Country.

Genus IRENA, Horsf.

100.—*I. puella*, Horsf.—*Edolius puellus*, Temm.—*Fairy blue bird.*

This most lovely plumaged bird is far from being uncommon in many of the lofty forest jungles of Malabar. I have seen it in the jungles near Palghautcherry, Trichoor, the Wynaad, and on the Coonoor ghaut, as high as 4000 feet and upwards. It is only found in the densest portions of the jungle.

The fairy blue bird lives generally in small parties of four or five, or more, occasionally in pairs, frequents the loftiest trees near their summit, and feeds on various fruit and berries. It has a loud, mellow, agreeable warble, which it is frequently heard repeating; by which I have generally first detected their presence in the thick and umbrageous parts of the forest they inhabit. As this bird was not observed either by Mr. Elliot, or Colonel Sykes, I presume it does not extend far to the northward. In one or two instances, I observed two or three hairs arising from the nape, as in the *Tricophori.* Irides fine ruby red; bill and legs black. Length 10 inches; wing 5¼; tail 4; tarsus $\frac{6}{10}$ths.

Fam. SYLVIADÆ.—*Warblers.*

Sub Family SAXICOLINÆ—*Stonechats.*

Gen. GRYLLIVORA, Swains.—Kittacincla, Gould.

101.—*G. intermedia*, Sw.—*Gracula Saularis*, L.—*Turdus Amœnus*, Horsf.?—*Pastor*, Temm.—*Lan. Mindanensis*, Auct.—*Little Indian Pie*, Edw. pl. 181.—*Dial bird*, Lath.—*Dayyur or Deyr*, H.—*Large or Magpie Robin.*

This bird, so long with others of its genus banded about by authors, has at length, I hope, found a firm resting place among the *Stonechats*, to which it is certainly most closely allied in manners, as well as in structure. I think that this generally spread Indian bird, is referable to Swainson's* species named as above. It is far from being numerous in the Carnatic, or Deccan, except in well wooded situations; is more so in the Northern Circars, but most abundant on the Western Coast, as well in the jungles, as in gardens, avenues, topes, &c. It is solitary, frequents thick trees and bushes, feeds on the ground, flying down from a low branch, its usual perch, and frequently hopping a few steps on the ground, jerking its tail well up every now and then. On securing an insect it flies back again to its perch, elevating its tail on reseating itself, and uttering a pleasant warble. Towards evening it may often be seen near the top of some lofty tree in the jungle, pouring forth its agreeable song; which, however beautiful, must yield the palm to that of the next species mentioned. It is occasionally caged for its song. Its chief food is small grasshoppers and similar insects. Irides hazel brown; bill black; legs dusky. Length 7½ to 8 inches; wing about 4; tail 3 $\frac{8}{10}$ths; tarsus 1 $\frac{1}{10}$th.

I have hitherto procured so few specimens from different localities that I cannot say whether Swainson's new species, if it be from India, (*G. brevirostra*) be well founded or not. I possess a specimen shot in thick jungle which certainly has a smaller bill than the common species, and only 3 of the tail feathers on either side are pure white, the next one being edged with black; and as this, though a young bird, is the only one I shot in high jungle, it may turn out to be a distinct species. Another species, not uncommonly seen in cages in the Carnatic, is, I

* V. Swains. Classification of Birds. Part 5.

think, the *G. magnirostra* of Swainson—this I have hitherto not met in a state of nature, and it is said to be brought over from Malacca, Ceylon, Java, and other Eastern Islands. It sells for a high price, and sings most charmingly.

102. *G. longicauda*, Swains.—*Turdus macrourus*, Gmel.—*Long tailed thrush*, Lath.—*Long tailed Robin.*—*Indian Nightingale.*—*Abbeka*, H.

This most charming songster of the forest, is unfortunately rather rare, and only found in the most retired and impervious parts of the thickest forest jungle. I have seen it in the bottom of the Coonoor pass, and in the greatest abundance in a tract of forest west of Sultan's Battery, in the Wynaad; in both places in the densest thickets. It is solitary, perches on low branches, and hops to the ground to secure a grasshopper, small mantis, or other soft insect. When alarmed it flies before you from tree to tree at a low height. Its song is heard in the greatest perfection towards evening, and is certainly surpassed by no Indian bird, if indeed it is by the celebrated Nightingale. I believe it is occasionally caught and caged for its song in the Northern provinces, and sells for a high price at Calcutta. Irides hazel brown; bill black; legs pale flesh colour. Length 12 inches, of which tail nearly 8; wing $3\frac{3}{4}$; tarsus 1 inch.

Genus THAMNOBIA, Swains.

103. *T. fulicata.—Ixos fulicatus.—Motac. fulicata*, L.—*Kulchoo-ree*, H.—*Indian Robin.*

This well known bird (with regard to which similar remarks to those made on *Gryllivora* as to its previous situation and nomenclature apply even more strongly), is tolerably common in most parts of the country, and its familiar habits have gained for it the name of "Indian Robin." It is found mostly about villages, pagodas, walls and old buildings and houses; often perching on the roof or pandaul, and feeding in the verandahs, or occasionally even entering houses. It is generally seen single or in pairs; feeds on the ground, on which it runs with great agility, frequently pursuing and capturing several insects before it reseats itself on its perch, either on a house, or some neighbouring tree or bush. At all times, but especially when feeding, it has the habit of jerking up its tail, by successive efforts, so as almost to overshadow its head. The male has a very sweet little song, which it

warbles forth from the top of a wall or low tree—and it is occasionally caged. The *Kulchooree* is not confined to the vicinity of villages, &c. but is very common on stony hills, and in various other situations. Irides dark brown. Length 6½ inches; wing $2\frac{8}{10}$ths; tail 2½; tarsus 1 inch.

I have twice seen the nest of the bird, once built among a heap of large stones raised from a boury, and the bird made its nest during the time the well was being blasted, and continued the process of incubation till the young ones were hatched, when it was accidentally destroyed. On the other occasion it had built its nest in a hole inside the wall of a house. It has 4 eggs, light dusky bluish colour, spotted with purplish brown.

GEN. SAXICOLA, Bechst.—*Stonechat.*

104.—*S. rubecola*, Temm.—European *Stonechat.*

I have seen this bird in all parts of India during the cold weather, making its first appearance in the beginning of October. It frequents bushes on the plains, hedges, and grain fields, and feeds on the ground on ants and various other insects. Irides dark brown; bill and legs black. Length 5¼; wing 2¾; tail 1¾; tarsus $\frac{8}{10}$ths.

105.—*S. caprata*, Vieill—*Mot. caprata*, L. P. E. 235.—*Sax. fruticola*, Horsf. ?—*Sax. bicolor* and *S. erythropygia*, Sykes.—*Indian Stonechat.*—*Neilgherry* or *Hill Robin.*—*Kala Pidda* (*i. e. Black Warbler*), *H.*

There are two varieties (of size only however) of this bird found in the peninsula. The smaller kind is found throughout India. I have seen it in the Carnatic, Deccan and West Coast—the larger variety I have only seen on the Neilgherries, but as they nearly correspond in size with those found by Colonel Sykes, there is a regular gradation from the mentioned length of the *S. fruticola* of Horsf. (viz. 4½ inches) to that of the hill variety, which reaches 6¼ inches, and as from the descriptions there appears no discrepancy in the colour of the plumage, I think that there can be but little doubt that they are mere varieties of one bird. The *S. erythropygia* of Sykes, as might indeed have been guessed from his own description, is the female of his *bicolor* (our present subject) as I have ascertained beyond a doubt—as well from dissec-

tion, as from being so universally met with together in all localities. This bird is not very common in the low country, and is perhaps most numerous in bushy and jungly districts, frequenting bushes, low trees, hedges, &c. On the Neilgherries it is extremely abundant, and there obtains the name of *Hill Robin*. It has the same manners as others of its genus, darting down to the ground from its perch on the top of a bush, or branch of a tree, and having secured an insect returning to its seat. It has a short little song, as well as the usual chattering note common to the *Stonechats*, and from which they derive their name. Varies in length from 5 to 6¼ inches. Of one 6¼ inches, the wing is $3\frac{8}{10}$ths; tail 2¼; tarsus $\frac{8}{10}$ths. Irides dark brown. Bill and legs black. The young bird is brown, spotted or streaked with light rufous.

106.—*S. rubecoloides*, Sykes.—*Indian red breast.*

This curious little species is clothed almost in the plumage of the well known European Robin. It is a rare bird. I have only seen it twice or thrice in topes in the neighbourhood of villages in the northern part of the table land. It is seen in small flocks, as well as singly, perched on the lower boughs of some large mango or tamarind tree, it hops to the ground to pick up ants and other insects, occasionally hopping a step or two, and then flying back frequently alights on the trunk of the tree, clinging to it for some seconds. It occasionally takes a very short flight from its perch, and back again, but whether to capture an insect in the air or not, I do not know. It differs from the *Stonechats* in structure, approaching the flycatchers in its broader and more depressed bill, and weak feet and legs. Irides dark brown; bill and legs brown. Length 5 inches; wing 2 $\frac{6}{10}$ths; tail 2; tarsus about $\frac{6}{10}$ths.

107. *S. nigrorufa.*—New species.—*Orange Robin.*

This prettily plumaged and apparently new species, I have only met on the summit of the Neilgherries, in the dense woods of which it may occasionally be seen, preferring the most close, retired and damp spots. Here it may be seen seated motionless on a low bough, suddenly darting to the ground to feast on a caterpillar or other insect it may have spied. I never heard its note.

Description—Head, face, back of neck and wings dusky black; rest of body bright cinnamon rufous or orange; palest on the belly.

Length about 4½ to 5; wing 2½; tail 2; tarsus $\frac{8}{10}$ths. Irides hazel brown; bill black; legs dirty reddish.

SUB FAMILY PHILOMELINÆ, Swains.—*Large Warblers.*

GENUS PHÆNICURA, Swains.—*Redstarts.*

108.—*P. atrata*, Jard. and Selby.—*Indian Redstart.*—*Thirt-hira*, H—i. e. *Tremoter*, or *Quaker*, from the motion of its tail.

This bird is very common in most parts of India during the cold weather, but more so in the table land, I think than in the Carnatic. It is solitary, frequents wooded places, gardens, hedges, old walls and buildings, being often seen about the roofs of houses. Feeds on the ground on wasps, ants and various other insects. Has a most peculiar quivering motion of its tail especially after feeding. The young bird has a brownish colour, where in the old bird it is blackish cinereous. Length about 6 inches; of wing 3½; tail $2\frac{6}{10}$ths.

109.—*P. Suecica.*—*M. Suecica*, L.—*Hoosenee Pidda*, H.—*Blue throated Redstart.*

I have not seen this beautiful Redstart in the Carnatic; and in the Deccan, it is far from being common, and is only found during the cold season, from October till March. It frequents thick hedges, gardens, sugar cane fields, and long grass or weeds in beds of tanks, &c.; occasionally coming close to houses; and feeds on the ground, on which it runs along picking up various insects, and does not return so quickly to its perch, I think, as the last species; neither has it that peculiar quivering of the tail, though while feeding on the ground, it occasionally jerks it up. It generally, when observed, tries to conceal itself among the bushes it frequents. Few of those I have seen were in perfect plumage. Irides dark brown; bill and legs brownish. Length nearly 6 inches; of wing 2 $\frac{8}{10}$ths; tail 2.

GENUS PHILOMELA, Swains.

110.—*P. Orphea.*—*S. Orphea*, Temm?—*P. melanocephala?* Ill. Ornith.—*Largest Blackcap.*

Though I am far from certain that my specimens are identical with the European bird, yet from the brief and imperfect description I possess,

I conclude they may be so, if indeed it is not the species referred to in Swainson's Synopsis as *P. melanocephala*, a description of which I have not seen. This bird is found during the cold weather in hedges, thickets, large trees and gardens, and even on the low bushes on the plains. It is active and restless, moving about from branch to branch, clinging to the twigs, and feeding on various insects, grubs, caterpillars, also on flower buds. I have seen it alone, and also two or three together. It is rather an uncommon bird. I have seen it occasionally in the neighbourhood of Jaulnah, and on one occasion only in the Carnatic.

I shall here add a brief description. Head, face and back of neck, black in the male; dark slaty in the female; back and wings brownish ash grey; quills dusky brown; tail greyish black; external feathers white, with black shaft, and edged internally with blackish; next three feathers tipped with white; beneath white, with a reddish tinge on breast and belly; bill blackish horn colour; legs reddish brown. Irides dull greenish yellow. Length 6½ to 7 inches; bill ½ inch to front wing.

GENUS CURRUCA, Swains.—*Phoolareea*, II. —i. e. *Flower eater or Flower pecker.*

111.—*C. cinerea*, Selby.—*S. cinerea*, Temm.—*White-throat.*

Though I have the same uncertainty with regard to this species as the last, I shall refer it at once to the European bird, giving a brief description to determine it more exactly. This is more common than the last species, but like it is only found during the cold season, remaining till March. It frequents similar situations, and has similar habits and food. I have sometimes seen them feeding on the same tree. On one occasion I observed it in the month of March very numerous in a hedge row in the Carnatic, and found it had been feeding on the pupæ of some ants, to seize which it hopped down on the ground; feeds also much on flower buds. I frequently have heard its pleasant warbling song. Irides of a reddish brown yellow.

Description.—Head and neck cinereous; ears dark; rest of outer tail feather nearly all white; rest tipped with white only; the plumage above reddish cinereous; wings and tail brownish; throat white; rest beneath white, with a tinge of reddish; bill and legs brown. Irides brownish yellow. Length 5½ to 6 inches.

112.—*C. garrula*, Selby.—*S. sylvrilla*, Penn.—*Lesser white-throat.*

I have less hesitation in referring this bird to the European species, as it is included in Colonel Sykes' Catalogue. It is more common than either of the last, frequents the same places and has similar habits, feeding on insects and flower buds, and incessantly moving about the upper and extreme branches of the trees it frequents. Irides light brownish yellow; bill blackish, pale beneath; legs dark slaty. Length rather more than 5 inches.

Genus AGROBATES, Sw.

113.—*A. brunnescens.*—New species?

Description.—Above light olive brown, darkest on wings and tail, and lightest on the rump; beneath, and eyebrow, whitish, with a tinge of olive yellow; wings and tail beneath cinereous; plumage soft and silky; bill dark brown, flesh coloured at base of lower mandible; legs horny. Irides *dull greenish yellow ochre.* This curious bird I have placed for the present as a species of Swainson's genus *Agrobates*, with which it agrees in its large thrush like bill, strong feet and legs, and slender claws; differing however in the tip of the bill being distinctly though slightly notched, and in having a few bristles at the gape. It is an uncommon bird. I have seen it in the Carnatic, near Trichinopoly; also near Jaulnah, and in other parts of the table land. In its manners this bird somewhat approaches the *Orthotomi* and *Priniæ.* I have found it in high grain fields, to the stalks of which it was seen clinging, and on being observed concealed itself among them. At Jaulnah I have lately seen it in my garden, hunting about various low shrubs, peas and beans, &c. among which, on being observed, it immediately withdrew, most carefully hiding itself, and being with difficulty driven from its place of refuge. I occasionally heard it utter a harsh clucking note. I found its food in two instances to consist of small grasshoppers and ants. Length 7 to 8 inches, of one 8 inches long the wing is 3½; tail about 3; tarsus 1 $\frac{2}{10}$ths; bill above nearly $\frac{7}{10}$ths, to gape above one inch.

(To be continued.)

III.—*On Chemical Tests.—By* Lieutenant Braddock.

To the Editor of the Madras Journal.

Sir,—Having experienced the want of a book of reference on chemical tests and re-agents, I have made the following compilation, which may perhaps be found not only generally useful, but, as geological research seems to be gaining ground in South India, such a compilation may be particularly acceptable to many of the subscribers to your Journal, who interest themselves in such like scientific pursuits and investigations.

II. That more regard to chemical testing ought to be paid by writers on the mineralogy of this part of India, seems to be evident from the following observations, for which I am indebted to Captain Campbell, Assistant Surveyor General, who has favoured me with them, and who has had occasion to make extensive experiments in the "qualitative examination" of the minerals of sundry districts under the Madras Presidency.

III. Captain C. says, "Chemistry as applied to the examination of "minerals has been too much neglected in India.—In Europe, where "almost every mineral is known, having been examined by professional "analysts, this is of no consequence; for a mineralogist can provide "himself with examined specimens, and is able to name any newly "found mineral, by comparing it with the specimens in his cabinet. "But in India this cannot be done. Great numbers of our Indian minerals are quite unknown in Europe, hardly any of them have been "analytically examined, and the comparison of them with the specimens of a cabinet of European minerals is almost useless. In fact "I consider that no person can be a good mineralogist in India, who is "not also an expert (mineralogical) chemist.

IV. "The consequence of this neglect of the chemical examination "of minerals has been, that Indian minerals have been most carelessly "and incorrectly named by various writers in this country: and to such "an extent, that, as the knowledge of geology becomes more attended to in India, the descriptions of the first writers who have taken "up the subject, will become next to obsolete. Buchanan, Christie, "Malcolmson, and Benza, have all described the black pillars of "Tippoo's tomb at Seringapatam, as being hornblende, apparently "without one of them testing it even by the blow-pipe. On analysing "the mineral, I find it to be composed of silica, magnesia, alumina, "and iron: and the silica and magnesia being in the largest proportion, it is therefore a silicate of magnesia; and contains no lime, "and is quite infusible, while the characteristics of hornblende are

" that it does contain lime, and is very fusible. Dr. Benza has called " a mineral which is found in the Palicondah hills, an eurite, but which " I find to be very fusible, and that it proves to be a silicate of alumi- " na, with iron and an alkali in combination. The same writer has ap- " plied the term silicious schist to a mineral, which Dr. Clark has called " hornstone, which latter term I believe to be the most correct.*

v. " The reasons why the chemical examination of minerals has " been so little attended to in this part of India are probably, first, that " the apparatus required is supposed to be too bulky for convenient " carriage; secondly, that chemical tests are not easily procured in " India, and thirdly that a chemical library is necessary.

vi. " With regard to the first reason, if apparatus was required for " experiments with gases, and for chemical purposes generally, it " would doubtless be too bulky to be portable; but as applicable to " mineralogical purposes, the *whole* apparatus required may be con- " tained in a box 24 inches long, 12 wide, and 6 deep. A common " country blacksmith's forge is always at hand as a furnace, and a " rough analysis of a mineral may be made in an afternoon in a tent.

vii. " With respect to tests, the tests and precipitants required in " mineralogical analysis are few and simple; they are easily made, " and almost every bazar affords at a small cost the materials re- " quired.

viii. " The third difficulty appears to carry the most weight, for to " acquire the knowledge necessary to conduct an analysis, many ex- " pensive works are wanted, and continual reference from one to " another is necessary to glean and arrange the information required. " Rose, is the best work on the subject, but it is perplexing to a begin- " ner, who is bewildered with a multiplicity of tests, and the elaborate " detail of precipitation and separation with which the work is filled. " Such information is indeed of the greatest value, but to the inex- " perienced analyst, who is unable to discriminate between what " it is necessary to attend to, and what may be neglected, it seems like " a labyrinth, only to bewilder and confuse; and he soon finds that " he wants something simpler." That want the following pages may perhaps in some degree supply.

ix. The sources of information that I have consulted have been the best I could obtain, but they have been almost limited to my own library, which has furnished me less copiously than I could have wished. This paper therefore I look upon only as a first imperfect attempt to form a work, which under abler hands, with some additions, would be found extremely useful to all who are not professed chemists,

* See Note at the end of this Number.—Editor.

but who are either learning that science, or who occasionally employ themselves in chemical investigations.

x. Accum's Tests by Maugham gave me the first idea connected with this compilation, and the index to his book formed an easy guide for the alphabetical order which I have adopted. His book and the following works are those to which I have been chiefly indebted for the information I have here collected and put together, viz. Rose's Analytical Chemistry translated by Griffin; Henry's Chemistry; Ure's Chemical Dictionary; New edition of the Encyclopœdia Brittannica; Joyce's Mineralogy; some chemical tables; the London and Edinburgh Philosophical Magazine, and some other scientific Journals.

xi. I should have been glad to have made the descriptive action of the tests more satisfactory if I could, but chemical authorities I find do not always agree, and there are some great discrepancies among them. Besides, the colours and precipitates produced by re-agents are very much influenced by quantity, as well as by foreign substances that may be held in solution, so that colours especially, cannot always be correctly defined. If a test acted on a solution of one substance only, and that substance was pure, no doubt but its precise action and the colour of the precipitate might be correctly delineated, but when an unknown *compound* is to be examined, the direct object of testing is to ascertain the several substances that make up the compound, and to arrive safely at this point it is necessary to make use of several tests, especially of those that are distinctive, if such are known, and to be had.

xii. There are two methods of doing this, and by the two conjointly, viz., by the blow pipe, and by re-agents, analytical investigations are successfully performed. I have combined both, and have endeavoured to attain the object in view as far as my means allowed.

xiii. I presuppose that those who may use the following compilation are acquainted generally with the proper methods of testing, and with the use of the blow-pipe. But those who are not I will briefly put in the way, premising only that the examples given are as plain and simple as I could make them; but not at all professing to go into the minute detail necessary when mineral or other substances are to be analized, and the quantities of their component parts are to be specified by weight.

xiv. Suppose an alkaline earth to be picked up, and you wished to know what it consisted of. The first step would be to dissolve it* in

* Or as much of it as is soluble.

pure water, stir it well, and filter. The clear liquid might then be thrown into clean test tubes, or wine glasses. If reddened litmus paper was dipped into one of them, and the liquid turned the paper blue, it would indicate the presence of a carbonated, or of a free alkali. To ascertain if carbonic acid was present, a little dilute nitric acid might be dropped into the same glass; should effervescence occur, it would establish the fact of carbonic acid being present; but if there was no effervescence, a free alkali may be assumed to be held in solution, and to have changed the colour of the paper.

xv. The solution might then be neutralized by nitric acid, and it would be known to be in that state when it affected neither blue nor reddened litmus paper; or it might be made a little acid. A drop of nitrate of silver might then be added, and if a white precipitate took place that blackened in the sun, and that was soluble in ammonia, it would indicate the presence of muriatic acid.

xvi. If a drop or two of oxalic acid, or oxalate of ammonia, were added to the liquid in another test tube, and a white colour or precipitate took place, it would indicate that lime was held in solution.

xvii. If another portion of the liquid was now concentrated by evaporation, and put aside to cool, perhaps crystals would shoot in it. If these crystals deflagrated when thrown on red hot charcoal, they would indicate that the earth contained saltpetre.

xviii. If the crystals were removed from this concentrated solution, when cold, and it was evaporated slowly to dryness, probably something like common salt would be seen to form. And if the taste in some measure corresponded therewith, it would, with the test of nitrate of silver, indicate that the earth was a saltpetre earth, mixed, as it usually is, with muriate of soda or common salt, and other substances.

xix. The earth that remained in the filter might be next examined—suppose dilute muriatic acid poured upon it dissolved a considerable portion with effervescence, leaving only a quantity of sand behind. If the acid solution gave a white precipitate with sulphuric acid, or oxalic acid, it might be presumed that the earthy part which was insoluble in water was chiefly carbonate of lime, and sand.

xx. I purposely abstain from going into niceties, because that would involve a dissertation: whereas, to ascertain the chief qualities of the earth is all that is here aimed at, or designed.

xxi. But as some further insight into the method of examining an unknown substance, may be desired by the young enquirer, I add the following directions from Rose, which I have re-arranged, and endeavoured to make plain and intelligible.

XXII. METHOD OF EXAMINING A MINERAL, OR COMPOUND SUBSTANCE, CONSISTING ONLY OF A BASE COMBINED WITH AN ACID; OR OF A METAL COMBINED WITH A NON-METALLIC BODY; ITS CONSTITUENTS BEING AMONG THE FOLLOWING SUBSTANCES.

BASES.

1 Potash
2 Soda
3 Ammonia
4 Barytes
5 Strontian
6 Lime
7 Magnesia
8 Alumina
9 Protoxide of manganese
10 Oxide of zinc
11 Oxide of cobalt
12 Oxide of nickel
13 Protoxide of iron
14 Peroxide of iron
15 Oxide of cadmium
16 Protoxide of lead
17 Oxide of bismuth
18 Deutoxide of copper
19 Oxide of silver
20 Protoxide of mercury
21 Peroxide of mercury
22 Oxide of gold
23 Protoxide of tin
24 Peroxide of tin
25 Protoxide of antimony

ACIDS, AND NON-METALLIC BODIES.

1 Sulphuric acid
2 Nitric acid
3 Phosphoric acid
4 Arsenic acid
5 Boracic acid
6 Carbonic acid

7 Chlorine
8 Fluorine
9 Sulphur
} combined with a metal of the above named bases.

TO DISCOVER THE BASE OR METAL.

XXIII. Reduce the mineral or substance to powder, and treat it first with distilled water, and the remainder with dilute muriatic acid, assisted by heat if necessary.* If it be a sulphuret, or if it contain silver, mercury, or lead, dilute nitric acid must be used instead of muriatic acid; for muriatic acid combines with silver, mercury, and lead, and produces an insoluble powder. The foregoing metals and bases may be dissolved by this process, but quartz, flint, silex, and such like hard stony matter cannot be, nor can the sulphates of barytes, strontian, lime, and lead.

* The water may be tested first, and afterwards the acid solution, or both may be mixed together.

XXIV. Provide a number of test tubes or other glasses: pour a little of the clear solution into each,* *the solution being made somewhat acid*, and proceed as follows. Each following letter, from *a* to *u* is supposed to be a distinct portion of the solution to be tested, in a different glass, or test tube.

FIRST.—*Examination by means of water† fully saturated with sulphuretted Hydrogen.*

XXV. *a.* Add liquid sulphuretted hydrogen:‡ if no precipitate occurs, the base is included from No. 1 to 13.—If a precipitate takes place, the base is contained in from No. 14, to 25, and if the precipitate§ be white and milky, it is a proof that of all the before enumerated bases, peroxide of iron, alone, is present; but if it be black, the base is one of those from 16 to 22. These bases may be thus discriminated.

14. Perox: iron.
15. Ox: cadmium.
16 Protox: lead.
17. Ox: bismuth.
18. Deutox: copper.
19. Protox: silver.
20. Protox: mercury.
21. Perox: mercury.
22. Ox: gold.
23. Protox: tin.
24. Perox: tin.
25. Protox: antimony.

XXVI. *b.* Add ammonia: if the solution turn blue, the base is deutoxide of copper: or if the clean blade of a knife, or piece of clean iron be dipped into the solution, it will soon be coated with copper, if copper be present.

XXVII. *c.* Add a large quantity of water. If a milkiness occurs it indicates that the base is oxide of bismuth.‖

XXVIII. *d.* If nitric acid, and not muriatic acid, has been used, add a drop or two of dilute muriatic acid; a white precipitate will indicate the presence of silver, or mercury. If it be silver, the addition of suffici-

* In many cases a mere drop of the solution upon a slip of glass may be tested, and the substance be ascertained from the indications given by the test.

† Distilled water is *always* intended whether specified or not.

‡ Arsenic is also precipitated by sulphuretted hydrogen, but the metallic oxides are precipitated sooner than arsenic, and may be separated from it by rapid filtration. The filtered solution, (which should smell strongly of sulphuretted hydrogen) may then be boiled and, if a yellow precipitate occurs, which is soluble in hydrosulphuret of ammonia, the presence of arsenic may be considered certain.

§ The word precipitate in its largest signification includes the idea simply of cloudiness or discolouration on the adding of a test. An *immediate* precipitate depends generally on the quantity, not on the quality, or nature, of a substance.

‖ Other tests in all these, and the following cases may be used, and ought to be, in order to verify the examination. Thus, on referring to the alphabetical list of tests, No. 41, bismuth, it will be seen, is discriminated before the blow pipe by fusing into a brittle globule that flies to pieces under the hammer; and if the substance examined is supposed to contain several bases, those tests should be selected which are absolutely discriminative of only one base if such can be found. For instance, clean iron discriminates copper beyond all doubt, and without liability of mistake. See 51 f. and 66.

ent ammonia will re-dissolve the precipitate: but if it be mercury, the ammonia will turn it black, or grey, but not dissolve it.

xxix. *e.* Add caustic potash in excess: if a yellow precipitate occurs, the base is peroxide of mercury.

xxx. *f.* Add sulphate of iron: should a brown precipitate be formed it may consist of metallic gold.*

xxxi. *g.* Add sulphuric acid, or the solution of a sulphate, if a white precipitate takes place the base is oxide of lead.

xxxii. If the precipitate formed by the liquid sulphuretted hydrogen is

Milk white....	the base is....	Peroxide of iron.
Dark brown....	do.	....Protoxide of tin.
Orange red.....	do.	....Protoxide of antimony.
Yellow.....	do.	....Peroxide of tin, or oxide

of cadmium, but to distinguish which of these last two bases is indicated, proceed as follows:

xxxiii. *h. Neutralize* the solution with ammonia, then add hydrosulphuret of ammonia, and if a yellow precipitate falls, which is not soluble in an excess of the hydrosulphuret of ammonia, the base is oxide of cadmium; but if the precipitate is easily dissolved in excess of hydrosulphuret of ammonia, then, the base is peroxide of tin.

xxxiv. This completes the examination of Nos. 14 to 25 for the base, or metal: but if peroxide of tin; protoxide of antimony, and arsenic acid, be all of them present in solution, it is difficult to discriminate these three substances with certainty, and to demonstrate their co-existence. Other tests must then be employed to corroborate and confirm the foregoing indications. See the several articles, antimony: arsenic: tin.

SECOND.—*Examination with Hydrosulphuret of Ammonia.*

xxxv. If the *acid* solution of the substance under examination gives no precipitate with liquid sulphuretted hydrogen, the base is not one of those just examined, viz. 14 to 25. Another portion of the solution should then be *neutralized* with ammonia, put into several other test tubes, and be proceeded with as follows:

xxxvi. *j.* If on adding hydrosulphuret of ammonia a precipitate is produced, the base is contained in from No. 8 to 13, and if the precipitate is black, the base is No. 11, 12, or 13. These three may be distinguished, one from the other, by the following experiment.

8. Alumina.
9. Protox: manganese.
10. Ox: zinc.
11. Ox: cobalt.
12. Ox: nickell.
13. Protox: iron.

* Gold is dissolved only by nitro-muriatic acid.

XXXVII. *k.* Add carbonate of potash, or of soda; if the precipitate is

First white, then green and finally brownish red at the surface.	the base is Protoxide of iron.
Dirty red.....	do. ...Oxide of cobalt.
Bright green.....	do. ...Oxide of nickell.

XXXVIII. *l.* Add hydrosulphuret of ammonia: if a flesh-red precipitate occurs, the base is protoxide of manganese; but if it is white, the base will be either zinc, or alumina. They may be distinguished thus:

XXXIX. *m.* Supersaturate with caustic ammonia, and if the white precipitate re-dissolves on adding the ammonia, the base is oxide of zinc but if it does not, the base is alumina.

XL. *Note.*—If strontia, barytes, lime and magnesia be present in combination with phosphoric, or boracic acid, or when their metallic bases are combined with fluorine, they may also be precipitated by caustic ammonia. Phosphoric and boracic acid and fluorine ought not therefore to be present when ammonia is used, nor ought indeed magnesia by itself simply, for magnesia is also precipitated by caustic ammonia.

XLI. THIRD.—If the *acid* solution does not give a precipitate with liquid sulphuretted hydrogen; nor the *neutral* solution with hydrosulphuret of ammonia, the base is not included in Nos. 8 to 25, but in Nos. 1. to 7.

1 Potash.
2. Soda.
3. Ammonia.
4. Barytes.
5. Strontian.
6. Lime.
7. Magnesia.

XLII. *n.* Add to the *neutral* solution, carbonate of potash. If a white precipitate occurs, the base is from No. 4 to 7. To discriminate which, observe that a white flocculent precipitate indicates magnesia: but if only after some time a precipitate is formed, the base is barytes. If no precipitate appears, the base is either lime or strontian.

XLIII. *o.* To distinguish between lime and strontian, dilute the *neutral* solution with a large quantity of water, and test with a few drops of sulphate of potash, or very dilute sulphuric acid. If a precipitate is *immediately* produced, the base is strontian; but if no immediate precipitate takes place, but after some time a crystalline precipitate appears, the base is lime.

XLIV. FOURTH.—If neither liquid sulphuretted hydrogen; hydrosulphuret of ammonia; nor carbonate of potash gives a precipitate, the substance must be from 1 to 3, that is, potash, soda, or ammonia.

XLV. *p.* To distinguish these; *concentrate* the solution. Add concentrated caustic potash, and hold over the liquid, a rod dipped in muriatic acid; if white clouds appear, the base is ammonia.

XLVI. *q.* Add to another portion of the *concentrated* solution, chloride

of platinum, if a yellow precipitate takes place, the base is potash: if no precipitate occurs, the base is soda.

XLVII. THE FOREGOING EXAMINATIONS HAVING DISPOSED OF THE BASES, AND METALS, INCLUDED IN THE LIST BEFORE ENUMERATED, THE FOLLOWING EXPERIMENTS ARE

TO DISCOVER THE ACID, OR NON-METALLIC BODY.

XLVIII. *r.* To the substance dissolved in water, or pounded and mixed with a little water, add muriatic acid; if effervescence occurs, accompanied with the well known odour of sulphuretted hydrogen gas, it indicates the presence of a sulphuret: but if the gas is in-odorous, it indicates carbonic acid in combination with some of the foregoing bases.

XLIX. To ascertain whether both carbonic acid and sulphur are present, provide a vial with a small glass tube bent twice at right angles. Place a portion of the pulverized substance in a vial and pour upon it dilute acid: place one leg of the tube in the vial and allow the gas to pass through the tube into another vial containing a solution of muriate of barytes, or lime water, to either of which a little ammonia has been added; let the other leg of the tube dip below the liquid in this second vial, and close both vials.* If a white precipitate takes place, which dissolves with effervescence in dilute acid, the substance contains carbonic acid. The sulphur will be recognized by the smell of sulphuretted hydrogen.

L. *s.* If muriatic acid produces no effervescence add to a *neutral* solution of the substance, muriate of barytes, and if a white precipitate takes place the presence of one of the acids in the margin is indicated. To ascertain which, proceed as follows:

Sulphuric, phosphoric, Arsenic, boracic, fluoric.

LI. Add muriatic acid to the precipitate; if it remain unaltered, the acid is sulphuric: but if it dissolves, the following experiments must be made.

LII. Reduce a portion of the substance under examination to powder, and add thereto concentrated sulphuric acid, either in a leaden or a platina dish; prepare a piece of glass coated with wax, and trace any figure through the wax reaching to the glass. Warm the mixture gently, cover it with the glass, and if the glass after some time becomes corroded where the tracings were made, the substance proves to be a fluoride, i. e. containing fluoric acid.

LIII. If this effect does not occur, put a portion of the pulverized substance into a porcelain or platina capsule, and add a few drops of sul-

* It is necessary that the muriate of barytes, or lime water should be shielded from the atmosphere.

phuric acid. Then mix with it some alcohol, and inflame it: if a green flame is produced, the acid in combination is boracic acid.

LIV. *t.* If neither fluorine, nor boracic acid be present, add to the *acid* solution of the substance liquid sulphuretted hydrogen, and boil it: if a yellow precipitate is formed, soluble in hydrosulphuret of ammonia, it indicates arsenic acid.*

Carbonic acid,
Sulphuric acid,
Boracic acid,
Arsenic acid,
Phosphoric acid,
Sulphur,
Fluorine.

LV. *u.* When it has been ascertained that none of the foregoing substances are present, add to a portion of the substance dissolved in dilute nitric acid, nitrate of silver; and if a white precipitate is produced, which is not soluble in dilute nitric acid, but which is soluble in ammonia, then the substance contains chlorine in combination with one of the bases before enumerated.

LVI. Lastly, if none of the foregoing substances have been discovered throw a portion of the pulverized mineral on red hot charcoal. If lively combustion occurs, or if deflagration takes place, the acid in combination is nitric acid.

LVII. *Note.* As before observed, each paragraph beginning with a letter, i. e. from *a* to *u*, details a distinct experiment, which is to be performed with a fresh and distinct portion of the substance in solution, as directed: except the last experiment (LVI) in which the mineral or substance is to be pulverized.

OBSERVATIONS.

LVIII. The foregoing detailed experiments suppose that the nature of the substance is wholly unknown to the experimentalist; but whether it is partially known or not, he should assure himself of the accuracy of his determinations by other tests which he will find in the following pages.

LIX. In using the alphabetical list of tests, it will be frequently seen that several tests act on the metal, or substance to be tested. The learner may be at a loss which test to choose: but *in those cases where the test is distinctive, its indications are printed in italics;* by running the eye therefore over any article, *wherever the indications of the tests are seen printed in italics, those tests are to be preferred, as being those which may be most relied on.*

LX. When testing, it is desirable, in almost every case, to refer to the tables of tests at the end of this paper in order to ascertain at a glance how other tests affect the substance tested. This should never be neglected by the inexperienced.

* If neither sulphuric, arsenic, boracic nor fluoric acid is present, then the precipitate (L. *s*) must prove to be the only remaining acid, viz. the phosphoric.

LXI. It may lastly be mentioned, to prevent misconception by the young beginner, that in all cases, except where otherwise specified, the test, and the substance tested, is to be in the state of solution. And that, where neutralization is mentioned, he will remember that acids are neutralized by alkalies, and alkalies by acids. When a solution is neutralized it affects neither blue, nor reddened litmus papers; i. e. the solution, so neutralized, does not change the colour of either. Some *neutral salts* however affect litmus paper. See, Nos. 77 in the subsequent list of test.

LXII. ☞ It will be highly conducive to improvement, and to the acquisition of the most useful knowledge relative to the action of tests if the young experimentalist exercise himself in the examination of easy compounds made up by him of known combinations: for instance, let him mix a little common salt, and saltpetre together in solution, and test them for the bases, potash and soda; and for the acids muriatic, and nitric. Let him refer to those four articles in the list of tests, and endeavour, from the directions given, to ascertain both the bases, and the acids to his own satisfaction, and beyond doubt. He will learn more by this one experiment than by pages of printed directions not reduced to practice. Of course he is supposed to understand the modern nomenclature, and to be aware that common salt is muriate of soda; and that saltpetre is nitrate of potash: or, in other words, that common salt is muriatic acid in combination with soda, and that saltpetre is nitric acid in combination with potash. From this experiment he may proceed to others; and after he has attained some facility and skill, he may examine other combinations making them more complex and difficult, in proportion as his knowledge increases, and as he obtains more confidence and dexterity in qualitative examinations.

OBSERVATIONS ON THE BLOW PIPE.

LXIII. So also with regard to the use of the blow pipe, practice is the only efficient teacher: and the unpractised experimentalist should initiate himself by operating first on small fragments of known minerals and metals. A few concise observations here follow with respect to the examination of minerals.

LXIV. Take a minute chip of the mineral, and place it in a hollow made in a piece of well burned, hard, charcoal. Apply the blow-pipe, at first at the extremity of the flame where there is the least heat, and afterwards gradually at the point of the *blue* flame where there is the greatest heat. Observe the phenomena that occur, such as phosphorescence

ebullition, intumescence, vapours, odour, such as of sulphur, or garlic, the latter indicating arsenic, decrepitation, fusibility, colour, &c.

LXV. The same process and the same observation of phenomena should be repeated with fresh fragments of the mineral, fluxing them first with soda, then with borax, and lastly with microcosmic salt, the latter being a flux made of five parts of crystallized phosphate of soda and two parts of phosphate of ammonia. The indications produced by all these methods are given in a table at the end of this article; and by comparing the phenomena observed in his experiments with the indications specified in the table, the experimentalist in all ordinary cases will be able to identify the mineral or metal under examination.

LXVI. If the substance should decrepitate, it may be inclosed between two pieces of charcoal, and the flame be directed on it through a hole in the charcoal made for the purpose. In the case of earthy minerals, they may be wrapped in a piece of platina foil.

LXVII. All phenomena occuring upon the use of chemical tests, and appearances produced by the blow pipe, should be noted down immediately in a memorandum book in regular *methodical* order.

ANALYSIS OF MINERAL WATERS.*

LXVIII. The following observations may perhaps be useful in directing the student's attention to a few of the leading points in the examination of mineral waters.

LXIX. In examining a mineral water, it is of importance to ascertain its specific gravity, which gives some insight into the proportion of its saline ingredients. Mr. Kirwan (Essay on Mineral Waters, p. 145.) has given the following formula for calculating the proportion of saline substances in a water of known specific gravity: "subtract the specific gravity of pure water from that of the water examined, and multiply the remainder by 1.4. The product is equal to the saline contents in a quantity of the water denoted by the number employed to indicate the specific gravity of distilled water. Thus, suppose the specific gravity of the water = 1·079, and that of pure water = 1000 then 79. × 1.4 = 110.6 = saline contents in 1,000 of the mineral water." It is advisable to conjoin this method with the following:

LXX. Evaporate a given weight, say 1,000 parts, to dryness, and expose the residue for 24 hours to a temperature not exceeding 300

* From Brande.

upon a platinum capsule; weigh it while warm, and the mean obtained from this and the former experiment will give the proportion of dry saline ingredients within a trifling error. Thus suppose 1000 parts of the above mentioned water give by evaporation 114·4 dry residue, then 110.6 + 114·4 = 225 + 2 = 112.5 = quantity of saline matter in a dry state (salts deprived of water of crystallization) existing in the water.

Having ascertained the relative quantity of foreign matter in the water, the nature of the substances present is next to be inquired into. The substances which have been found in mineral waters are extremely numerous, those which very ordinarily occur are the following:—Oxygen, nitrogen, carbonic acid, sulphuretted hydrogen, carbonate of lime, carbonate of magnesia, carbonate of iron, muriate of magnesia, chloride of sodium, sulphate of magnesia, sulphate of soda, and sulphate of lime.

LXXI. Oxygen and nitrogen exist in the greater number of spring-waters in the proportions constituting atmospheric air; the proportion of nitrogen is, however, not unfrequently predominant. These gases give no peculiar flavour to the water.

LXXII. Carbonic acid renders waters sparkling and effervescent: it is detected by occasioning a precipitate in aqueous solution of baryta, which dissolves with effervescence in dilute muriatic acid.

LXXIII. The presence of sulphuretted hydrogen is known by its odour, by the production of a black precipitate, on dropping into the water a solution of nitrate of silver; and by the deposition of sulphur, on adding a few drops of nitric acid.

LXXIV. The carbonates are dissolved in the water by excess of carbonic acid, and consequently fall upon its expulsion by boiling. Carbonate of lime and magnesia are deposited in the form of a white precipitate. Carbonate of iron occasions the separation of a brown powder, and the water is blackened by a few drops of tincture of galls.

LXXV. Mr. Phillips, in his analysis of Bath-waters, has shown that the delicacy of galls, as a test for iron, is affected by the presence of certain salts: if the iron be in the state of protoxide, its detection is facilitated by salts with a base of lime, and by alkalies; if in the state of peroxide, lime prevents the action of the test. This is well shown by dissolving a very minute portion of protosulphate of iron in a glass of distilled water, and adding a drop of tincture of galls, which occasions no immediate discoloration; but a drop of lime water, or other alkali, instantly renders the presence of iron evident; so that the quantity of iron present in a water cannot be correctly judged of by the degree of precipitation occasioned in it by tincture of galls.

LXXVI. Ferrocyanuret of potassium is also a good test to show minute quantities of iron in water, by the blue precipitate which it occasions; its action is aided by previously adding two or three drops of nitric acid to the water; but it is an equivocal test compared with galls.

LXXVII. The presence of chlorides or muriatic salts is indicated on adding sulphate of silver by a white cloud, insoluble in nitric acid.

LXXVIII. The sulphates, when present in water, afford a white precipitate on the addition of nitrate of baryta, which is insoluble in nitric acid.

LXXIX. Lime is recognised by a white cloud on dropping oxalate of ammonia into the water. A portion of the precipitate collected upon leaf-platinum, and heated before the blow-pipe, may be burned into quick lime.

LXXX. Magnesia is rendered evident by adding carbonate of ammonia, which throws down the lime, and subsequently dropping in phosphate of soda, which, when magnesia is present, carries it down in the form of a granular precipitate of ammoniaco-magnesian phosphate.

LXXXI. Such are the readiest means of recognising the presence of the various substances that commonly occur, by the action of re-agents or tests; and, having gained such general information, we next proceed to the analysis of the water, in order to ascertain the relative proportions of the gaseous and saline ingredients which it holds dissolved.

LXXXII. To ascertain the relative proportions of the gaseous contents of water with perfect accuracy, is difficult, and rarely necessary; the following method is sufficiently precise in all ordinary cases. Provide a florence flask capable of holding rather more than a measured wine pint, which quantity of the water under examination is to be introduced into it, and a cork carefully fitted to its neck, having a perforation, in which is inserted a glass tube one-eighth of an inch in diameter, rising perpendicularly about eighteen inches, and then bent so as to pass conveniently under the shelf of the mercurio, pneumatic apparatus. (Where a sufficiency of mercury cannot be procured, warm water may be substituted, if only carbonic acid be present, and it may be absorbed by transferring the jar containing it to a solution of potassa). The flask should be placed over an argand lamp, and heat gradually applied till the water fully boils. The gas evolved is to be collected in the usual way, in a graduated jar over quicksilver, and submitted to the following examination.

LXXXIII. Throw up a small quantity of solution of potassa, which, if carbonic acid be present, will absorb it, and the quantity will be shown by the diminution of bulk.

LXXXIV. Introduce the remaining air, or a portion of it, into a small bent tube, containing a bit of phosphorus; heat it so as to kindle the phosphorus, and note the diminution of bulk when cold. It is proportional to the oxygen present, and, if equal to one-fifth of the whole bulk, the gas may be regarded as atmospheric air.

LXXXV. If sulphuretted hydrogen be present it may be separated by alcoholic solution of iodine, which absorbs it, and scarcely takes up more than its own volume of carbonic acid gas. Chlorine, added to a mixture of sulphuretted hydrogen and carbonic acid, will also produce the absorption of the former, if a little water be present; but it cannot be conveniently used over mercury.

LXXXVI. During the ebullition it not unfrequently happens that a precipitation ensues, indicating that the substances thrown down were dissolved by carbonic acid; and in that case they should be separated upon a filter, (*a*) after which the remaining water may be evaporated to dryness in a glazed porcelain basin; the dry residue must be transferred to a silver, capsule and perfectly desiccated at a temperature not exceeding 500° (*b*).

LXXXVII. The precipitate (*a*) may consist of carbonate of lime, of carbonate of magnesia, or of oxide of iron; or it may be a mixture of the three. Dissolve it in dilute muriatic acid, and add oxalic acid, which throws down oxalate of lime; separate this by filtration, and saturate the filtrated portion with carbonate of ammonia, which precipitates the peroxide of iron, and having removed this, evaporate the residuary mixture, and expose the dry salt to a red heat in a small platinum capsule; the magnesia, if any were present, will remain; if not, there will be no residue; for the oxalic acid and muriate of ammonia will be destroyed and volatilized.

LXXXVIII. When carbonic acid holds iron in solution, the metal is in the state of protoxide, and if air be excluded, it requires long boiling to decompose it; for the same reason, if the water be exposed under the exhausted receiver of the air-pump, it does not readily become brown, as is the case when it is exposed to air; a drop or two of nitric acid facilitates the deposition of the red oxide.

LXXXIX. The dry residue (*b*) is to be digested in six or eight parts of boiling anhydrous alcohol, which will take up muriate of magnesia, and in some rare cases (where no sulphates are present) muriate of lime. Filter off the alcoholic solution, and wash the residue (*c*) with a little fresh alcohol, which add to the former, and evaporate to dryness, the dry mass (*d*) exposed for some time to a heat of 500,° is generally pure muriate of magnesia: if it contain muriate of lime, the latter earth may be separated by solution of oxalic acid, in the state of oxalate of lime.

xc. It is, in some cases, convenient to convert the muriates of lime, and magnesia into sulphates, by pouring upon them excess of sulphuric acid, evaporating to dryness, and heating the dry mass red hot. The sulphate of magnesia may then be almost completely separated from the sulphate of lime, by a small quantity of cold water; or a saturated solution of sulphate of lime may be used, which takes up the sulphate of magnesia, and leaves the sulphate of lime.

xci. The residue (*c*) insoluble in alcohol, may contain chloride of sodium, sulphate of soda, sulphate of magnesia, and sulphate of lime; digest it in ten parts of boiling distilled water, which, when cold, will have taken up every thing but sulphate of lime, of which an inappreciable portion only will have been dissolved; separate the solution into two equal portions, A and B: which may afterwards be further diluted.

xcii. To A add nitrate of silver, and wash and dry the precipitate, which is chloride of silver, 146 parts indicate 60 of chloride of sodium.

xciii. To B add acetate of baryta as long as it occasions a precipitate, which is sulphate of baryta, (*e*) and which is to be separated, dried, and weighed. 117 grains are equivalent to 72 of dry sulphate of soda and 60 of dry sulphate of magnesia.

xciv. In order to ascertain the quantity of magnesia present, and consequently the quantity of sulphuric acid belonging to it, evaporate the liquid filtered off the barytic precipitate (*e*) to dryness; it will contain chloride of sodium, acetate of soda, acetate of magnesia, and, probably, a portion of the added acetate of baryta; ignite the dry mass, and wash it to separate the chloride of sodium and the soda; magnesia and carbonate of baryta will remain insoluble, upon which pour dilute sulphuric acid; digest, filter, and evaporate the clear liquor to dryness; it is sulphate of magnesia, equivalent of course to the original portion of the salt; deduct the sulphuric acid contained in it from the whole in the precipitate (*e*), and the remainder will give the quantity united to the soda.

xcv. To estimate the quantity of sulphate of lime in the water, the residue of the evaporation of one pint may be washed with cold saturated solution of sulphate of lime, which, in most cases, will dissolve every thing but that sulphate, and which may thus be obtained and weighed; or, add oxalate of ammonia to a given quantity of the boiled and filtered water, collect the precipitate, and give it a red-heat with excess of sulphuric acid, by which it is converted into sulphate of lime, equivalent to the original in the water.

xcvi. Besides the substances now enumerated, and which may be

considered as the most frequently occuring ingredients in mineral waters, the following are occasionally present.

xcvii. *Carbonate of soda* is known to exist in water, when, after having been boiled down to half its bulk, and, if necessary, filtered, it reddens turmeric paper, and restores the blue of litmus reddened by vinegar; it also affords an effervescent precipitate with nitrate of baryta, soluble in dilute nitric acid. This carbonate is incompatible with the soluble salts of lime.

xcviii. *Muriate of lime* may also be used to detect the alkaline carbonates, with which it affords a precipitate of carbonate of lime. Carbonate of soda is distinguished from that of potassa, by the latter affording a precipitate in neutral muriate of platinum, which the former does not. Carbonate of ammonia is discoverable by its smell, when acted on by caustic fixed alkali or lime: also by its action on test-papers.

xcix. *Silica* is detected by evaporating the water to dryness, and boiling the residue in dilute muriatic acid. The silica, if present, remains as a white powder not altered by a red-heat, but instantly fusing with a particle of carbonate of soda.

c. *Boracic acid and borax* have been found in certain lakes in India, and in some parts of Italy. To detect boracic acid, evaporate to one-eighth the original bulk of the water, and add carbonate of soda as long as it occasions any precipitate; boil and filter. The filtered liquor will contain borate of soda with some other salts of the same basis; evaporate to dryness in a platinum crucible, and digest the residue in three or four parts of sulphuric acid, diluted with its bulk of water. If boracic acid be present, it will separate in micaceous crystals.

ci. *Alumina* has been found in a few mineral waters in the state of a sulphate. It may be separated by the following process: evaporate to dryness, digest in alcohol, and redissolve the residue in eight parts of water; filter and add oxalic acid, which throws down lime, and which, being separated, leaves magnesia and alumina in solution. Carbonate of ammonia throws down the alumina and leaves the magnesia.

cii. Pure ammonia throws down both alumina and magnesia. These earths may be separated by solution of potassa which dissolves the former but not the latter.

ciii. *Manganese* is sometimes found in water, but only in very small proportion, so as not to amount to more than a trace. Dr. Scudamore found a trace of Manganese in the waters of Tunbridge Wells, and it has never been discovered in larger proportion.

CIV. Certain *nitrates* are occasionally present in water. Nitrate of lime will be taken up from the residue of evaporation by alcohol, and may be decomposed by carbonate of potassa, so as to afford carbonate of lime and crystals of nitre.

CV. It sometimes happens that water contains *lead*, which may be detected by evaporation to one-eighth its bulk, adding a few drops of nitric acid, and then sulphate of soda, which gives a white insoluble precipitate; and sulphuretted hydrogen, which forms a black cloud. These precipitates may be reduced by heating them before the blow-pipe upon charcoal, mixed with a little black flux.

CVI. If *vegetable* or *animal matter* be contained in water, it gives it a brown colour, especially when evaporated. It may be destroyed in the dry residue by igniting it with a small addition of nitrate of ammonia.

CVII. *Iodine* and *Bromine* must always be sought for in mineral waters. Where they are suspected, the water should be evaporated to dryness, and the residue triturated with a little distilled water, which will take up the iodic and bromic salts, they are recognized by the addition of a solution of starch, having previously added a few drops of solution of chlorine; the iodine will turn blue, but if no iodine be present the chlorine will turn the bromine of a yellow tint.

A DICTIONARY

OR ALPHABETICAL LIST OF

CHEMICAL TESTS, AND RE-AGENTS.

1. **ACID** *acetic*, detects resin and gluten which dissolve in it, but on the addition of water the resin precipitates: the gluten does not. See 103. Acetic acid dissolves camphor, and essential oils; and combines with earths, alkalies and metals, forming the class of salts, called acetates. *These salts are decomposed by strong sulphuric acid, which liberates the acetic acid, when the latter may be detected by its well known odour, which is that of strong vinegar*, see 18 *a*.

a Acetic acid may be contaminated by sulphureous and sulphuric acids; they may be discovered by their proper tests, see 40, and 70 *a*.

2. **ACID** *arsenious*, the white arsenic of the shops, detects and is detected by hydrosulphurets, and sulphuretted hydrogen gas, with which it produces a yellow precipitate. The liquid contained in the stomach of a rabbit poisoned with three grains of arsenious acid, afforded a white precipitate with nitrate of silver, greyish-white with lime water, green with the ammonia-sulphate, and deep yellow with sulphuretted hydrogen water, see 39.

a When a particle of arsenic is sublimated between two plates of glass, it forms nebulous patches, considerably like those formed by sulphur, sublimated in the same manner, but the microscope makes a great distinction between them. The sulphur is globular or semi-globular; the arsenic is crystallized: this method might be used as an auxiliary in detecting small quantities of arsenic, see 39.

3. **ACID** *boracic, is indicated by its characteristic green flame when a solution of it in alcohol is set on fire.* To distinguish a borate from other salts, digest it in sulphuric acid slightly in excess, evaporate to dryness, and digest the residue in alcohol, which dissolves the boracic acid set free by the sulphuric acid, and its presence is then indicated as above. Boracic acid turns turmeric paper brown; it has but a slight action on litmus paper.

4. **ACID** *carbonic*, is detected by barytes, see 40 *e*. By litmus, see 77. By lime water, see 75; By sulphate of iron, see 67 *b*. and *by the mineral acids which drive it off, or set it free with effervescence*, see 11 *e*, 13 *g*, and 18 *g*. Carbonic acid detects lime in solution, precipitating it as carbonate of lime. Carbonates may be easily distinguished from other salts, by their effervescing without smell, on the addition of a mineral acid; see 45 ☞.

5. **ACID** *chloric, or hydro-chloric*, see 11.

6. **ACID** *chromic*, see 48.

7. **ACID** *fluoric*, see 18 *a*, and 54.

8. **ACID** *gallic, detects iron in solution, forming ink.* The solution should be of the per-oxide of iron for the test to act immediately, see 55. Gallic acid may be distinguished from tannin by producing no precipitate when added to a solution of gelatine.

9. **ACID** *hydriodic. This acid, or any of the hydriodates may be detected by adding thereto sulphuric, or nitric acid, or chlorine, which sets the iodine free; the iodine may then be recognized by its blue colour.* The best way of testing is to add starch to the solution, and afterwards a drop or two of strong sulphuric acid, which will produce the characteristic blue colour, if iodine be present. If liquid chlorine be employed it must not be added in excess, for if it is, it destroys the blue colour, and becomes a fallacious test. Chlorine gas may be thrown on the surface of the liquid, and be thus used successfully, producing the same blue appearance, see 63 and 113.

a Hydriodate of potass or iodine is acted on by several tests; but none are so distinctive as the foregoing. Corrosive sublimate forms a fine carmine red precipitate of the bin-iodide of mercury. Acetate of lead thrown down a fine yellow precipitate of the iodide of lead. Protonitrate of mercury precipitates protiodide of mercury, which is a yellow powder that fades gradually into a dirty brown. Muriate of platinum produces a brown precipitate of iodide of platinum.

10. **ACID** *hydro-cyanic*, or *Prussic acid may be known in its free state by the similarity of its smell to the odour of peach-blossoms.* But if the acid is strong, great care should be taken, not to smell it too hastily; as it is deadly poisonous. To detect it in solution, add first protosulphate of iron, and then pure potass slightly in excess, which will precipitate the protoxide of iron. Let the whole be exposed to the air for five or six minutes, and then add sufficient muriatic, or sulphuric acid to re-dissolve the precipitate; and if hydro-cyanic acid be present, there will be a formation of prussian blue. Nitrate of silver is also a test for prussic acid, see 108, *b*.

a To ascertain the strength of a solution of this acid, precipitate with nitrate of silver, and dry the precipitate. 100 parts correspond with 20.33 of pure hydrocyanic acid.

b. Both the bitter almond, and the cherry laurel, as well as the flowers and kernels of some fruits, contain more or less of this violently poisonous acid.

11. **ACID** *muriatic, chloric* or *hydro-chloric.* These three names may be considered as synonymes for the same acid. Muriatic acid detects (*a*) silver; (*b*) lead; (*c*) manganese; (*d*) ammonia; (*e*) carbonic acid. Muriatic acid is detected by sulphuric acid and other tests, see 18, 47, and 108.

a. Muriatic acid detects and is detected by solution of silver, by a copious white precipitate of the muriate or chloride of silver; which is

soluble in ammonia, insoluble in dilute nitric acid, and which blackens in the sun, see 47, 106.

b. Lead, by a white precipitate, which is not soluble in ammonia, but which is soluble in nitric acid, see 69.

c. Manganese, by the disengagement of chlorine gas. Melt soda, or borax in a platina spoon, add a little manganese, or ore containing manganese, and a red colour will appear on keeping the spoon in the interior flame of a candle, but it gradually disappears; add nitre and place the spoon in the exterior flame and the red colour again becomes visible, which confirms the test, see 81.

(*d*) Ammonia, by dense white clouds, thus; dip a rod in muriatic acid, and if free ammonia be present, on holding the rod over the substance to be examined, dense white clouds of muriate of ammonia will be seen to form, see 27, and 28.

(*e*) Carbonic acid, by the effervescence produced on adding muriatic acid to either a mineral, or a solution in which carbonic acid is present.

(*f*) Pure muriatic acid is colourless, but it frequently contains iron or chlorine which may be known by its being then of a yellow colour. It may also contain sulphuric acid. Both the iron and the sulphuric acid, may be detected by their proper tests, see 55 and 40.

(*g*) The specific gravity of muriatic acid should be 1·170, but that of commerce is generally from 1·156, to 1·160.

12. ACID *meconic.* This acid yields a red colour with the persalts of iron, and an emerald green with the sulphate of copper. By these tests the presence of opium may be discoverd

(*a*) M. Couerbe gives the following table of the colours produced by agitating the peculiar substances contained in opium with sulphuric acid and air. The experiment is to be made in a four ounce vial with six grains of the substance, and nearly half an ounce of sulphuric acid mixed with a little nitric acid. Strong agitation is to be employed and the colour is developed in a few minutes.

Sulphuric acid mixed with a little nitric acid.		*Pure Sulphuric acid.*	
Thebaia.	Instantly red, becoming deeper.	Thebaia.	Rose colour, shade of yellow.
Narcotina.	Yellow, turning red.	Narcotina.	Blood red.
Codeia.	Very pale green.	Codeia	Green.
Morphia.	Green, almost immediately.	Morphia.	Brown.
Meconin.	In 24 hours superb rose colour.	Meconin.	Turmeric yellow; afterwards red.
Narceia.	Mahogany colour.	Narceia.	Chocolate colour.

b. Morphia and its salts, form a deep greenish blue solution with permuriate of iron; and turn brown on adding a drop or two of iodic acid.

The proper solvents of morphia are alcohol, and diluted acids. Nitric acid turns it orange red, or if much acid is used, yellow, all the salts of morphia are intensely bitter, see *f.*

c. Narcotine is distinguished rather by negative than positive chemical properties. If *pure* it is not affected by permuriate of iron, nor nitric acid. When morphia and narcotine are crystallized together in an alcoholic solution, and when they are not quite pure, the narcotine forms tufts of pearly thin tabular crystals, while the morphia is in short thick adamantine prismatic crystals.

d. Codeine differs from morphia and narcotine in being moderately soluble in water and from this solution it may be obtained in large crystals tending to the form of octahedrons.

e. In cases of poisoning by tincture of opium, it is difficult to detect it, if it has lain in the stomach a few hours.

f. A mixture of equal parts of strong aqua-ammonia, and alcohol will produce in laudanum a crystalline precipitate of morphia in a few hours. This precipitate of morphia may by being twice dissolved in acetic acid, and twice precipitated by ammonia be obtained quite white.

13. ACID *nitric,* detects (*a*) resin; (*b*) starch; (*c*) nitrogen; (*d*) uric acid; (*e*) iron from steel; (*f*) tin; (*g*) carbonic acid.

a. Resin. When concentrated nitric acid is digested repeatedly with gum, mucilage, gluten, jelly, extract, gum-resin, or other immediate vegetable product, it is partly converted into oxalic acid, but resin is not. The resin results as a pale orange coloured mass, soluble in water, but possessing no resinous properties, see 1 and 103.

b. Starch. If a vegetable substance is digested for some days in dilute nitric acid; on the addition of alcohol, starch will be precipitated if present, see 113 *a.*

c. Nitrogen. This gas is set at liberty when animal matter is digested with nitric acid.

d. Uric acid is detected in the analysis of urine by a pink or rose colour on the addition of nitric acid. If a little of the solution containing the nitric acid be evaporated to dryness in a watch glass over a spirit lamp, a beautiful purple colour is produced, which is improved by the addition of water.

e. Dilute nitric acid dropt on iron produces a grey spot, but on steel, a black spot, see 114

f. Tin is precipitated by nitric acid in the state of pure oxide.

g. Carbonic acid is liberated with effervescence by nitric acid, in the same manner as by muriatic, or sulphuric acid. See 11 *e*, and 18 *g*.

14. **ACID** *nitric* detected. *If a solution contain nitric acid free or in combination with a base, it will not by itself dissolve gold leaf, but on the addition of muriatic acid the gold will be dissolved, nitro-muriatic acid being formed. Morphia turns nitric acid of a beautiful orange red colour. Nitrate salts deflagrate when thrown on red-hot charcoal.* Nitrates are also detected by sulphuric acid, see 18 *a*. Strong sulphuric acid and copper filings being put into a test tube with a nitrate salt, the acid will be detected by the disengagement of orange-yellow vapours.

a. Nitric acid should be as limpid as water and be kept in a dark place to prevent its conversion into the nitrous kind. It may be adulterated with sulphuric, or muriatic acid, either of which may be detected by the proper tests: see 40, and 108.

b. Concentrated nitric acid has a specific gravity of 1·500, but it is seldom found so heavy.

15. **ACID** *oxalic*, detects lime producing a white precipitate of oxalate of lime. See 35,44,72. See 35 for precautions in using the test of oxalic acid for lime. Many of the metals are acted on by this test; see table of re-agents. If nitrate of silver be dropped into a solution of oxalic acid, a white precipitate of oxalate of silver occurs, which being collected on a filter, dried, and heated, first becomes brown on the edges, then fulminates and is dispersed.

a. Oxalic acid oxidizes lead, copper, iron, tin, bismuth, nickel, cobalt, zinc and manganese. It also combines with alkalies, earths, and metallic oxides and forms salts known by the name of oxalates.

b. Oxalic acid is detected by muriate (or hydrochlorate) of lime, producing a white precipitate of oxalate of lime, soluble in nitric acid; which distinguishes it from sulphate of lime. On the other hand oxalate of lime is not soluble in a *small* quantity of muriatic acid, and this distinguishes it from the tartrate, citrate, carbonate and phosphate of lime. Sulphate of copper gives a faint bluish white or greenish white precipitate of oxalate of copper, not soluble in a small, but soluble in a large quantity of muriatic acid. Its insolubility upon adding a few drops only of muriatic acid distinguishes it from the carbonate and phosphate of copper. Nitrate of silver produces a detonating precipitate as before mentioned, which is a good distinctive test of oxalic acid. The citrate and tartrate of silver become brown and froth up, and the

former deflagrates on applying sufficient heat, but neither of them fulminates like the oxalate of silver.

16. ACID *prussic*; see 10.

17. ACID *phosphoric* is detected by proto-nitrate of mercury which produces a precipitate of phosphate of mercury; by acetate of lead which gives a white precipitate; and by nitrate of silver which yields a yellow precipitate. All these precipitates are soluble in nitric acid. No alkali, or alkaline earth should be present, see 83 *e*. The detection of phosphoric acid is frequently attended with difficulty.

a. Solutions of the neutral phosphates of alkalies produce precipitates with the muriates of barytes, and lime; and with lime water and barytes water. These precipitates are soluble in muriatic and nitric acids; and in solutions of ammoniacal salts.

18. ACID *sulphuric*, (see 116) detects (*a*). The acids in combination with salts; (*b*), barytes; (*c*), strontian; (*d*), lime; (*e*), lead; (*f*), mercury; (*g*), carbonic acid; (*h*) vegetable or carbonaceous matter.

a. The salt to be examined should be in the solid state or nearly so: it is to be pounded and covered with sulphuric acid, and heat is then to be employed. If the salt is a *nitrate*, the nitric acid will be evolved in white vapours without effervescence, and if copper filings be added, red vapours accompanied with effervescence will be disengaged. See 14. If the salt be a *muriate*, the muriatic acid will be driven off in white vapours, which will form a dense white cloud round a rod held in them, if it be first dipped in ammonia. See 11 *d*, 28 *b*. *Acetic acid* will be discovered by the vapours smelling like vinegar, see 1. *Fluoric acid* is driven off in poisonous fumes, which must not be inhaled, and which corrode glass if it be held in or over them for a few minutes, see 54. The whole of the foregoing indications may be confirmed by other tests.

b. Baryta detects and is detected by sulphuric acid either free, or in combination, as in the state of sulphates, by the production of a white precipitate, see 40, and 115 *e*.

c. Strontia is affected in the same manner as barytes, see 40, and 115.

d. Lime is detected by sulphuric acid, but the solution should be concentrated,—oxalate of ammonia is a better test for lime, see 35, 44, 72.

e. Lead gives a white precipitate of sulphate of lead, when tested with sulphuric acid, see 69.

f. Mercury also gives a white precipitate with sulphuric acid, which becomes yellow when boiled. But there are other more useful tests for mercury, see 82.

g. Carbonic acid is discovered by its effervescence on adding sulphuric acid, in the same manner as before mentioned under the head of muriatic acid.

h. When water containing vegetable or carbonaceous matter is evaporated after adding sulphuric acid, it acquires a distinct brown colour, which becomes deeper as the liquid becomes more concentrated.

19. **ACID** *tartaric* distinguishes potash from soda. The solution must be concentrated, and the tartaric acid be added in excess. With potash it produces a precipitate of bi-tartrate of potash, or cream of tartar; with soda it produces no precipitate.

a. To detect tartaric acid; add to a solution which must be concentrated an excess of lime water, and a precipitate will be formed which is soluble in a small quantity of ammonia:—*or add carbonate of potash which will precipitate tartrate of potash, or cream of tartar.*

20. **ACID** *uric*, see 13, *d* for its detection.

21. **ACIDS** *free, are detected by litmus or turmeric paper, or by tinctures or solutions of litmus and turmeric;* but the litmus test is not universally distinctive, see 77. Acids in combination with salts and other bases, are discovered by a variety of tests, see all the foregoing articles.

22. **ALBUMEN** is detected by the per-muriate of mercury, see 53. It is also indicated by the muriates of gold, and tin; by sub-acetate of lead, and nitrate of silver; but these tests are not decisive, as they are affected by other substances, see 87. When a liquid containing albumen is submitted to galvanism (which is considered a most delicate test) it coagulates on the wire connected with the positive pole of the battery, and pure soda is found at the negative wire.

a. The precipitate by the per-chloride of mercury is soluble in acetic acid, and is not altered by boiling. Sulphate of copper added to the solution produces a green, and chloride of iron, a yellowish-brown precipitate.

b. An excess of sulphate of copper completely precipitates albumen of a green colour, which is dissolved by an excess of albumen. Ammonia dissolves this precipitate forming a dark blue solution. Potash produces a violet solution. A solution of carbonate of soda dissolves it completely, occasioning a violet colour. Potash throws down the copper, but in the filtered liquor, no sulphuric acid can be detected. The

precipitate consists of albumen and protoxide of copper; the per centage of the oxide being about 1·65.

c. Albumen is not precipitated by phosphoric nor by acetic acid.

d. If water containing $\frac{1}{1000}$ *of its weight of albumen be boiled, it will be rendered perceptibly opaque.* This is a distinguishing characteristic, and sufficiently delicate for practical purposes.

e. Ferrocyanate of potash is a delicate test also, but a slight excess of acetic acid should be previously added.

23. ALCOHOL is useful in analysis, and for making tinctures. Its strength is known by its specific gravity, which in the strongest is about 0.800. It detects the adulteration of volatile or essential oils with fixed oils, thus; mix a few drops of oil of almonds, or of olives, with any essential oil, say oil of lavender, and pour alcohol on the mixture; the essential oil will dissolve in the spirit, but the fixed oil will not. Pour off the alcholic solution, and add thereto distilled water; the water will unite with the alcohol, and set the essential oil at liberty, which may be thus obtained pure and freed from the adulterated oil. See 73 regarding the action of alcohol with acids, and æthers.

a. Alcohol dissolves soap, vegetable extract, sugar, oxalic, camphoric, tartaric, gallic and benzoic acids, volatile oils, resins, balsams; fixed oils it dissolves but sparingly except castor oil which it dissolves in considerable quantity. It combines with sulphur, phosphorous, and the pure alkalies, but not with their carbonates, nor when pure with any of the earths. Some salts in solution particularly sulphates are precipitated on the addition of alcohol; by this means salts insoluble in alcohol are sometimes separated in chemical analysis.

b. When alcohol is set on fire, mingled with boracic acid, the flame is green; with nitre, common salt, and the salts of barytes the flame is yellow: with strontia, rose-red; with salts of copper, a greenish hue; and a red colour with the salts of lime and lithia.

24. ALKALIES *and their carbonates,* may be *detected by litmus paper,* see 78. Potash is distinguished from soda by the tests, Nos. 19.97.110. Alkalies and their carbonates act on almost all the metals, so that they are not discriminative tests, but are useful auxiliaries. See table of re-agents.

25. ALUMINA, *muriate of,* detects carbonate of magnesia in solution. If an alkali be present it must first be neutralized.

26. ALUMINA if pure is white, but is often yellowish and horny when obtained by gently drying the hydrate of alumina. It is insoluble in water, but soluble in acids if it has not been ignited. After ignition it is best dissolved by digestion in concentrated muriatic acid, diluted

with a very small proportion of water—no free acid produces a precipitate in aluminous salts.

Potash produces in neutral solutions a bulky precipitate of the hydrate of alumina soluble in excess of the potash. Muriate of ammonia (if the precipitate be re-dissolved by the potash) produces in such solution a precipitate of alumina.

Ammonia gives a voluminous precipitate insoluble in an excess of the ammonia. The presence of muriate of ammonia does not prevent the production of this precipitate, (see 34) nor yet of the precipitates by the following re-agents, on which account salts of alumina cannot be mistaken for those of magnesia.

Carbonate of potash....
Carbonate of ammonia
Phosphate of soda....
} A voluminous precipitate soluble in acids, and in a solution of potash.

Oxalic acid, neutral oxalates, prussiate of potash, tartaric acid, liquid sulphuretted hydrogen, and *sulphuretted hydrogen gas* produce no precipitates.

Hydrosulphuret of ammonia produces a precipitate of pure alumina and so does muriate of ammonia, see 34 and 36.

a. Aluminous minerals before the blow-pipe on charcoal produce a blue flame if moistened with nitrate of cobalt.

b. Salts of alumina are distinguished by a sweet astringent taste. They are not precipitated by oxalate of ammonia, nor tartaric acid, which distinguishes them from salts of yttria; nor by tincture of galls, or prussiate of potash, in which they differ from the salts of yttria and of glucina. If sulphuric acid, and then sulphate of potash be dropped into a solution of alumina, or its salts, and the liquid be allowed to repose, crystals of alum soon make their appearance.

c. Solutions of alumina are distinguished from those of alkaline salts by producing a white precipitate with ammonia: from solutions, of barytes, stronia, and lime by a white precipitate with ammonia, and no precipitate with sulphuric acid which produces a precipitate in those earths except in the case of dilute solutions of lime. Alumina is distinguished from magnesia in solution by its behaviour with potash, and muriate of ammonia. In neutral aluminous solutions, potash produces a bulky precipitate, which wholly re-dissolves in an excess of potash; and in such a solution of alumina in potash, muriate of ammonia produces a precipitate of alumina. Distinguished from glucina, see 57, *a.*

d. The hydrate requires very careful washing and long continued heat in drying for quantitative analysis.

27. AMMONIA, detects copper, turning the solution blue. Ammonia acts on a great number of the metals. See table of re-agents. *It is detected by muriatic acid,* see 11, *d.* Pure liquid ammonia is liable to attract carbonic acid from the atmosphere, bnt this acid may be detected by baryta, see 40, or lime water, see 75.

a. Ammonia is acted on by a spirituous solution of chloride of platinum, and by sulphate of alumina in the same manner as potash is, namely, the former produces a bright yellow precipitate, and the latter produces crystals of alum, if the solution be acid, and concentrated. Tartaric acid produces in concentrated solutions of ammonia a crystalline precipitate of bitartrate of ammonia. Hydrofluosilicic acid precipitates its own silica in solutions of ammonia, but it must not be added to saturation, the ammonia must be in excess, otherwise no precipitate is produced.

b. When dry ammoniacal salts or concentrated solutions of them; and caustic or carbonated alkalies, or earths are triturated together, an immediate odour of ammonia escapes; and the presence of ammonia is infallibly detected by presenting to the mass, or the liquid, a rod dipped in rather strong, but not fuming muriatic acid.

c. It is of the greatest importance to be aware of the remarkable property possessed by ammonia of forming triple salts with earths and metallic oxides, as is the case when the sulphates of magnesia, lime, and iron, occur together.

d. If a mineral water contain free carbonic acid, or carbonate of magnesia, and carbonate of lime, the addition of ammonia will take up part of the carbonic acid, and the carbonate of ammonia thus formed will throw down carbonate of lime.

e. Liquid ammonia dissolves several of the metallic oxides, and with some of them forms crystallizable compounds. It dissolves the oxides of silver, copper, zinc, arsenic, antimony and tellurium: the protoxides of iron, cobalt, and nickel; and the peroxides of tin, mercury, gold, and palladium. These compounds are all decomposed by heat. The compounds of ammonia with the oxides of gold, silver, and platinum detonate when heated, and the oxide and ammonia are both decomposed.

28. AMMONIA, *salts of,* are detected, (*a*) by corrosive sublimate; (*b*), by heat; (*c*), by caustic potash, and some other tests.

a. To a neutral solution of an ammoniacal salt, add a drop of any alkali; the solution of corrosive sublimate or perchloride of mercury then added, becomes a delicate test for ammonia by producing a white precipitate.

b. Heat liberates the ammonia in an ammoniacal salt, and the ammo-

nia may be detected by holding a rod dipped in muriatic acid in the vapour. See 11, *d.* and 27 *b.*

c. ***Caustic potash produces, when added to an ammoniacal salt, the odour of ammonia.*** This distinguishes these salts from other alkaline salts. See 27, *b.* Chloride of platinum detects salts of ammonia by a yellow precipitate of very small crystals, but as it acts also on salts of potash, the one may be mistaken for the other, if the chloride of platinum test, only, be employed. Ammoniacal salts are not precipitated by infusion of nut galls, nor by prussiate of potash.

d. If to an ammoniacal salt dissolved in water a little of any salt containing magnesia be added, and afterwards phosphate of soda be dropped in, a copious white precipitate falls.

29. **AMMONIA,** *benzoate of,* is an excellent test for separating iron from manganese when together in one solution, which should be accurately rendered neutral. It also liberates iron from all earthy salts, and from nickel, cobalt, zinc and some other metals.

30. **AMMONIA,** *carbonate of,* detects copper, turning the solution blue, when neutral. This test acts, generally speaking, like ammonia. See table of re-agents. Carbonate of ammonia in its solid state should be entirely volatilized by heat. It may contain impurities, and may be examined in the same manner if used as a test as carbonate of potash, see 98, *d.*

31. **AMMONIA,** *fluate of,* detects lime, but the oxalate of ammonia is a more common test, though Dr. Henry says, he finds the fluate of ammonia to be the most delicate.

32. **AMMONIA,** *ferrocyanate of,* this test is of use only in the analysis of saline substances. It may happen, for example, that a fluid contains neutral salts with alkaline bases, together with metallic salts. In this case ferrocyanate of potash cannot be well applied to separate the metallic salts, because it then would be difficult to ascertain whether the alkaline salts were originally present in the solution or not; but if ferrocyanate of ammonia be employed, no ambiguity can result; for the metallic salts need only be precipitated by this test, and the earths by bicarbonate of ammonia, in a temperature of 180°, or upwards, in order to ensure the decomposition of magnesian salts, which this carbonate does not effect in the cold. The liquor may then be separated by filtration, and boiled to dryness, and the dry mass exposed to such a heat as is sufficient to expel the ammoniacal salts. This application of heat will

drive off, also, any excess of the ammoniacal carbonate, which might have retained in solution, either yttria, glucina, or zirconia. The alkaline salts may be separated from these earths, by boiling the mixture in water, and filtering and evaporating it. The salts, with bases of fixed alkalies, will remain unvolatilized. By this process, indeed, it will be impossible to ascertain whether ammoniacal salts were originally present; but this may be easily learned, by adding to the salt under examination, before its solution in water, potash; which, if ammonia be contained in the salt, will produce the peculiar smell of that alkali.

33. AMMONIA, *hydro-sulphuret of.* This test acts on a great number of the metals. See the tables of re-agents.

34. AMMONIA, *hydro-chlorate, or muriate of, or sal-ammoniac,* detects platinum, producing a bright yellow precipitate, if the platinum be pure. If a solution contain both gold and platinum, the gold may be precipitated by green sulphate of iron, see 67, and the platinum by muriate of ammonia. This test separates alumina from its alkaline solutions; the alkali combines with the muriatic acid, and the liberated ammonia determines the precipitation of the alumina, which after being washed and dried, is perfectly pure.

a. Muriate of ammonia dissolves more or less of all the earthy carbonates when both are together in solution. See pages 95, 178 and 333, of the London and Edinburgh Journal of Science, A. D. 1837, for its action on metals.

b. Sulphate of lead is completely decomposed by a solution of muriate of ammonia; which also acts upon silver with the assistance of air and dissolves it. Muriate of silver is partially dissolved by a concentrated solution of muriate of ammonia, and is still further acted on if boiled.

c. Sal-ammoniac or muriate of ammonia used as a test, ought to be entirely volatilized by a low heat, when laid on a heated iron; if sulphate of ammonia be also present in it, it may be detected by baryta, see 40.

35 AMMONIA, *oxalate of,* is a capital test for detecting lime which it is said to indicate, if lime be diluted to the extent of 24,000 times its weight in water. It also occasions a cloudiness with magnesia, but the magnesia does not precipitate till it has stood for several hours. In using this test or oxalic acid, if a mineral acid be present, it must be neutra-

lized; if baryta or strontia be present, they must both be removed previously by sulphuric acid. The following numbers should also be referred to, as sulphuric acid acts on solutions of lime, as well as on baryta and strontia; 18, *b*, *c*, *d*: 40: 44: 72: 115. The presence of other earths in solution along with lime impedes decomposition by oxalic acid, and the oxalates. Thus a watery solution of sulphate of magnesia and sulphate of lime is not precipitated by these tests.

36. **AMMONIA**, *succinate of*, acts like the succinate of soda, which detects the peroxide, but not the protoxide of iron, occasioning a brown precipitate. It precipitates also alumina, if the solution be not too acid. Succinate of ammonia throws down glucina, zirconia and baryta. See 115 c. Both the succinates are useful in separating peroxide of iron from the oxide of manganese; the iron however re-dissolves in an excess of the precipitant.

37. **ANIMAL MATTER** is detected by nitric acid, which occasions it, with cold digestion, to give off nitrogen. Animal matter is thus distinguished from vegetable matter.

38. **ANTIMONY**; *solutions of the protoxide of antimony which are usually of a brownish yellow colour, are best and most readily known by their action with hydrosulphuret of ammonia, which produces a red precipitate, completely soluble in an excess of the precipitant; and by liquid sulphuretted hydrogen, or sulphuretted hydrogen gas, either of which occasions both in acid and neutral solutions, a red precipitate.* If there should be at first merely a red colour in neutral solutions the precipitate is immediately produced by adding muriatic acid, or by heating the solution.

a. Metallic zinc precipitates antimony in a black metallic powder. Tin also precipitates it.

b. Before the blow-pipe with soda, the salts of antimony are reduced in the inner flame, and the bead of metallic antimony remains long in the melted state after being removed from the flame, and gives off a thick white smoke. Afterwards the bead is covered with a net work of crystals of protoxide of antimony.

c. Potash, ammonia, carbonate and bicarbonate of potash, carbonate of soda, phosphate of soda, oxalic acid, gallic acid, prussiate of potass, all produce a white precipitate insoluble in excess of the precipitant. Water produces a white precipitate which is a disalt.

d. Neither nitric, sulphuric, phosphoric, nor carbonic acid forms

salts with protoxide of antimony, at least we are not acquainted at present with any such combinations.

39. ARSENIC is detected (*a*),by nitrate of silver;(*b*),sulphate of copper; (*c*), sulphuretted hydrogen; (*d*), soda; (*e*), iron. It is also precipitated by salts of lead and by lime water; the precipitates being white.

a. By nitrate of silver, which gives a yellow precipitate in arsenites, and a brown precipitate in arseniates, but the solution ought to be slightly alkaline. This test however must not by itself be considered decisive, as it is acted on by many other substances.

b. By sulphate of copper or by acetate of copper, both of which give green precipitates, but in this case a little carbonated alkali must be present in solution.

c. By sulphuretted hydrogen, which produces a bright yellow colour in acidulated solutions of arsenic, but a precipitate does not form till after long standing.

d. By soda. If arsenic mixed with a little soda be submitted to the action of the blow-pipe, a smell of garlic occurs.

e. The red-acetate of iron detects arsenic by forming a bright yellow deposit. Pure hydrate of iron recently made and suspended in water, completely precipitates arsenious acid.

f. Note. There is much difficulty in detecting small quantities of arsenic, and much caution is required lest false conclusions should be formed; especially in investigations connected with cases of poisoning. The garlic like smell by heat is a good criterion, and still better if confirmed in the following manner. Mix the substance supposed to contain arsenic with fresh made charcoal, or with black flux, in a small glass tube; submit it to heat, and if arsenic be present it will sublime to the upper part of the tube, where it will be deposited and may be recognized by its steel coloured lustre. The open end of the tube must be loosely stopped with a piece of cotton, or other porous substitute, see 2, *a*: and the remainder of this article.

g. The following method for detecting arsenic has been published by professor O'Shaughnessy at Calcutta. See Journal of the Asiatic Society of Bengal, February 1839. Also Jameson's Journal No. 42, or the Arcana of Science for 1837.

h. The beautiful process invented by Mr. Marsh of Woolwich, for the detection of minute quantities of arsenical poison consists in placing

the suspected substance in very dilute sulphuric acid, and introducing a slip of pure zinc. The hydrogen is evolved in combination with the metallic arsenic, and on examination presents most distinct and remarkable phenomena. If ignited, the flame is of a leaden blue colour, and diffuses a powerful smell of garlic and a dense white smoke. If the flame be reduced to the size of a pea and applied to the interior of a thin glass tube, a crust of metallic arsenic is formed in the tube, surrounded by a white ring of arsenious acid. To this, by a little dexterous management, the several tests may be applied, namely the ammoniacal nitrates of silver and copper, and the sulphuretted hydrogen gas. But this process is not entirely distinctive of *all* the arsenical poisons; and tartarized antimony gives almost the same indications upon testing, as the arsenical solutions.

k. Dr. O'Shaughnessy examined the contents of the stomach of a young woman who had been poisoned with crystallized yellow orpiment, (sulphuret of arsenic) but the yellow powder which was separated from the contents of the stomach when treated by the above process gave no indication whatever of the presence of arsenic. He then converted the sulphuret into an oxide, namely, by boiling the yellow matter with a few drops of nitric acid, and after the sulphuret was thus converted into arsenious acid, the process, when applied gave its proper indications. In examinations by this process the Professor therefore recommends that the insoluble contents of the stomach or a part of these contents in cases of poisoning, should be boiled in a capsule of glass or porcelain with small quantities of nitric acid until red fumes are no longer given off. The mass should then be diluted with water, neutralized with carbonate of potash or soda, and lastly examined by Marsh's process.

m. With respect to the indications of tartarized antimony, or tartar emetic, Dr. O'Shaughnessy suggests that the encrusted tube when cold should be moistened with a solution of nitrate of silver in distilled water, and then be held over the mouth of a bottle containing strong ammonia, so that the vapour may traverse the tube. If the crust be arsenical it instantly assumes a vivid canary colour, owing to the formation of arsenite of silver; but no such effect is produced by antimonial compounds. This test therefore affords a simple and conclusive check on Marsh's process.

n. Note.—The zinc of commerce often contains arsenic: the zinc used should therefore be tested; and the same zinc should not be twice used for the same purpose.

39½. **BARYTES** or *Baryta*, when pure is of a greyish white colour, and very friable. It slakes like lime, falling into a powder with heat

when a little water is poured upon it. Solution of barytes in water has a caustic taste; and turns reddened litmus paper blue. Pure barytes does not fuse at a red heat. The following tests discover barytes, as well as its salts, see also 36.

Sulphuric acid produces	A white precipitate in very dilute solutions; it is not soluble in acids.
Hydrofluosilicic acid	After some time a crystalline precipitate which is almost insoluble in free muriatic or nitric acid.
Pure caustic potash	A voluminous precipitate which almost disappears on adding a quantity of water.
Caustic ammonia	No precipitate.
Carbonate of potash *Carbonate of ammonia* *Neutral phosphate of soda*	A white precipitate soluble in nitric or muriatic acid.
Oxalic acid *Binoxalate of potash*	No precipitate. But if the solution be strong and ammonia be added, a precipitate occurs.
Hydrosulphuret of ammonia *Prussiate of potash* *Red prussiate of potash*	No precipitate.

a. To detect the presence of barytes in sulphate of barytes, a portion is boiled in a solution of carbonate of potash or soda and filtered. The insoluble remainder is treated with muriatic acid, the solution is filtered, and then tested with dilute sulphuric acid which produces a precipitate. The sulphate of strontian is insoluble in acids. The muriatic solution, supposing both baryta and strontian to be present may also be diluted with water, filtered, and hydrofluosilicic acid be added: the barytes will be precipitated as shewn above; but the strontian will not be affected. By this test sulphate of barytes may be discriminated from sulphate of strontian, see 40 *d*, 115 *b*, *d*, *e*.

b. Baryta is precipitated white by phosphates and oxalates (see the test, oxalic acid in this article); pale lemon yellow by chromates, and white by carbonates, see 40 *h*.

c. Barytes, strontites, lime, and magnesia are found always combined with acids, which are generally the carbonic, sulphuric, fluoric, boracic and phosphoric.

40. BARYTA, *solution of; and the acetate; muriate; and nitrate of barytes.* These four tests act alike namely detecting sulphuric acid, either free or in combination; and also carbonic acid. They produce a white precipitate in either case; but the sulphuric precipitate is inso-

luble while the carbonic precipitate is soluble in *weak* muriatic, or nitric acid. Suppose sulphate of potash and carbonate of potash to exist together in solution; on adding any one of the baryta tests, a white precipitate will fall of sulphate, and carbonate of barytes mingled together. They may be separated and their weights ascertained thus. Wash the precipitate with pure water, dry, and weigh it. Then add dilute muriatic or nitric acid, and the carbonate of barytes will dissolve with effervescence; the sulphate will remain untouched. The sulphate washed, and dried, will give its own weight, and the difference between the weight of the sulphate, and the original weight, will be the weight of the carbonate.

a. Solution of barytes, or barytic water is made by dissolving pure baryta in distilled water. It may be employed to separate baryta from strontia in a neutral solution; the baryta having a stronger affinity for acids will be taken up, and the strontia will be precipitated. As barytic water soon spoils, it should be used fresh.

b. Baryta and its combinations are poisonous. A considerable number of its salts are insoluble in water.

c. Baryta in solution is distinguished from the alkalies by its producing a white precipitate with carbonated alkalies, and with dilute sulphuric acid.

d. To distinguish barytes from strontia, dip a piece of paper in the solution. Barytes burns yellow; strontia red, see 115 *c.* To distinguish barytes from lime, see 44, 72 *d*, and 79 *d.*

e. Baryta, acting on carbonic acid, is of course equally acted on and decomposed by the carbonated alkalies: but in this case their precipitate as before shown in this article is soluble with effervescence by dilute acid, either nitric or muriatic. Both the nitrate and muriate of baryta are soluble in water, the sulphate is not.

f. It has been remarked by Berzelius, that when sulphuric acid is precipitated from some of the weaker bases by a barytic salt, the precipitated sulphate of baryta is combined with a portion of those bases. Thus when sulphate of iron or copper is decomposed by muriate of baryta, the sulphate of baryta, when dried and calcined, assumes a reddish colour in the first case, or a yellowish green in the second. In order, therefore, to determine with precision the quantity of sulphuric acid, it is necessary to remove the excess of oxide by some acid in which it is soluble.

g. By the cautious addition of acetate of baryta, as long as it occasions any precipitate, all the sulphates existing in any solution are decomposed, and their bases are obtained united with acetic acid. By evaporating the liquid to dryness, and calcining the residuum, the ace-

tic acid is destroyed, and the bases of these salts may be obtained separate, or combined only with carbonic acid, and in this state may be recognised by properties which are more characteristic than those belonging to them in a state of more energetic combination. In this way the alkaline bases may be obtained separately from the earthy ones; for the addition of water to the incinerated mass takes up the former, and leaves the latter.

h. Phosphoric and oxalic salts occasion a precipitate also, with barytic solutions, which is soluble in dilute muriatic and nitric acids without effervescence. See the last article *b*.

41. BISMUTH, *the salts of bismuth may be recognized by water precipitating them;* by the precipitate becoming black by sulphuretted hydrogen, and by a black precipitate with hydrosulphuret of ammonia. *Before the blow-pipe they fuse easily into a brittle button, which flies to pieces under the hammer; the charcoal becoming coated with a yellow powder.* They are distinguished from lead by giving no precipitates with sulphuric acid; and by the brittleness of the fused globules from the blow-pipe.

a. Carbonate of baryta perfectly separates the oxide of bismuth in cold solutions from peroxide of copper, and from lead, manganese, and nickel. The carbonates of lime and magnesia also precipitate bismuth whether in hot or cold solutions. See 69, *c*.

b. The following tests tend further to discriminate bismuth.

Potash, ammonia, carbonate of potash, and carbonate of ammonia— produce white precipitates insoluble in an excess of the precipitant.

Phosphate of soda, a white precipitate.

Oxalic acid: no immediate precipitate but after some time a crystalline precipitate is perceptible.

Prussiate of potash; white precipitate insoluble in muriatic acid.

Red prussiate of potash; pale yellow precipitate soluble in muriatic acid.

Hydrosulphuret of ammonia; liquid sulphuretted hydrogen, and sulphuretted hydrogen gas in a current, produce a black precipitate; but if the bismuth be in small quantity a dark brown precipitate.

Metallic zinc. A black spongy precipitate.

c. Solutions of the salts of oxide of bismuth redden litmus paper.

42. BRAZILWOOD PAPER. See litmus 77, which may be used as a substitute.

43. CADMIUM. Solutions of cadmium are recognized by their giving yellow precipitates with liquid sulphuretted hydrogen, or with a current of hydrogen gas. This precipitate resembles orpiment, but it may be distinguished by the facility with which it dissolves in muriatic acid and by its bearing a red heat without being altered. Before the blow pipe, with soda, the salts of cadmium coat the charcoal with a brownish red or orange coloured powder.

a. A considerable number of the salts of cadmium are soluble in water, and the solutions are colourless, or have a slight yellow tinge. The insoluble salts are white powders, and dissolve in acids.

b. The pure oxide of cadmium gives a reddish brown powder. The hydrated oxide is white. The oxide is soluble in ammonia and easily dissolves in acids, and acts towards re-agents as follows.

c. Potash, carbonate of potash, and carbonate of ammonia produce a white precipitate, and hydrosulphuret of ammonia, in neutral solutions, a yellow precipitate; all of which precipitates are insoluble in an excess of the precipitant. Henry says, the fixed alkalies throw down a white hydrated oxide soluble in ammonia. Prussiate of potash and oxalate of ammonia cause a white sediment.

d. Ammonia produces in neutral solutions a white precipitate, easily soluble in an excess of ammonia; oxalic acid does the same.

e. Solutions of the neutral cadmium salts redden litmus paper.

f. A plate of zinc immersed in a solution of cadmium precipitates it in dendritical leaves; or according to others in grey coloured spangles.

g. Cadmium resembles tin very nearly, in colour, lustre, and the sound it emits when bent. It melts below a red-heat, and volatilizes at a heat not much greater than that which volatilizes mercury; it condenses in drops.

44. CALCIUM, *lime is detected by oxalate of ammonia, oxalic acid, or bin-oxalate of potash, all of which produce a white precipitate of oxalate of lime which is soluble in nitric acid;—the precipitation is assisted by the addition of ammonia to neutralize any free acid.* See 15,35,72. Sulphuric acid, and the carbonated alkalies, and phosphate of soda, also detect lime, but not so satisfactorily as oxalic acid, or the oxalates.

a. Calcareous salts are, in concentrated solutions, distinguished from alkaline salts by giving a white precipitate with carbonate of potash; or dilute sulphuric acid. Lime is distinguished from barytes by its giving no precipitate with hydrofluosilicic acid. See 40, 72 *b*; 79 *d*.

b. A concentrated solution of lime is acted on as follows by the undermentioned tests.

Carbonate of potash; or potash. Dense white flocculent precipitate.

Sulphuric acid. Dense white powdery precipitate.

Oxalic acid. Dense white cloud which precipitates more slowly than the others.

c. Hydrochlorate of lime in crystals deliquesces, hydrochlorate of baryta does not. The crystals of the latter are four sided tables, the crystals of hydrochlorate of strontian are delicate six sided prisms. These characteristics may assist in distinguishing barytes, lime, and strontia, from one another: see 72 *e*, and 79 *d*.

45. CARBONATE *of lime* and some other carbonates, are useful in analysis to separate different substances, see 65 *c*, *d*; 69 *c*.

☞. Carbonates are sometimes not acted on by acids when in combination with alcohol and æther, see 73.

46. CERIUM gives with the following tests the indications specified opposite to each.

Potash	A white voluminous precipitate; insoluble in excess of the precipitant.
Ammonia	The same; gelatinous. Insoluble in an excess of ammonia.
Carbonate of potash *Carbonate of ammonia*	The same; soluble in excess of precipitant, but precipitated if boiled.
Phosphate of soda	White precipitate in neutral solutions, soluble in nitric and muriatic acid.
Oxalic acid	White curdy, do. do. do.
Sulphate of potash	Crystalline precipitate, if the solution be not too dilute.
Prussiate of potash	White chalky precipitate.
drosulphuret of ammonia	Do. of protoxide of cerium.
Sulphuretted hydrogen gas *Gallic acid*	No precipitate.

Pure hydrate of cerium is white, becoming yellowish by exposure to the air. The neutral salts redden litmus paper.

a. The detection of protoxide of cerium in the compounds of protoxide of cerium which are insoluble in water is attended with some difficulty. The best way is to dissolve such a compound in an acid and to place a crust of crystals of sulphate of potash in the solution, which will produce the double sulphate of protoxide of cerium and potash,

which is insoluble in a solution of sulphate of potash, and sparingly soluble in water.

b. A mixture of cerium and iron may be separated, by boiling in oxalic acid; the iron dissolves and the cerium is left in the state of a white powder decomposable by heat, see 65 *d.*

c. Solutions of protoxide of cerium are distinguished from those of alkalies, barytes, strontian, lime and magnesia, in the same manner as solutions of alumina are distinguished from those substances, see 26 *e.* From alumina and glucina, the protoxide of cerium is distinguished by its insolubility in an excess of potash; from thorina, by its relation to heat. The latter does not become red when ignited, neither does it give a coloured bead when fused with borax, or microcosmic salt, before the blow-pipe. When this proof is made, the substance must of course have been freed from iron. Protoxide of cerium is distinguished from yttria in the same manner as from thorina, and also by its behaviour towards a solution of sulphate of potash.

47. CHLORINE, *Muriates* or *chlorides are detected by nitrate of silver which produces a white precipitate of muriate, or chloride of silver insoluble in nitric acid, but soluble in ammonia, and blackening in the light, or more quickly in the sun,* see 108. Solutions of lead and mercury also detect muriatic salts, but pure chlorates are not affected by these tests. See 70 *b,* and 83 *b.*

a. The precipitate by nitrate of silver is not decomposed at a red heat: but it melts, and upon cooling forms a crystalline, sometimes translucent mass, which cuts somewhat like horn, from which it has been called horn-silver: it is the lunar caustic of the apothecary, which is soluble in water, and is then a proper test for muriatic acid.

48. CHROMIUM, or chromic acid, is detected by proto-nitrate of mercury which forms a red precipitate becoming green when strongly heated: also by hydro-sulphuret of ammonia, and prussiate of potass, both of which produce green precipitates. Rose says, prussiate of potass produces no precipitate. Nitrate of silver produces a carmine colour changing to purple, and nitrate of copper a chestnut red. See the tables of re-agents.

a. The salts of chromic acid are precipitated by salts of lead of a yellow colour: by salts of silver of a reddish brown; by protoxide salts of mercury of an orange colour, and this precipitate heated leaves protoxide of chromium. Salts of baryta produce a lemon-yellow precipitate. When mixed with a little alcohol and nitric acid, chromic acid,

immediately assumes a bluish-green colour which preserves the same shade even after dessication.

b. Solutions of chromium are distinguished by their green colour, which undergoes no alteration on being treated with sulphuretted hydrogen. Chromium gives an emerald green before the blow-pipe, and imparts a beautiful green colour to the fluxes. This colour is discriminative; it occurs both in the inner and outer flame, and distinguishes chromium from copper, which produces a green bead only in the outer flame.

49. COBALT. Pure oxide of cobalt has a greenish grey colour; *and both it and cobalt salts are easily detected before the blow-pipe by producing an intensely blue glass when mixed with 20 times its weight of borax.* It may also be known by its solution in acid being of a violet red, or rose colour; by alkalies producing a precipitate of violet blue, and by alkaline hydro-sulphurets giving a black precipitate. Carbonate of potash produces in cobalt solutions, a red precipitate, which, upon being boiled becomes blue. See table of re-agents.

a. The following tests act on cobalt, and produce the colours specified.

Potash. Blue; after repose green: if boiled dirty pale red.

Ammonia. Blue; more ammonia turns the precipitate green, and still larger quantity dissolves the precipitate and forms a green solution.

Carbonate of potash. Red; if boiled blue.

Carbonate of ammonia. In neutral solutions, red; soluble in muriate of ammonia.

Phosphate of soda. In neutral solutions, blue.

Prussiate of potash. Green turning grey.

Hydrosulphuret of ammonia. In neutral solutions, black.

b. Solutions of cobalt-salts are particularly distinguished from zinc, manganese, zirconia, cerium, yttria, thorina, glucina, alumina, and the earths and alkalies, by producing a black precipitate with hydrosulphuret of ammonia. This precipitate is hydrosulphuret of cobalt.

c. An impure oxide of cobalt fused with a mixture of sand and potassa, produces a blue glass, which, reduced to powder, is known in commerce by the name of smalt.

d. Neither cobalt nor nickel is precipitated by the carbonate of lime or of magnesia.

50. COLUMBIUM. There is great difficulty in separating columbium from other substances. The infusion of galls produces in solutions of columbium an orange precipitate, and the recently prepared oxide of the metal is soluble in citric, tartaric, or oxalic acid. The columbate of potash is crystallizable, and the oxide of the metal is immediately precipitated on the addition of an acid.

51. COPPER in solution, is detected by ammonia which in small quantity turns it first green, then blue; but if iron be also in solution, it ought first to be removed. Clean iron free from rust precipitates metallic copper, and this distinguishes copper from nickel, for ammonia turns nickel also blue. Metallic zinc causes a black precipitate. *The ammonia and iron conjointly are decisive tests.*

Potash produces a voluminous blue precipitate (hydrated oxide) which when boiled with an excess of potash turns black and quickly subsides. If the potash is insufficient, a light green precipitate occurs.

Ammonia, in small quantity occasions a green precipitate which easily dissolves in more ammonia and produces a blue solution. If this solution be boiled with caustic potash a dense black precipitate is formed.

Carbonate of potash. A blue precipitate, rendered black by boiling.

Carbonate of ammonia. Same as ammonia.

Phosphate of soda. A greenish white precipitate soluble in ammonia and if potash be added, a dense black precipitate takes place on boiling.

Oxalic acid. A greenish white precipitate.

Prussiate of potash. A reddish brown precipitate insoluble in muriatic acid. This and clean iron are trust-worthy tests, but the solution should be either neutral or slightly acid, and not alkaline.

Red prussiate of potash, a yellow green precipitate insoluble in muriatic acid.

Hydrosulphuret of ammonia, liquid sulphuretted hydrogen, and a current of sulphuretted hydrogen gas, give black or dark brown precipitates according to the quantity of copper in solution.

Metallic zinc or tin precipitates copper black.

Metallic iron, pure copper.

a. Persalts of copper turn blue with ammonia; blue with potassa; reddish brown with prussiate of potassa, and black with hydrosulphuret of ammonia. By these indications copper may be distinguished from other metals and from nickel, as before stated, as well as also by its action with solution of potassa, and sulphuretted hydrogen: the first of

which turns nickel apple green, but copper blue; and the second produces no immediate precipitate with nickel, but with copper it does. The hydrated blue oxide of copper is converted to black by boiling.

b. The greater number of the salts of copper are soluble in water, and speedily acquire a blue or green colour on exposure to the air. The salts of sub-oxide of copper are never blue or green, but white, red, brown or black.

c. The deutoxide of copper is black: it fuses on exposure to a very strong heat. It readily dissolves in acids. The solution has generally a blue colour. The muriate solution is of an emerald green colour.

d. The solutions of neutral salts of deutoxide of copper redden litmus paper.

e. Before the blow-pipe with soda on charcoal the salts of copper are reduced to a metallic globule. With borax they give a dark green in the exterior, and a reddish brown colour in the interior flame.

f. Copper in solution may be decisively distinguished by the joint action of ammonia and clean iron. Clean iron dipped into and remaining a few minutes even in a weak solution of copper, becomes coated with it.

g. Persalts of copper have a blue or green colour, prosalts are colourless, but absorb oxygen rapidly and become blue.

52. COPPER, *metallic* detects and precipitates silver in solution. The solution should be somewhat acid in order to precipitate the silver completely.

a. The following analysis may be introduced here to point out the method of separating copper, from nickel and zinc. See also 41, *a.*

b. 24½ grains of copper, 12 grains of zinc, and 20 grains of oxide of nickel were dissolved in nitromuriatic acid. The solution, strongly acidified with muriatic acid, was diluted with about a pint of water; a current of sulphuretted hydrogen gas was then passed through the solution until all the copper was precipitated; the bisulphuret of copper thus formed, having been well washed, was acted on by nitric acid, which dissolved the copper and left some sulphur; after the separation of the latter, the solution of copper was boiled with caustic soda to precipitate the peroxide, which after ignition weighed 30.4 grains which is equal to 24.3 grains of copper. The solution containing the zinc and nickel was carefully evaporated to dryness to expel the excess of acid, and the residue dissolved in water acidulated with one fluid ounce of strong acetic acid S. G. 1.069 and warmed to assist the action. When this was effected, the solution was diluted to about a pint, and a stream of sulphuretted hydrogen was passed through it until the gas was in excess. A dingy white precipitate of sulphuret of zinc fell which weighed 18 grains, equal to 12 grains of metallic zinc. The

remaining solution containing the nickel, after being heated to expel the sulphuretted hydrogen was decomposed by caustic soda; this gave hydrate of nickel, which, when reduced to protoxide by strong ignition, weighed 20.1 grains. In this experiment there was a loss of 0.2 grains of copper, and a surplus of 0.1 grain of oxide of nickel; errors so small that they are evidently those of manipulation. London and Edinburgh Journal, vol. 8, page 81, 1836.

c.—*Nitrate* of copper is reduced by zinc, lead, cadmium, and tin: cobalt acts very slowly, and bismuth but imperfectly even when the solution is hot. The reduced copper appears with metallic lustre only upon cobalt, lead, and clean iron, with other metals it forms a brown, or black alloy. *Chloride* or *muriate* of copper is easily decomposed by iron, tin, zinc, cadmium, and cobalt, and slowly by lead if the solution be not acid. The *ammoniacal* solution of copper is reduced only by zinc, iron, and cadmium, not by tin, lead, or cobalt. Zinc is by far the most effectual precipitant of copper.

53. CORROSIVE SUBLIMATE called also *per-muriate; oxymuriate; bichloride, and perchloride of mercury* detects albumen and ammonia; heat must be employed to separate the whole of the albumen contained in any solution; it will fall down in a flocky precipitate, which when carefully dried will contain about 78 per cent. of albumen. To detect ammonia, see 28. Corrosive sublimate is detected by lime water, see 75.85.

a. The perchloride of mercury in solution removes stains on the skin caused by nitrate of silver, and it also effaces the so called indelible ink for marking linen, the base of which is nitrate of silver, or the lunar caustic of the apothecary.

54. FLUORINE *fluates, fluoric acid,* these substances are detected by glass, thus; *the fluoride, or fluate is to be reduced to powder, and mixed with sulphuric acid to the thickness of paste, it may then be put into a leaden dish, and heated over a spirit lamp; fluoric acid will escape, and if glass be held over its fumes it will be thereby corroded.* If the glass is covered with wax and tracings be marked on it down to the glass, etchings may be produced. The gas, or fumes of the acid are poisonous, and must not be inhaled. See 18, a.

55. GALLS, *tincture of, detects iron in solution turning it black or purple.* See 8. 65. Alkaline or earthy salts, if present, influence the colour changing it to violet or purple. Sulphate of lime

makes it first whitish, and afterwards black. When the quantity of iron is small, as in some mineral waters, a slice of gallnut may be suspended in the liquid by a silk thread for two or three days. The iron ought to be in the state of peroxide for the gall test to act immediately. If it be in the state of protoxide, the test does not act till after some time. Gall tincture acts also on other metals. See the tables of re-agents.

a. By applying tincture of galls to a solution before and after boiling, it may be known whether the iron is held in solution by carbonic, or by a mineral acid. If the tincture acts before boiling and not afterwards, carbonic acid is the solvent. If it acts both before and after boiling, a mineral acid is the solvent. If by the boiling, a yellowish powder be precipitated, and yet the gall tincture continues afterwards to discolour the solution, the iron, as often happens, is held in solution by both carbonic, and a mineral acid.

56. GELATINE, see jelly.

57. GLUCINA is detected by the carbonated alkalies. See the tables of re-agents. Salts of glucina are not precipitated by oxalate of ammonia, nor tartrate of potash, which distinguishes them from the salts of yttria. The tests for alumina act in the same manner with glucina as they do with alumina. See 26.

a. Glucina is distinguished from alkaline and calcareous salts in the same manner as alumina. It is distinguished from alumina by giving no crystals of alum with potash and sulphuric acid; and by the colour of its flame before the blow-pipe becoming dark grey, or black; and not blue, like alumina.

b. Litmus paper is reddened by the neutral salts of glucina.

c. Glucina, yttria, and zirconia occur in but few minerals, and in small quantity. They are rarely met with.

58. GLUTEN detected, see 1.

59. GOLD is detected by sulphate of iron, or by sulphurous acid, which produce in very dilute solutions first a blue colouring, and afterwards a brown precipitate of metallic gold; by oxalic acid which occasions a greenish black colour, metallic gold afterwards subsiding; and by fresh made muriate or proto-chloride of tin which gives a purple precipitate, see 123. *Solutions of Gold may be distinguished by the*

united action of these three tests. Hydrosulphurets produce a dark brown, or black precipitate. See the tables of re-agents.

a. Protonitrate of mercury precipitates gold as a mixture of calomel and metallic gold. Sulphurous acid precipitates gold in the metallic state. Gold is easily reduced by soda on charcoal before the blow-pipe. It is refined by cupellation, and by quartation.

60. GOLD, *muriate of,* detects tin producing a purple precipitate, but a little carbonate of soda should be present in solution . The colour of the precipitate varies in proportion to the relative quantities of the tin and the test. The colour produced may be violet, or even rose coloured, see 122.

61. HYDROGEN *sulphuretted,* acts on most of the metals. See the tables of re-agents. This test is useful in analysis either by itself in the form of gas, or in combination with water, it precipitates many of the metals in the form of sulphurets. See 62 for detecting this substance.

62. HYDROSULPHURETS *in solution* are detected by acetate of lead producing a black precipitate; by nitrate of silver, or nitrate of mercury producing also a black precipitate; by arsenious acid producing a yellow precipitate, and by silver leaf, or quicksilver which becomes tarnished, see the tables of re-agents.

63. IODINE is detected by starch which produces an indigo blue colour; but this blue colour is discharged when the solution is made hot. Starch and iodine are reciprocal tests.

a. In testing for iodine the iodine must be free, if not, a minute quantity of acid must be added. The solution of starch, (i. e. the test) must be used cold. The precipitate, ioduret of starch, is soluble in dilute sulphuric acid. Iodine is soluble in alcohol. A stream of sulphuretted hydrogen destroys the blue colour, after starch has produced it in any solution that may be under examination, see 9 and 113.

64. IRIDIUM is detected by sulphuretted hydrogen which produces a dark brown or black precipitate, but this precipitate is not distinctive of the metal. Ammonia and the fixed alkalies produce a yellow precipitate; and tincture of galls instantly destroys the red colour of the solution. Iridium may be precipitated (reddish brown) by muriate of ammonia, or the chloride of potassa, but both the test and the

metallic solution must be concentrated, and then very strong alcohol must be added so that the liquid may contain 60 per cent of it in volume. The precipitate will be chloride of iridium and the alkaline matter, both of which are insoluble in alcohol. The solution should contain a small excess of chloride of potassium;—the precipitate may be washed with spirits of wine.

a. The muriate of iridium is iridescent having a brown or green tinge; yields a red solution with water, which is rendered colourless by alkalies, sulphuretted hydrogen, ferrocyante of potash, and infusion of galls. No precipitate is produced by carbonate of soda.

65. IRON *is detected by tincture of galls, which produces a purple colour, see* 55*: also by ferrocyanate of potash which produces a blue colour.*

a. Solutions of protoxide of iron may be discriminated by their action with hydrosulphuret of ammonia which gives a black precipitate, and by the red prussiate of potash producing a dark blue precipitate; and the peroxide of iron by hydrosulphuret of ammonia, prussiate of potash, and liquid sulphuretted hydrogen; by which the indications are respectively, a black precipitate by the first, a dark blue precipitate insoluble in muriatic acid by the second; and a milky white precipitate of separated sulphur by the last. These tests discriminate iron from other bases.

b. The neutral solutions of iron redden litmus paper.

c. When carbonate of lime, or carbonate of magnesia is boiled with a solution of peroxide of iron, and protoxide of manganese, the iron is completely precipitated, and the whole of the manganese remains held in solution. See 29.

d. When protosalts and persalts of iron exist together in solution, if the solution be boiled with carbonate of magnesia, the persalt is completely separated, and precipitates in the state of a sub-salt. See 36. The carbonate of lime, of baryta, of strontian, or of magnesia, when added to a cold solution of peroxide of iron, so completely separates it, that no re-agents indicate a trace of it afterwards. The carbonates of baryta and strontia are to be preferred. This is said to be an excellent process for procuring also oxide of cerium entirely free from peroxide of iron.

e. The following list shews the colours of the precipitates of the protoxide and peroxide of iron, using the same test in both cases.

PROTOXIDE: (*blue*).	PEROXIDE: (*red*).
Potash, flocky hydrate precipitate nearly white changing to grey, green, and finally reddish brown, where in contact with the atmosphere.	*Potash*, voluminous reddish brown precipitate of hydrate of iron.
Ammonia, same as potash: if muriate of ammonia be present no immediate precipitate, but on exposure to the air a small green precipitate falls.	*Ammonia*, same as potash.
Carbonate of potash, and carbonate ammonia, white precipitate of carbonate of iron, becoming green, and then reddish brown, soluble in muriate of ammonia, which however lets fall a green precipitate after standing exposed to the air.	*Carbonates of potash, and ammonia*, reddish brown with both tests.
Phosphate of soda white, turning green.	*Phosphate of soda*, white: if ammonia be added brown, and after some time completely dissolves.
Oxalic acid, after some time a yellow precipitate of oxalate of iron soluble in muriatic acid.	*Oxalic acid*, no precipitate, but a yellow colour.
Prussiate of potash, light blue changing dark. Insoluble in muriatic acid.	*Prussiate of potash*, immediate dark blue; insoluble in muriatic acid.
Red prussiate potash, immediate dark blue. Insoluble in acids.	Red prussiate of potash, no precipitate.
Hydrosulphuret of ammonia, black, being sulphuret of iron, turning reddish brown in air. This brown colour distinguishes iron from nickel and cobalt.	*Hydrosulphuret of ammonia*, black precipitate becoming reddish brown in air.
Liquid sulphuretted hydrogen; *and sulphuretted hydrogen gas.*—No precipitate.	*Liquid sulphuretted hydrogen, and sulphuretted hydrogen gas*, in neutral solutions a milky white precipitate of sulphur; and the solution becomes protoxide.

Muriate of gold. Precipitate becomes gradually purple, but a little carbonate of soda should be added.

f. Iron ores, as magnetic iron ores, sometimes contain both protoxide and peroxide of iron. To detect them dissolve the ore in a closed flask with concentrated muriatic acid: add to one portion of the solution a saturated solution of sulphuretted hydrogen, and a milky white precipitate will indicate the peroxide. Dilute with water the other portion of the solution and test it by red prussiate of potash and the dark blue precipitate will indicate the protoxide. See 36; also letter *d* of this article.

g. The protoxide salts of iron which are insoluble in water are nearly all soluble in muriatic, or diluted sulphuric acid. This resulting acid solution when supersaturated with ammonia, generally precipitates the salt. Hydrosulphuret of ammonia added thereto blackens this precipitate. The same remark is generally applicable to the persalts of iron.

h. Before the blow-pipe the salts of iron yield with borax a glass, which, in the outer flame, is of a deep red, becoming lighter as it cools. In the inner flame it is green when hot, but colourless when cold, unless a large quantity of protoxide of iron is present. To microcosmic salt, very small quantities of iron impart a green colour while hot, which fades in cooling and disappears entirely when cold. With soda on charcoal the salts of iron are reduced and yield after washing away the particles of charcoal, a magnetic powder.

66. IRON, *metallic* is a good test for copper in solution, precipitating it in the state of pure copper. The solution should be slightly acid, and the iron should be clean and free from rust. The weight of the copper cannot however in delicate experiments be correctly ascertained by this method of precipitation.

67. IRON, *protosulphate* of, detects 1, oxygen gas in water, which shortly after the test is applied turns turbid: 2 gold: 3 palladium, both of which are precipitated in the metallic state: 4, gallic acid, which turns purple. It also detects hydrocyanic acid; see 10.

a. Sulphate of iron may be likely to contain copper; if used as a test, the copper may be detected by ammonia: any copper that may be present may be precipitated by clean iron, and the solution be thus purified.

b. I am indebted to a friend for the following. Protosulphate of iron is a convenient test for ascertaining whether a piece of chunam (or mortar) is combined with carbonic acid, or not. If a piece of plaister be taken which is partly combined with carbonic acid and partly not, and

be dipped into a solution of protosulphate of iron, a deposit of the protoxide of iron takes place on that part which is *not* combined with carbonic acid, and turns it of a dark green colour, changing eventually to an orange yellow. Many other metallic solutions, such as the bichloride, and the proto and pernitrates of mercury and the nitrate of silver, do the same thing, but the colours produced by them are different from the foregoing.

68. JELLY, or *gelatine*, is detected by tan, or tanning, which produces an adhesive mass. An immediate precipitate with tan may be considered as a pretty certain indication of gelatine. The test acts on albumen also, but not immediately, see 118. Corrosive sublimate does not act on gelatine, but it acts powerfully on albumen.

69. LEAD is detected by sulphuric acid, and by muriatic acid. The sulphuric acid may be free, or in combination as sulphate of soda, or potash. The precipitate by muriatic acid is soluble in twenty-two parts of water at 60° Faht. and in weak nitric acid. It is also soluble in boiling water and crystallizes on cooling. Alkaline sulphates are good tests for lead. See the tables of re-agents.

a.—The solutions of protoxide of lead may be distinguished by their action with sulphuric acid which produces a white precipitate; and from alkaline earths by hydrosulphuret of ammonia, which produces a black precipitate with lead, but not with the earths.

b.—Sulphate of lead is soluble in pure potash, but very sparingly soluble in dilute acids. *Treated with soda on charcoal before the blowpipe all the salts of lead give buttons or globules of metallic lead.*

c. Carbonate of lime, or of baryta added to a cold solution of nitrate of lead, and nitrate of bismuth, precipitates the bismuth; but if the mixture be boiled both metals are completely precipitated. Lead may be thus separated from the bismuth of commerce, and also from alloys of copper, see 41 *a.*

d. Pure protoxide of lead is yellow, but its powder has a reddish hue. The best solvent for it is nitric, or acetic acid. When it does not wholly dissolve in these acids it is impure. The red oxide of lead, is, by a strong heat converted into protoxide of lead: when put into nitric, or acetic acid it becomes brown being partly converted into protoxide which dissolves in the acid, and partly into the brown oxide of lead, which if heated gives out oxygen gas, and is changed into the protoxide without going into the intermediate state of the red oxide.

e. The following tests act on protoxide of lead in solution as follows. *Potash.* A white precipitate soluble in excess of precipitate.

Ammonia. A white precipitate insoluble in ammonia: acetate of lead is not affected by ammonia, but after some time a subsalt is deposited.

Carbonate of potash
Carbonate of ammonia } A white precipitate soluble in pure potash.

Phosphate of soda. The same, but the solution must be neutral.

Oxalic acid
Prussiate of potash } In neutral solutions, a white precipitate.

Red prussiate of potash. No precipitate.

Hydrosulphuret of ammonia. A black precipitate insoluble in excess.

Metallic zinc, precipitates metallic lead in blackish grey shining spangles, or if it be suspended by a silk line in a solution of lead the latter forms around it a crystalline arborescence.

70. LEAD, *acetate of*, detects (*a*) sulphuric acid; (*b*) muriatic acid; (*c*) alkaline and earthy carbonates; (*d*) phosphoric acid; (*e*) hydrosulphurets and sulphuretted hydrogen; (*f*) carbonic acid; and (*g*) boracic acid.

a. Sulphuric acid, and the alkaline sulphates are detected by giving a white precipitate of sulphate of lead.

b. Muriatic acid is also detected by giving a white precipitate, which is muriate, or chloride of lead.

c. Alkaline and earthy carbonates are detected by a white precipitate; but if the solution in which they are contained be first saturated with nitric acid the test does not discover them.

d. Phosphoric acid and phosphates produce with this test, a white precipitate that melts before the blow-pipe into a pearl white globule, which eventually becomes pure lead.

e. Hydrosulphurets, and sulphuretted hydrogen turn black on the application of this test.

f. Carbonic acid is better discovered by other tests than by acetate of lead.

g. So also is boracic acid, see 3.

71. LEAD, *subacetate of*, deprives wine of its colouring matter. It acts on a variety of animal and vegetable matters, and is not therefore a discriminative test.

a. If acetate, or subacetate of lead used for testing should be mixed with acetate of lime, or baryta, the former i. e. lime may be detected by adding to a dilute solution, oxalic acid, or oxalate of ammonia; and the latter by sulphuric acid, the solution being largely diluted. Acetate of

lead ought to be entirely soluble in water: any insoluble matter may be regarded as an impurity.

72. LIME *is detected by oxalate of ammonia;* see 15 *b*, and by sulphuric acid, but the latter will not discover lime if it is held in very dilute solution, see 15,35,44.

a. A considerable number of the salts of lime are insoluble in water. Some of those that are soluble cannot be easily crystallized. When a salt of lime is insoluble in water if it be boiled for some time in a solution of carbonate of potash, a white powder remains which is soluble in nitric acid with effervescence, and which possesses all the properties of, and is in fact carbonate of lime.

b. To distinguish precipitated sulphate of lime from the sulphate of barytes, or of strontia, wash it well, and boil it in a considerable quantity of water; filter, and divide into two portions; to one, add muriate of barytes, to the other oxalate of ammonia. If a white precipitate be produced in both cases, and the precipitate by the muriate of baryta be insoluble in muriatic acid, then the base of the sulphate is lime. The sulphate of baryta is insoluble in water; the sulphate of strontia is not quite insoluble, but very nearly so.

c. Salts of lime are distinguished from alkaline salts by giving white precipitates with carbonate of potash, and if not too dilute with sulphuric acid.

d. Lime may be distinguished from baryta by its giving no precipitate with hydrofluoric acid; and when in very dilute solution, by its giving no precipitate with sulphuric acid. Baryta is acted on by both those tests.

e. Lime may be distinguished from strontia by sulphuric acid, but the lime must be in weak solution. Strontian gives a white precipitate with sulphuric acid and acts more rapidly on adding ammonia, but if the solution of strontian be very dilute the precipitate does not take place immediately. The same method of discrimination may be followed with respect to barytes. Sulphuric acid detects both strontia and barytes in much weaker solutions than it detects lime, see 79 *d*. Lime may be further distinguished from barytes and strontia thus: nitrate of lime crystallizes in prisms, is very deliquescent, and is soluble in alcohol. The nitrates of barytes and strontian crystallize in octahedrons, or segments of octahedrons; are not deliquescent, and do not dissolve in pure alcohol, see 44 *c*.

f. Lime is always found in nature combined with an acid, see 39½ *c*.

g. Lime and magnesia are frequently found together in magnesian lime stone; they may be separated as shewn under the article magnesia, 79 *e.*

73. LIME, *carbonate of.* Anhydrous alcohol; sulphuric æther; and acetic æther disguise more or less the properties of the strongest acids. Their solution in these etherial spirits does not redden litmus paper nor decompose a great number of the carbonates. But artificial carbonate of lime, and even marble itself is attacked with extreme violence by a solution of muriatic-acid-gas in alcohol, although diluted with many times its volume of water. This gas in alcohol attacks, also, but less strongly the carbonates of barytes, strontia, magnesia and soda, even when they have been previously calcined; but it does not decompose carbonate of potash. Concentrated nitric acid mixed with alcohol does not decompose carbonate of potash, but it acts energetically upon the carbonates of lime and strontia; it acts less powerfully on the carbonates of barytes, magnesia, and soda.

a. Oxalic acid which disengages carbonic acid from the carbonates of strontia, magnesia, and barytes does not act at all on the carbonate of lime, or of potash in alcoholic solutions. These facts shew that on some occasions in which alcohol is employed in chemical investigations, it will prevent the operator from discovering the presence of an acid by litmus paper.

b. A mixture of about six parts of absolute alcohol and one part of concentrated sulphuric acid does not act upon any neutral carbonate; but it decomposes acetate of potash.

c. Carbonate of lime, and some other carbonates are useful in analysis to separate different substances, see 65 *c. d.* and 69 *c.*

d. To distinguish *carbonate* of lime from lime, see 67 *b.*

74. LIME, *muriate of,* may be used as an auxiliary to discover alkaline carbonates. The carbonates of potash, soda, or ammonia separates from this test the lime, and the muriatic acid in the test combines with the alkali producing muriate of potash, soda, or ammonia, as the case may be. The alkaline base must be discovered by appropriate tests, see 28, 98, 110.

75. LIME WATER, detects carbonic acid producing a white precipitate of carbonate of lime. With salts having a base of magnesia or alumina, and with sulphates it gives a cloudiness or a precipitate. It also detects corrosive sublimate producing a precipitate of a yellow, or brick dust colour, which becomes transparent on the addition of an acid.

a. Lime water soon spoils if exposed to the air. It is made by adding distilled water to fresh slacked lime and stirring it repeatedly during 24 hours. It should be kept in well stoppered bottles.

b. Where neither uncombined carbonic acid, alkaline nor earthy carbonates, alumina, nor oxide of iron exist in a mineral water, lime water is one of the best precipitants of magnesia. One twelfth part of a grain in a pint of water may be detected.

c. Lime water decomposes a neutral solution of platina if exposed to the sun's rays. See 96, d.

76. LITHIA, the detection of this substance by re-agents is somewhat difficult. But the lithia in salts of lithia may be detected before the blow-pipe. When a portion is melted upon the end of a platina wire bent into a ring, and the melted mass is placed at the point of the inner flame, then the outer flame acquires a beautiful and very strong carmine red colour, see 115 *g*. The chloride of lithium acts the most strikingly. When the lithia salt is mixed with a potash salt, then the red colour alone is produced before the blow-pipe, and the presence of potash, even when the assay contains more potash than lithia, cannot be detected by its behaviour before the blow-pipe. When on the contrary, a lithia salt is mixed with a salt of soda, then only the re-action of the soda is observable, and the outer flame, even when an excess of lithia is present, acquires merely a yellow colour. This is also the case when a lithia salt contains salts of both potash and soda.

a. The spirituous solutions of lithia salts burn with a beautiful carmine red flame, particularly when the spirit is nearly consumed, and the burning liquid is stirred with a glass rod.

b. The presence of lithia, in solutions of the salts of lithia, is best determined as follows. The operator first assures himself, by the addition of a solution of carbonate of potash or carbonate of soda, that the salt in solution is actually an alkaline salt, which point is determined if this test, on being added to a not very concentrated solution of the compound, produces no precipitate. In the next place, if the solution be not troubled by solutions of tartaric acid and chloride of platinum, the absence of potash is determined. If farther, the solution, on being mixed with a solution of phosphate of soda and ammonia, produces, after some time, a strong precipitate, the presence of lithia is determined, and that substance is hereby distinguished, more particularly from soda, but also from potash. Finally, lithia can be sufficiently discriminated from the other two alkalies by its behaviour before the blow-pipe.

c. Neither carbonate nor phosphate of soda; phosphate of potash; tartaric acid; oxalic acid; chloride of platinum; hydrofluosilicic acid, nor sulphate of alumina produces any precipitate in solutions of lithia. If phosphate of soda and then ammonia be added to a solution of lithia a precipitate is produced but not instantly.

d. The solutions of the salts of lithia act upon reddened litmus paper in the same manner as the corresponding salts of potash and soda, see 98 *c*; and 110 *d*.

77. LITMUS, *the solution and tincture of litmus, and litmus paper all act in the same manner, namely, from blue, their natural colour they turn red on the application of an acid.* See 73, for exceptions to this general rule, also *b* in this article.

a. Fixed acids turn litmus permanently red; volatile acids produce a transient red which disappears on the application of heat, or when the paper gets dry. Carbonic acid and sulphuretted hydrogen in water turn litmus a transient red, before, but not after boiling.

b. The salts of silver and manganese have no effect on litmus paper. The salts of nickel and cobalt affect it slightly, but solutions of the neutral salts of all the following substance turn it red:—

Antimony,	Iron,
Alumina,	Lead,
Bismuth,	Mercury,
Cadmium,	Platinum, the oxide, not the chloride,
Cerium,	Tin,
Copper,	Yttria,
Glucina,	Zinc,
Gold,	Zirconia.

c. Solution of boracic acid changes blue litmus to red or reddish; and renders turmeric paper brown.

78. LITMUS *reddened. Litmus or litmus paper reddened by diluted vinegar, or by any very weak acid becomes a test for alkalies.* The blue litmus is a test for acids. Suppose a piece of blue litmus paper to be dipped into a weak acid, it will turn red; if it then be dipped into an alkaline solution it will turn blue, and regain its natural colour. This effect will be produced as often as it is dipped alternately into an acid or alkaline solution of equivalent strength. See 98, *c*.

a. The alkaline earths baryta, strontia, &c. also restore the blue colour. To discover whether alkalies, or their carbonates, or alkaline earths have acted on the test, add sulphuric acid to the solution, the earths will be precipitated; but the alkalies will not.

79. MAGNESIA. Pure magnesia is a white powder, infusible by heat, and nearly insoluble in water. If laid on reddened litmus paper and moistened, it changes the colour to blue.

The following tests indicate magnesia.

Potash. A voluminous flocculent precipitate in neutral solutions. Muriate of ammonia may diminish or prevent this precipitate, according to quantity.

Ammonia. A bulky precipitate in neutral solutions, which entirely disappears on adding muriate of ammonia.

Carbonate of potash. The same. If muriate of ammonia be previously present, no precipitate occurs in this, or the last case. If the solution however be boiled, a precipitate occurs.

Phosphate of soda added to caustic, or carbonated ammonia produces a precipitate in neutral solutions.

Sulphuric acid
Hydrofluosilic acid
Oxalic acid
Binoxalate of potash
Hydrosulphuret of ammonia
Prussiate of potash.
} No precipitate.

a. Magnesia is precipitated from its solutions by the pure alkalies as a bulky hydrate, which is soluble in dilute sulphuric acid. This latter circumstance distinguishes magnesia from other alkaline earths, their sulphates being very sparingly soluble.

b. Magnesia in *neutral* solutions is distinguished from alkaline salts by its producing white precipitates with caustic ammonia, and carbonate of potash; and from solutions of baryta, stronia and lime by caustic ammonia, which does not precipitate those three earths.

c. Magnesia in *acid* solutions may be distinguished from the salts of potash, soda, or ammonia by producing a white precipitate with phosphate of soda after having been supersaturated with ammonia. From the salts of lithia, magnesia may be distinguished by giving a precipitate with an excess of potash, especially when the mixture is boiled. From baryta, and strontia, it may be distinguished by producing no precipitate with sulphuric acid; and from lime by its giving no precipitate with oxalic acid.

d. Suppose baryta, strontia, lime, and magnesia to be held together in solution, they may be thus distinguished: add ammonia; if the so-

lution is *neutral*, a white flocculent precipitate will fall, indicating magnesia. Filter the solution, and add hydrofluosilic acid; after some time a precipitate will be formed, indicating barytes. Filter, and to the remainder of the solution add water, diluting it largely; then add dilute sulphuric acid, and a precipitate will fall indicating strontian. After this has completely separated, to the clear solution add oxalate of ammonia, and a cloudiness will indicate the presence of lime. In this case all 4 substances are supposed to be present, but if the tests do not act, as above stated, the absence of that substance to which the test is appropriate is to be inferred, see 115, *b. c. d. e* 44 *c.* and 75, *b.*

e. Lime and magnesia may be thus separated. To the solution add oxalate of ammonia, slightly acidulated with oxalic acid, collect the precipitate, wash, and dry it at 212.° 100 parts of the dry precipitate indicate 38 or 39 of lime. Another process is to add muriate of ammonia to a muriatic solution of lime and magnesia, and afterwards to add caustic ammonia slightly in excess; if necessary, filter. Then add oxalate of ammonia, and separate the oxalate of lime by filtration. Phosphate of soda, or phosphate of ammonia now added will precipitate the magnesia, as an ammonia magnesian phosphate, which dried at a heat of 100° probably consists of

Ammonia	1	.....	17	.....	14.41
Magnesia	1	.....	20	.....	16.96
Phosphoric acid	1	.....	36	.....	30.45
Water	5	.....	45	.....	38.18
	1	.....	118	.....	100.00

80. MAGNESIA, *carbonate of*, see 25, 65 *c.*

81. MANGANESE. Liquid potash, soda, or ammonia produces in a solution containing manganese a white precipitate, insoluble in an excess of the alkali, changing to brown, and at the point of contact with the atmosphere, to black. Carbonate of potash produces in solutions of proto-salts of manganese a white precipitate, which on exposure to the air, does not change colour, but remains white. Prussiate of potash produces a white or pale red precipitate which is soluble in free acids. Hydrosulphurets produce a white, grey, or reddish precipitate. Chloride of soda (common salt) dropt into a solution of protoxide of manganese produces a black bulky precipitate of deutoxide of manganese.

a. The following tests discriminate manganese more particularly.

PROTOXIDE.	DEUTOXIDE.
Potash produces a white precipitate, changing in air to yellowish, then brown and finally black.	*Potash.* In a muriatic solution a dark brown voluminous precipitate.
Ammonia; a white precipitate which in air soon turns brown and finally at the point of contact with the air black.	*Ammonia.* The same as potash.
Carbonate of potash; a white precipitate: not changing in air.	*Carbonate of potash.* The same as potash.
Carbonate of ammonia; the same as carb: potash.	*Carbonate of ammonia.* The same as potash.
Phosphate of soda, a white precipitate.	*Phosphate of soda,* in a neutral muriatic solution a light brown precipitate.
Oxalic acid, and oxalates, produce if the solution be concentrated, if it contain no muriate of ammonia, and it be not acid, crystals of oxalate of magnesia; ammonia added assists these tests.	*Oxalic acid.* No precipitate but after a time it makes the solution colourless.
Prussiate of potash, a white or pale red precipitate soluble in free acids.	*Prussiate of potash,* a greyish green precipitate.
Hydrosulphuret of ammonia, in neutral solutions a yellowish or flesh red precipitate. In air it becomes oxidised and brownish black.	The same as the protoxide.
Liquid sulphuretted hydrogen, and sulphuretted hydrogen gas no precipitate in neutral solutions: if the solutions be made acid and a few drops of ammonia be added a pale flesh red precipitate occurs.	These tests produce a milk-white precipitate of sulphur and the deutoxide is reduced to protoxide.

b. The salts of manganese treated on charcoal with borax before the blow-pipe, produce a bead, which acquires in the outer flame an amethyst colour; but this colour disappears in the inner flame; it however may be made to re-appear by placing the bead again in the outer flame. *The smallest portion of manganese can be detected before the blow-pipe by fusing it, or its salt, with soda on platina foil: the melted mass exhibits a green colour in the outer flame.*

c. If a mineral substance is supposed to contain manganese, reduce it to powder, pour upon it muriatic acid, and apply a moderate heat. If chlorine gas should be abundantly produced the mineral is chiefly manganese, see 11 *c*, also 41 *a*.

82. MERCURY. This metal is acted on by a great number of tests. It may be detected by muriatic acid, which produces a white precipitate insoluble in simple acids; but rendered black on the addition of ammonia.

a. The following list shews the different colours or precipitates produced by the same test in solutions of the protoxide and peroxide of mercury.

PROTOXIDE.	PEROXIDE.
Potash. Black.	*Potash.* Reddish brown; added in larger quantity yellow: if much free acid, or if muriate of ammonia be present the precipitate is white.
Ammonia. Black.	*Ammonia.* White.
Carbonate of potash. Dirty yellow, which becomes black by boiling.	*Carbonate of potash.* Reddish brown. If muriate of ammonia be present, white.
Carbonate of ammonia, grey: but in larger quantity black.	*Carbonate of ammonia.* White.
Prussiate of potash. White gelatinous.	*Prussiate of potash.* White, changing after exposure to blue.
Iodide of potassium; greenish yellow; test added in larger quantity, the colour is blackish, excess of test dissolves the precipitate.	*Iodide of potassium.* A cinnabar red, soluble in excess of test: also in muriatic acid.

b. Silver and mercury precipitated, or held in separate solution may be thus distinguished from each other. If in solution, drop a very little of both solutions on different parts of a piece of clean copper: rub them with a clean finger; in each case a silvery whiteness will appear: but for the silver, its action will be more certain if it be rubbed with a little common salt and cream of tartar mixed together. Then apply heat to the copper: the mercury will be dissipated, but the silver will remain. If solutions of mercury and of silver be respectively precipitated by muriatic acid, ammonia turns black the mercurial precipitate, but dissolves the precipitate of silver.

c. Protosalts of mercury mixed with dry soda, placed in a glass tube closed at one end, and heated to redness by the blow-pipe are reduced, and the mercury sublimes in the form of a grey powder, which on being rubbed produces globules of metallic mercury.

d. Hydro-sulphurets, and sulphuretted hydrogen tarnish quicksilver; and turn its solutions black.

e. Pure protoxide of mercury is black: the peroxide is red, but when finely pulverized it becomes somewhat yellowish. A strong heat decomposes both into metallic mercury, and oxygen gas.

83. MERCURY, *protonitrate of*, made by dissolving mercury in nitric acid without heat, detects the following substances.

a. Uncombined ammonia, with which it produces an ash-grey, or black precipitate.

b. Muriatic acid, which gives a white precipitate insoluble but turning black, in ammonia.

c. Muriate of gold, which on adding the test gives a dense bluish black precipitate.

d. Muriate of platinum, producing an orange coloured precipitate.

e. Phosphoric acid;—a white precipitate is produced, soluble in an excess of the test, and also in nitric acid. In testing for phosphoric acid it is essential that no free alkali, or alkaline earth be present. See 17.

f. Sulphuric acid, indicated by a white crystalline or pulverulent precipitate that becomes yellow when repeatedly washed with boiling water.

84. MERCURY, *prussiate of*, or *cyanuret of*, is a delicate test for palladium, which it separates in the form of a yellowish white precipitate. See 95.

85. MERCURY, *permuriate*, *oxymuriate*, or *perchloride of*, may be detected thus. Place a drop of its solution on a piece of clean polished gold, and lightly rub the gold through the solution with the blunt point of a penknife; the part touched will become white. See 53, 82.

a. Lime water throws down a lemon yellow precipitate, more lime water produces a reddish yellow tint, a further quantity restores the lemon yellow colour. Caustic potash produces a yellow precipitate. Caustic ammonia causes a fine white flocculent precipitate which is a triple compound of ammonia, chlorine and mercury. Carbonate of potash gives a brick red precipitate of carbonate of mercury. Ferrocyanate of potash occasions a white precipitate of ferrocyanate of mercury, which gradually but slowly becomes yellowish and at length pale blue. Polished copper becomes tarnished, and if rubbed becomes of silvery whiteness. Solution of albumen causes a white precipitate soluble in excess of albumen.

b. Sulphuretted hydrogen gas precipitates the bi-sulphuret of mercury; if the solution is not very dilute a white or yellowish colour is produced before it becomes black. Hydriodate of potash causes a beautiful scarlet coloured precipitate of biniodide of mercury, which is soluble in an excess of the test. Protochloride of tin produces a white precipitate changing with more of the test to a greyish black; the solution must be excluded from the air, otherwise bichloride of tin is formed which does not act on the solution of corrosive sublimate.

c. Many of the foregoing tests acts on other solutions of mercury, besides the perchloride. See 82.

86. MOLYBDENUM. No acid but the nitric or nitro-muriatic acts on this metal, but several acids act on its oxide and afford blue solutions. Molybdic acid gives with nitrate of lead a white precipitate soluble in nitric acid; with the nitrates of mercury and silver a white flaky precipitate; with nitrate of copper a greenish precipitate, and it affords a white precipitate with neutral solutions of all the following tests; sulphate of zinc; muriates of bismuth, antimony, platinum and gold; and nitrate of nickel. Deutoxide salts of molybdenum are precipitated brown by alkalies and their carbonates, see the tables of re-agents.

a. There are two oxides of molybdenum; the protoxide, which is black, and the deutoxide, which is brown.

87. MUCUS *detected*; sub-acetate of lead instantly acts on animal mucilage, or mucus, and produces with it a copious white and flaky precipitate, but subacetate of lead is not rendered turbid by a solution of animal gelatine. This test acts on a variety of animal and vegetable matters, and is not therefore a distinctive test for mucus, but as mucus is not affected by tan the action of tan may serve to distinguish between mucus and gelatine, see 118.

88. MURIATIC ACID, AND MURIATES, *detected*, see 11, 83 *b*, and 108.

89. NICKEL. Pure oxide of nickel is dark grey: the hydrate is green. The solution is green. The following tests detect nickel. There are two oxides: the protoxide and the peroxide.

Potash, apple green precipitate.

Ammonia, in small quantity a green troubling; on adding a larger

quantity a fine blue colour inclining slightly to violet; after an hour or two the blue changes to violet or to an amethyst red. A solution of potash produces after adding the ammonia, an apple green precipitate.

Carbonate of potash, apple green precipitate.

Carbonate of ammonia, apple green precipitate, soluble in excess of this test and forming a bluish-green solution.

Phosphate of soda } White precipitate.
Prussiate of potash }

Oxalic acid, after some time a greenish precipitate.

Hydrosulphuret of ammonia, a black precipitate.

Liquid sulphuretted hydrogen, and sulphuretted hydrogen gas, blacken the solution, and after a very long time a small precipitate appears, but only in neutral solutions.

a. To distinguish salts of nickel from copper, see 51 *a*, from cobalt they may be known by their action with ammonia; and by potash on adding it to the ammoniacal solution, as mentioned above.

b. The soluble salts of nickel are distinguished by a beautiful emerald green colour, while the colour of the insoluble salts is usually light green, and in some cases leek green.

c. To separate nickel from copper and zinc, see 52; from bismuth 41 *a*.

d. A great number of non-volatile organic substances hinder the precipitation of the oxide of nickel by alkalies, but not by hydrosulphuret of ammonia.

e. Before the blow-pipe salts of nickel produce with borax, or microcosmic salt, a reddish coloured bead, which fades on cooling, and the colour often quite disappears when the bead is cold. With soda, on charcoal, they are reduced to a white metallic and magnetic powder.

90. NITRIC ACID AND NITRATES, detected, see 14.

91. NITROGEN liberated by nitric acid, see 13 *c*.

92. OPIUM detected, see 12.

93. OSMIUM. The solution of oxide of osmium is best detected by infusion of galls, which presently produces in it a purple colour that soon after changes to a deep vivid blue. With pure ammonia and with lime the solution of osmium changes to yellow, but it is not af-

fected by chalk, or by pure magnesia. The solution with lime gives a deep red precipitate with galls which turns blue by acids. Osmium heated in the air, and in distillation, has an odour somewhat like chlorine. If a very small piece of pure osmium be placed on a slip of platina foil near its edge, and be brought into the flame of burning spirits of wine, and be held so as to allow a portion of the flame to rise freely by the side of the platinum the flame becomes suddenly very brilliant just as if pure olefiant gas had been inflamed.

94. OXYGEN GAS in water detected, see 67.

95. PALLADIUM. Mercury, as well as protosulphate of iron throws down palladium in a metallic form: cyanuret of mercury separates it in the form of a yellowish white precipitate [cyanuret of palladium] but the solution of palladium must in this case be neutral. This precipitate detonates when heated. Palladium forms a red solution with nitric acid, and precipitates in a brown powder on adding protomuriate of tin; but if the solution be much diluted this re-agent produces a fine emerald green colour. Prussiate of potash produces an olive coloured precipitate; sulphuretted hydrogen a dark brown; and all the metals except gold, or silver, and platina precipitate metallic palladium. The alkalies occasion an orange coloured precipitate.

a. Almost all the salts of palladium are soluble in water, and the colour of the solutions is a fine red.

96. PLATINA. Platinum in solution which is generally brown, or yellowish brown is detected by muriate of ammonia, see 34, and by protomuriate of tin, which is a delicate test, and produces an orange coloured precipitate (Accum), see 122. Protochloride of tin communicates to solutions of chloride of platinum a deep reddish brown colour without producing a precipitate (Rose). Potash and ammonia and their carbonates produce yellow precipitates of chloride of the test and platinum. Prussiate of potash changes the colour from yellow to green

The following tests give further indications of platinum.

Potash and ammonia and their carbonates produce yellow precipitates as before mentioned, particularly when muriatic acid is added to the solution. These precipitates are not soluble in free acid; but those by potash and ammonia are soluble in an excess of those alkalies, when they are heated; and if the solution is afterwards supersaturated with muriatic acid a white precipitate is produced.

Phosphate of soda, oxalic acid, cyanuret of mercury, and protosulphate of iron produce no precipitate.

Hydrosulphuret of ammonia and sulphuretted hydrogen produce a brown, or brownish black precipitate. *Metallic zinc* precipitates platinum in the state of a black metallic powder.

a. Solutions of chloride of platinum do not affect litmus paper; but solutions of the oxide redden it.

b. Before the blow-pipe the compounds of platinum are completely reduced, and impart no colour to the fluxes.

c. Potash and ammonia discriminate platinum from all other substances; the solution should be acid.

d. If lime water be added to a neutral solution of platina, and it be exposed to the sun's rays, an instant copious white precipitate will occur; if the platina be in excess the precipitate will be pale yellow. A neutral solution of platina is decomposed by oxalic acid, as well as by the oxalates, in the sun's rays, with a copious disengagement of gas.

97. PLATINA, *muriate or chloride of,* is a valuable test for distinguishing the salts of potash from the salts of soda; it produces with all the salts of potash a yellow precipitate but it does not affect salts with a base of soda. It is essential when this test is used, that there be neither ammonia, nor excess of acid present in the solution, which should be somewhat concentrated. It is also a test for tin, see 121.

The action of this test with the salts of ammonia is the same as with salts of potash. See 28 *c*, and the next article.

98. POTASH *and its salts,* distinguished from soda and its salts; also from ammoniacal salts, see 28, 110 *a*. The best re-agents for detecting potash in solutions are the chloride of platinum, and tartaric acid. But as the chloride of platinum acts towards ammoniacal salts in the same manner as towards the salts of potash, the ammonia in solution, if any, must be first removed when testing for potash with this re-agent.

a. If a concentrated solution of sulphate of alumina be dropped into a salt of potash, octahedral crystals of alum will be soon deposited.

b. Salts of potash may be thus distinguished. Fuse before the blow-pipe a little borax to which a small portion of oxide of nickel has been added. A yellowish glass is obtained. Fuse this yellowish bead with a little of the salt under examination and if it contain potash the bead will assume a bluish or violet colour.

c. The neutral phosphate, arseniate, borate and carbonate of potash, and the fluoride and sulphuret of potassium turn reddened litmus paper blue.

d. Pure carbonate of potash dissolves in twice its weight of cold water. Common carbonate of potash used as a test should first be examined; it may contain sulphate and muriate of potash, and siliceous and calcareous earths. Nitrate of silver, baryta, and oxalat e of ammonia are proper tests to try it with, after saturating it with pure nitric acid. Potash also may be examined in the same way. A solution of pure potash will remain transparent on the addition of barytic water. Pure potash is apt to become carbonated by keeping even in g lass stopt bottles.

99. POTASH, *prussiate, or ferro-prussiate; or ferro-cyanate of,* is a valuable test: it forms precipitates with most of the metals, and from the colour of the precipitate, the particular metal in many cases may be inferred. It is not affected by the alkalies. It is chiefly used for detecting iron with which it produces a blue colour. See the table of re-agents for its action with metals generally.

a. If ferrocyanate of potash diluted with water gives immediately a blue colour, or precipitate, with muriatic acid, it is not pure; and may afford fallacious results if so used as a test. Neither sulphuretted hydrogen, the hydrosulphurets, the alkalies, nor the tincture of galls produce any precipitate in solutions of this salt.

100. POTASH, *red ferrocyante of,* precipitates the protosalts of iron blue or green according to the quantity in solution: but does not precipitate the persalts of iron. It is a more delicate test for protoxide of iron than the common ferrocyanates.

a. This test precipitates the following metals, and gives the following coloured precipitates, viz.

Tin.....	White.	Copper.....	Dirty brown.
Silver	Orange coloured.	Cobalt and uranium.....	Different shades of reddish brown.
Zinc.....	Do.		
Nickel.....	Brown.	Mercury, protoxide, and peroxide.	Brown.
Bismuth.....	Do.		
Titanium.....	Do.		

101. POTASH, *sulphate of,* acts as a test like sulphate of soda. see 112.

102. QUININE, *sulphate of,* if a solution containing this salt is acidulated with sulphuric acid, and solution of hydriodate of potash be added, a yellow precipitate will take place, which will gradually become of a greenish colour, and finally change to reddish brown.

a. Pure sulphate of quinine when deprived of its water of crystallization by a heat of 212° should lose only from 8 to 10 per cent of water. This salt is often adulterated by sugar, gum, starch, ammoniacal salts, and earthy salts as the sulphates of lime, and magnesia, and the acetate of lime. Gum and starch are left undissolved when the impure sulphate of quinine is digested in strong alcohol.

103. RESIN *is detected* by nitric acid. When concentrated nitric acid is repeatedly digested with gum, gluten, jelly, or other immediate vegetable products, it converts them partly into oxalic acid; but true resin suffers no such change, it merely becomes a pale, porous, orange coloured mass, see 1: 13 *a.*

104. RHODIUM. Pure metallic rhodium is not soluble in any of the acids, but in alloys it dissolves with other metals. With ammonia, potassa, soda, or muriate of platina it gives a yellow precipitate: and a brown precipitate with sulphuretted hydrogen and hydrosulphuret of ammonia. There are two oxides: the protoxide black, and the peroxide yellow. Henry says it is not precipitated by ferrocyanate of potassa, muriate of ammonia, hydrosulphuret of ammonia, nor by carbonated alkalies.

a. The salts of rhodium have as yet been but imperfectly examined: those containing the peroxide are mostly of a red, or orange colour; they are precipitated by cyanuret of mercury, by ferrocyanuret of potassium and by muriate of ammonia. The action of the pure alkalies on them is very indefinite. The perchloride of rhodium yields a difficultly soluble, dingy, yellow precipitate with excess of ammonia: muriatic acid redissolves it, and forms a red solution.

105. SILICA, is soluble in hydrofluoric acid, and forms silicated fluoric acid gas; it dissolves in no other acid after the silicate has been ignited. Before the blow-pipe silicic acid is best distinguished by its fusing into a perfectly clear bead with soda on charcoal; carbonic acid gas being at the same time disengaged with effervescence.

a. Of siliceous mineral 20 or 30 grains may be conveniently decomposed in the following manner. Prepare a leaden vessel of about 6 in-

ches in diameter and 3 inches deep—cover the bottom to the depth of ¼ of an inch with a paste of fluate of lime and sulphuric acid. Place in the vessel a shallow platina dish supported by leaden feet and spread thinly therein the siliceous matter to be acted on. Cover the vessel with a leaden lid and submit it to gentle heat, either in a sand bath, or over a lamp. The mineral will be decomposed in an hour or two. During the operation the powder must be moistened with a few drops of water; and when finished, concentrated sulphuric acid drop by drop must be added as long as any hydro-fluo-silicic acid is given off, using at the same time a gentle heat. Finally the sulphuric acid is to be driven off by continued heat and evaporation to dryness. The dry residue is then to be moistened with muriatic acid, and boiled in water.

b. Some silicates are soluble in concentrated muriatic acid and form a gelatinous mass; on adding water, the bases previously combined with the silicic acid, are dissolved in the state of metallic chlorides, and the free silicic acid remains in the form of delicate flocks. Other silicates which resist the action of acids, are converted into alkaline silicates soluble in water, by first fusing them with three times their weight of carbonate of potash in a silver crucible. The fixed mass being heated with concentrated muriatic acid, the silicic acid is precipitated as a jelly, and when well washed with water (which *may* dissolve it) and the water is evaporated, pure silicic acid remains in the form of a gritty white powder without smell or taste.

106. SILVER. *Muriatic acid free, or in combination, as in common salt, gives a white curdy precipitate in solutions of silver. This precipitate turns black in the sun; and is soluble in ammonia,* which distinguishes it from the precipitate given by muriatic acid in solutions of mercury or of lead. Iron, zinc, and copper precipitate silver from its solutions in a metallic state. The alkalies and their carbonates also act on silver, and so do several other tests, see 11 *a*, and 82 *b*. and table of re-agents.

a. Pure oxide of silver is a greyish brown powder, readily soluble in nitric, and some other acids. The following tests act on solutions of silver.

b. Potash and ammonia, and carbonate of potash, carbonate of ammonia and oxalic acid produce precipitates, all of which are soluble in ammonia. The colour of the first two is brown; of the three others white. Phosphate of soda and phosphoric acid give a yellow precipitate, also soluble in ammonia, but the solution when this test is used must be neutral. Hydrosulphurets and sulphuretted hydrogen produce black precipitates.

c. Metallic iron, copper, or zinc precipitates silver, metallic; near the zinc the silver is black, further from it white.

d. Muriatic acid and the chlorides give white curdy precipitates, when much silver is held in solution, but only an opalescence if it be in small quantity.

e. Protosulphate of iron precipitates silver in a white metallic state.

f. Before the blow-pipe salts of silver are reduced to the metallic state by fusion with soda on charcoal.

107. SILVER, *acetate of,* acts as a test precisely like the nitrate of silver; but it is sometimes more convenient to use it in analysis than the nitrate.

108. SILVER, *nitrate of,* is an excellent test for discovering muriatic acid, and chlorine, as well as muriates and chlorides. It produces with them white curdy precipitates that blacken in the sun, and that are soluble in ammonia. As this test is acted on by alkaline and earthy carbonates, and by sulphuric and sulphurous acids, and their combinations, these acids must be first removed by nitrate, or acetate of barytes, and the alkaline, or earthy carbonates, by fully saturating them with nitric acid. Carbonate of silver is soluble in dilute nitric acid with effervescence: the muriate or chloride of silver is not. See also 15 and 106, for other substances which act on solutions of silver.

a. With the assistance of an alkali, nitrate of silver is a test for detecting minute portions of arsenic, with which it produces a yellow precipitate, see 39. It likewise indicates minute portions of sulphuretted hydrogen, and hydrosulphurets in general, producing with them a black precipitate of sulphuret of silver. With chromic acid it yields a carmine red precipitate of chromate of silver. Vegetable extractive matter also acts on nitrate of silver; the precipitate is brown and dissolves in nitric acid.

b. Nitrate of silver detects hydro-cyanic acid with which it produces a white precipitate of cyanide of silver even in a very dilute solution of the acid. This precipitate is distinguished from other white precipitates of silver by its being insoluble in nitric acid at ordinary temperatures, but readily soluble at a boiling heat; and by its retaining its pure white colour when exposed to the rays of the sun, see 10. Cyanide of silver when dried and heated emits cyanogen gas which is easily known by the beautiful rose red colour of its flame.

c. Fused nitrate of silver may be contaminated as a test with copper, and perhaps with gold. But both are said to be precipitated on the caustic being dissolved in water. If nitrate of silver be made by

dissolving silver directly in nitric acid, the silver should be pure. Pure silver may be obtained by mixing carbonate of potash with precipitated muriate of silver, and melting the mixture in a strong heat. The result will be pure metallic silver. The muriate of silver before it is melted should be well washed with pure water.

109. SILVER, *sulphate of*, is used sometimes in analysis in preference to the acetate, or nitrate, but similar precautions should be adopted, as in using the nitrate of silver.

110. SODA and *its salts*, may be distinguished from potash and its salts by tartaric acid, and chloride of platinum, see 19, and 98. Salts of soda tinge the outer flame of the blow-pipe yellow, which is the best discriminative test.

a. Potash and soda may be very readily distinguished by the microscope thus. Add nitric acid and thus change the alkali into nitrate of soda, or nitrate of potash as the case may be. Spread a drop on a slip of clean glass and slowly evaporate it; place the glass under the microscope and if the base be soda, cubic or rhomboidal crystals will be seen, but if potash, needle-like crystals of saltpetre; the solution should not be too concentrated, nor the evaporation too rapid, or the crystals may become confused and irregular.

b. The solutions of the neutral phosphate, arsenite, borate, and carbonate of soda, and of fluoride and sulphuret of sodium, turn reddened litmus paper blue.

c. Carbonate of soda, used as a test, may be examined in the same manner as carbonate of potash, see 98 *d*.

111. SODA, *succinate of*, see 36.

112. SODA, *sulphate of*, or sulphate of potash detects lead. The precipitate, sulphate of lead, is insoluble in water and in liquid ammonia, but soluble in dilute nitric acid, when assisted with heat. The solution is blackened by sulphuretted hydrogen gas. These indications distinguish sulphate of lead from sulphate of barytes.

a. Sulphate of soda as a test should not contain an excess either of acid, or of alkali; both of which may be ascertained by blue, or reddened litmus; see 77, 78, nor should it contain earthy or metallic salts; the former of which are detected by carbonate of potash, and the latter by prussiate of potash. If it contains muriate of soda, it may be detected by sulphate of silver.

113. **STARCH**, see 63. When solutions of starch and iodine are added to each other, indigo-blue, reddish-blue, violet, or black, are the colours that may be produced; the colour depending on the quantities and proportions of the two substances.

a. Starch in solution is precipitated by subacetate of lead; and if boiled for a considerable time with sulphuric acid diluted with 12 parts of water, sugar is formed.

114. **STEEL** may be distinguished from iron thus: put on the article to be examined a drop of dilute nitric acid, and let it remain one or two minutes. If, on washing it off with water, a black spot is left, the article examined is steel; but iron if the spot be of a whitish grey colour.

115. **STRONTIA**, in a pure state resembles baryta in its properties. It is detected by sulphuric acid which produces a white precipitate, insoluble in diluted free acids. Even a small quantity of strontian salt produces a white precipitate with sulphuric acid; but the precipitate which does not form till after some time, is insoluble in diluted acid.

a. Either oxalic acid, or binoxalate of potash, troubles neutral solutions of strontian: if they are very dilute the opalescence does not occur immediately. The precipitate is instantly augmented by the addition of caustic ammonia.

b. Strontian salts may be distinguished from barytic salts by throwing them into alcohol and setting fire to it. They occasion a carmine red flame, particularly when stirred, and when the alcohol is nearly burnt away: baryta does not produce this coloured flame, see *g*.

c. Neutral succinate of ammonia produces an immediate precipitate in concentrated solutions of barytes; but none in concentrated neutral solutions of strontia, at least not until after some time. This test therefore distinguishes baryta from strontia.

d. M. Liebeg states that the iodate of soda is an excellent re-agent for separating barytes from strontia; the latter is not at all precipitated by it, while the former is completely thrown down in *neutral* solutions. The precipitate is flaky.

e. For discriminating strontia from lime, &c., see 72, and 79 *d*, from barytes, see 40 *d*, from lithia see, *g* in this article.

f. Hydro-fluo-silicic acid, hydrosulphuret of ammonia, prussiate of potash, and red prussiate of potash produce no precipitate in solutions of strontia.

g. Salts of strontia impart to the flame of the blow-pipe a bright carmine red colour, when fused on the platinum wire. Lithia does the

same, but strontia is distinguished from lithia by its giving a precipitate with the carbonated alkalies which lithia does not.

h. Strontia is found in nature always combined with an acid, see 39½, *c*.

116. SULPHURIC ACID: and *sulphates—Sulphuric acid, free or in combination is best detected by barytes*, see 40. To detect the presence of sulphuric acid in the sulphates which are either insoluble or very sparingly soluble both in water and in acids, such as the sulphates of barytes, strontian, lime, and protoxide of lead, it is necessary to boil the compound in a solution of carbonate of potash or of soda. The solution is filtered from the undissolved residue, and after being supersaturated with muriatic acid, is mixed with a solution of chloride of barium. This immediately produces a white precipitate of sulphate of barytes, provided the insoluble substance contained sulphuric acid.

a. Before the blow-pipe, sulphuric acid is detected in the sulphates, and especially in those which do not contain a metallic oxide, by the following experiment: a portion of the salt is added to a clear colourless bead formed by the fusion of soda with silica on charcoal, and the whole is heated in the inner flame. The colour of the bead is thereby rendered dark brown, or with small quantities and when it is cold red. When a sulphate is melted with soda, on charcoal, in the inner flame, and the mass is taken from the charcoal, laid on a bright piece of silver, and moistened with water the silver acquires a black or dark yellow stain.

b. The specific gravity of pure sulphuric acid should be 1.848 at 60° Fah. If it be heavier, there is reason to suspect the presence of some impurity. If a sediment occur on adding distilled water it contains sulphate of lead. If iron be present it may be detected by diluting the acid and adding a little carbonate of potash and then prussiate of potash, or tincture of galls, see 55. For detecting copper, test by ammonia, see 51.

c. All sulphates in solution may be decomposed by acetate of barytes; see 40 *g*.

d. The sulphates are an important class of salts: the greater part are soluble in water. Insoluble sulphates may be mixed with 3 times their weight of carbonate of soda, and ignited; they then form soluble sulphates of soda, and may be tested by barytes. The sulphates of potassa, soda, lithia, lime, baryta, and strontia resist a white heat without decomposition: the other sulphates evolve when heated intensely, sulphuric acid, sulphurous acid and oxygen. Many of them are decomposed at high temperatures by the action of hydrogen, which carries

off the oxygen of the acid, and of the base, and leaves a metallic sulphuret. They are all decomposed by charcoal at a red heat, and most of them are thus converted into sulphurets; carbonic acid, and carbonic oxide being at the same time evolved.

117. **SULPHURETS.** It is well known that certain oxides possess the property of precipitating others from their solutions, by combining with the acid of the dissolved oxide; and this process has been adopted for the separation of certain metallic oxides.

Metallic sulphurets, prepared in the usual way, may be employed in the same way as the oxides, for precipitating oxides from their solutions; the latter are then converted into sulphurets, whilst the metal of the sulphuret continues in the state of oxide with the acid, previously united with the metal precipitated; this action of the sulphurets frequently possesses advantages in chemical analysis.

The results obtained by employing eight metallic sulphurets will be stated; they were prepared either by precipitation with sulphuretted hydrogen or an alkaline hydrosulphate. In operating on the solution of a salt by a sulphuret, the sulphuret was always used in excess, and the mixture was exposed to a boiling heat for about a quarter of an hour.

Sulphuret of lead precipitates nitrate of silver, sesquichloride of iron, nitrate of copper; it does not precipitate nitrate of cobalt, nitrate of cadmium, nitrate of manganese, sulphate of nickel.

Sulphuret of cobalt precipitates acetate of lead, sesquichloride of iron, sulphate of cadmium, sulphate of copper, nitrate nickel, nitrate of silver; it does not precipitate sulphate of manganese.

Sulphuret of iron precipitates nitrate of lead, sulphate of cadmium, sulphate of copper, nitrate of silver; it does not precipitate nitrate of cobalt, sulphate of manganese, nitrate of nickel.

Sulphuret of cadmium precipitates nitrate of lead, sulphate of copper, nitrate of silver; it does not precipitate nitrate of cobalt, sesquichloride of iron, sulphate of manganese, nitrate of nickel.

Sulphuret of manganese precipitates acetate of lead, nitrate of cobalt, sesquichloride of iron, sulphate of cadmium, sulphate of copper, nitrate of nickel, nitrate of silver.

Sulphuret of copper precipitates nitrate of silver; it does not precipitate acetate of lead, nitrate of cobalt, sesquichloride of iron, sulphate of cadmium, sulphate of manganese, nitrate of nickel.

Sulphuret of nickel precipitates acetate of lead, sesquichloride of iron,

sulphate of cadmium, sulphate of copper, sulphate of silver; it does not precipitate nitrate of cobalt, sulphate of manganese.

Sulphuret of silver does not precipitate acetate of lead, nitrate of cobalt, sesquichloride of iron, sulphate of cadmium, sulphate of copper, sulphate of manganese, nitrate of nickel.

It will be observed on examination that sulphuret of manganese decomposes all the solutions of metallic oxides tried, while the sulphuret of silver did not decompose any one whatever; it results from these facts that if silver has the strongest and manganese the weakest affinity for sulphur, all the other metals are intermediate as to these, and arranged according to their degrees of affinity for sulphur; they stand thus: silver, copper, lead, cadmium, iron, nickel, cobalt, manganese.

The metals are here so arranged that any one of them in state of sulphuret does not act upon a solution of the metals following: thus for example, the sulphuret of nickel precipitates the salts of silver, copper, lead, cadmium and iron, but effects no change in those of cobalt and manganese.

There is only one exception, it is that the sulphuret of iron precipitates the nitrate of lead, whilst the sesquichloride and pernitrate of iron are only partially precipitated by the sulphuret of lead. *London and Ed. Journal*, Page 138. 1838.

SULPHURETS, may be detected, some by fire which drives off the sulphur: and those soluble in water, by being treated with muriatic or sulphuric acid, which disengages sulphuretted hydrogen, and if the solution be not too dilute, effervescence occurs. This gas may be known by its smell, or by its tarnishing silver. Or the sulphuret may be pulverized and digested with strong nitric acid; this converts the sulphur into sulphuric acid, which may be detected by a solution of barytes, or of lead.

118. TAN, *or tannin* is employed for detecting animal gelatine, or jelly, with which it forms an elastic adhesive mass, that soon dries in the open air, and becomes converted into a brittle resinous-like substance, insoluble in water, and capable of resisting a great number of chemical re-agents. It resembles overtanned leather. Tan also acts on albumen, but the precipitate does not take place immediately:—with gelatine an immediate precipitate occurs. A solution of tan may be made by pouring hot water on bruised gall-nuts, or oak-bark, catechu, &c., and allowing the infusion to stand some time, filtering it when it becomes cold.

a. If corrosive sublimate does not act on the liquid under examination the absence of albumen may be inferred with certainty. Then

add the test, tan, till the whole of the gelatine be precipitated, but not in excess; the flocculent precipitate that occurs is a mixture of tan and gelatine, which if weighed and multiplied by 0·6 will very nearly give the true weight of the gelatine.

119. TELLURIUM. In a nitro-muriatic solution of this metal, water produces a white precipitate, which fuses at a white heat and sublimes. Tellurium is precipitated in a metallic state by sulphurous acid; by sulphate of ammonia; by iron, and by zinc. Tincture of galls produces a yellow flaky precipitate, and solutions of potash and soda white precipitates soluble in excess of the precipitant, see table of re-agents.

a. The oxide of tellurium forms salts with acids and alkalies: combines with hydrogen yielding a colourless gas absorbable by water, and forming a claret coloured solution, with an odour like sulphuretted hydrogen.

120. THORINA after ignition is insoluble in all acids except hot sulphuric acid diluted with an equal weight of water. It is precipitated white by ferrocyanate of potash, phosphate of soda, hydrosulphuret of ammonia, and by oxalic acid. It forms a colourless glass with borax, before the blow-pipe.

a. Solutions of thorina may be distinguished from alkalies, and from barytes, strontian, and lime, by giving a gelatinous precipitate with ammonia: from magnesia by its action with ammonia: and by hydrosulphuret of ammonia, which produces no precipitate with magnesia, but in neutral solutions of thorina it precipitates hydrate of thorina; and from solutions of alumina and glucina, by producing with a solution of potash, a precipitate which does not redissolve in an excess of the precipitant.

121. TIN is detected by muriate of gold, see 60. Muriate of platina produces in solutions of tin an orange coloured precipitate; ferrocyanate of potash, a white precipitate; perchloride of mercury black, with protoxide salts, but white with the peroxide: and a plate or slip of lead, metallic tin. See table of re-agents

a. A slip of tin immersed in a muriatic solution of gold becomes covered with a purple powder which gradually diffuses throughout the fluid, and imparts to it the colour of red wine, but the colouring matter soon precipitates.

b. A bar of metallic zinc precipitates tin from the solutions of its protosalts in the metallic state in the form of small greyish-white span-

gles; but in solutions of persalts of tin, it disengages hydrogen gas, and causes a white gelatinous precipitate of peroxide of tin.

c. Before the blow-pipe, salts of tin are easily discriminated by producing a button of metallic tin. They should be added to a little soda on charcoal and be submitted to the inner flame.

d. Proto-salts of tin are easily recognized by their action with the solution of gold, see 59; and 60, the persalts may be distinguished by giving with hydrosulphuret of ammonia a yellow precipitate which is completely soluble in excess of the precipitant, and with liquid sulphuretted hydrogen, or a current of sulphuretted hydrogen gas; but in these cases the yellow precipitate does not take place immediately.

e. Nitric acid precipitates tin in the state of pure oxide.

f. In an acid solution of antimony and tin with the assistance of a vapour bath heat, the antimony may be precipitated by immersing a plate of tin and keeping the solution acid. The antimony should be well washed and dried before it is weighed.

122. TIN, *proto-muriate of*, is a delicate test for platinum, with the solutions of which it produces an orange coloured precipitate. See 96. It also detects gold producing a purple precipitate. See 59 and 60. With the neutral salts of palladium this test gives a dark brown precipitate, but if added in excess, the liquor remains of a fine transparent emerald green colour. With a solution of corrosive sublimate it produces a dark brown precipitate. The proto-nitrate of tin is said to be a more delicate test than the proto-muriate; it yields with solutions of silver; platina, palladium, and tellurium precipitates similar to that produced in a solution of gold.

a. This test is best when fresh made: it is apt to acquire a further portion of oxygen from the atmosphere, and become a permuriate which does not act like the proto-muriate. It should be kept in well stopt bottles.

b. Proto-muriate of tin reduces iron to a minimum of oxidation in those compounds in which the metal is peroxidized: thus red sulphate of iron is reduced by it to the green. It blackens the solution of corrosive sublimate.

123. TITANIUM, is precipitated from solutions in which it exists as titanic acid, by ammonia, which gives a bulky precipitate similar to that of alumina. Titanic acid is also precipitated but not com-

pletely by boiling. Infusion of gall-nuts precipitates it orange red: ferrocyanates, brown; and metallic zinc produces a purple powder if the solution be nearly neutral. Chemists are still far from being able to separate titanic acid with accuracy from all other substances.

a. The carbonated alkalies also precipitate titanium; and if prussiate of potash gives a green colour it is, according to Lowitz, owing to the presence of iron: an alkali dropped in after this test, produces a purple precipitate, becoming blue and eventually, white. Zinc immersed in weak solutions of titanium changes their colour from yellow to violet, and ultimately to an indigo; tin produces in them a pale red tint which deepens to a bright purple red. Hydrosulphuret of potash throws down a brownish red or according to others a dirty grass green precipitate. Salts of titanium in solution are not decomposed by sulphuretted hydrogen.

124. TUNGSTEN. Caustic or carbonated alkali produces in solutions of tungsten white precipitates; prussiate of potash dirty yellow, and tincture of galls brownish red. Sulphuretted hydrogen produces no precipitate.

a. Tungsten has a greyish white colour like that of iron, and a good deal of brilliancy. It is not magnetic. It is extremely hard and brittle, and requires, a heat of 170° Wedgewood to melt it.

125. URANIUM. A solution of uranium in nitric acid is yellow, or inclining to yellow, and by proper evaporation crystals of a citron yellow colour may be separated. In such solution the alkalies produce a pale green or yellow precipitate insoluble in an excess of alkali; ferrocyanate of potash a blood red precipitate; iron, no precipitate. The proto-salts of uranium are of a pale green or yellow colour, and are not precipitated by carbonate of potash; Thomson says they are precipitated by alkaline carbonates; but the precipitate is soluble in an excess of the precipitant: the peroxide is of an orange colour; nut galls produce a chocolate coloured precipitate.

a. No precipitate is produced in solutions of uranium by zinc, iron, or tin.

126. VANADIUM. The salts of vanadium are generally of a fine blue colour. Carbonated alkalies turn the solution brown. Muriatic solution of vanadium is orange red, with borax vanadium forms before

the blow-pipe a fine green glass, which appears brown when hot, and when tin is added the colour becomes blue.

127. YTTRIA. Pure hydrate of yttria has a white colour which ignition turns dirty yellow. It easily dissolves in acids, forming salts having a sweet astringent taste. The following tests indicate yttria.

Potash, *Ammonia* } White voluminous precipitate insoluble in excess.

Carbonate of potass, *Carbonate of ammonia* } Do. soluble in excess.

Phosphate of soda, *Oxalic acid* } Do. soluble in muriatic acid.

Hydrosulphuret ammonia, a precipitate of yttria.

Liquid sulphuretted hydrogen, *Sulphuretted hydrogen gas.* } No precipitate.

Prussiate potass, white chalky precipitate.

a. The solutions of the neutral salts of yttria redden litmus paper.

b. Solutions of yttria are distinguished from solutions of alkalies, barytes, strontian, lime, and magnesia, in the same manner as solutions of alumina are distinguished from those substances. From solutions of alumina and glucina, those of yttria are distinguished by producing with a solution of potash, a precipitate which does not redissolve in an excess of potash. Yttria and thorina are distinguished by the double salt produced by sulphate of potash, which if it contain thorina, is insoluble in a saturated solution of sulphate of potash, but soluble if it contain yttria.

c. Yttria precipitates glucina, zirconia and alumina.

128. ZINC. Pure oxide of zinc is white. When heated it becomes of a lemon yellow colour, but regains its whiteness when cold. It is not volatilized by heat and readily dissolves in acids. Zinc may be detected by the following tests.

Potash, ammonia, and carbonate of ammonia produce a white gelatinous precipitate soluble in excess of the precipitant.

Carbonate of potash. White precipitate insoluble in excess of precipitant, but soluble in potash or ammonia. If muriate of ammonia be

present, this test produces no effect in the cold, but if boiled till the ammoniacal salt be decomposed a precipitate falls.

Phosphate of soda in neutral solutions, a white precipitate soluble in acids, potash and ammonia.

Oxalic acid. In dilute solutions, a troubling. In stronger solutions, if neutral, a white precipitate, soluble in potash, ammonia and acids.

Prussiate potash white gelatinous precipitate, insoluble in free muriatic acid.

Red prussiate potash yellowish red precipitate, soluble in free muriatic acid.

Hydrosulphuret of ammonia. White precipitate of sulphuret of zinc If iron be present the precipitate may be grey, or black.

Liquid sulphuretted hydrogen, and sulphuretted hydrogen gas, a white precipitate in neutral solutions.

a. The solutions of the neutral zinc salts redden litmus paper.

b. A white precipitate produced by hydrosulphuret of ammonia in a clear and strongly alkaline solution can consist of nothing else than sulphuret of zinc (Rose).

c. Before the blow-pipe the salts of zinc are peculiarly easy of detection. If heated on charcoal with soda in the interior flame they spread on the charcoal a white coat of oxide of zinc. Moistened with nitrate of cobalt, and heated in the blow-pipe flame, they assume a fine green colour. With borax, or with microcosmic salt, oxide of zinc melts into a clear gluss, which flaming renders milky.

d. Metallic zinc is employed as a re-agent for separating copper, lead, tin, silver, and tellurium in a metallic state from their solutions in acids. The solution should be somewhat acid.

e. To distinguish sulphate of zinc (white vitriol) from sulphate of magnesia (epsom salts) a mixture which professor O'Shaughnessy found to have been sold in the Calcutta bazar, add to each of the solutions a few drops of ammonia. Place a little of the precipitate on a piece of red hot charcoal, and urge the heat with a blow-pipe. The zinc will appear of a splendid yellow colour; but the magnesia will retain its whiteness.

f. To separate zinc from copper and nickel, see 52.

g. Zinc in solution may be distinguished from alkalies by its behaviour with carbonate of potash. And from earthy salts by its giving a white precipitate with hydrosulphuret of ammonia.

129. ZIRCONIA. The hydrate of zirconia, like that of alumina forms a pale yellow horny mass easily soluble in acids, particularly with heat. Ignited hydrate of zirconia is insoluble in most acids: but if digested a considerable time in sulphuric acid, it becomes soluble in boiling water.

Potash. *Ammonia.* *Carbonate of potash.* *Carbonate of ammonia.*	Produce a voluminous precipitate insoluble in an excess of the precipitant. The carbonates, however, if greatly in excess dissolve a portion of it.
Phosphate of soda. *Oxalic acid.*	A voluminous precipitate.
Sulphate of potash.	After a short time, a white precipitate soluble in a large quantity of muriatic acid.
Prussiate of potash.	A white precipitate.
Hydrosulphuret of ammonia.	A precipitate of zirconia.
Liquid sulphuretted hydrogen. *Sulphuretted hydrogen gas.*	No precipitate.

a. The neutral solutions of zirconia redden litmus paper.

b. Solutions of zirconia are distinguished from solutions of alkalies, barytes, strontian, lime, and magnesia, in the same manner as solutions of alumina are distinguished from those substances. From alumina and glucina, zirconia is distinguished by its insolubility in an excess of potash. From thorina and yttria, by giving with a solution of sulphate of potash, when heated, a precipitate which is nearly insoluble, not only in water but in acids; while the precipitates produced by sulphate of potash in solutions of thorina and yttria, can be dissolved by a large quantity of water. Zirconia is also distinguished from yttria by being rendered insoluble in acids (with the exception of sulphuric acid) by ignition, whereas the ignited yttria dissolves pretty easily in muriatic acid. Finally, it is distinguished from protoxide of cerium by not acquiring the red colour of peroxide of cerium on exposure to heat, and by not producing when fused with borax or microcosmic salt before the blow-pipe, a coloured bead, either before or after cooling, provided the zirconia has been completely freed from iron.

TABLE OF RE-AGENTS: COMPILED FROM BRANDE.

Metal.	Solution.	Infusion of Galls.	Prussiate Potash.	Hydro: Sulp. Ammonia.
Antimony	Tartrate of antimony & potassa	Straw colour, white	.....	Bright orange
Arsenic	White oxide	But little change	.....	Yellow
Arsenic.....	Arsenic acid	.....	.....	Do.
Bismuth.....	Tartrate bismuth and potassa	Copious yellow orange	.....	Deep brown
Cadmium.	Chloride	.....	White	Yellow
Cerium..	Sulphate	Yellow	White	Proto salts, white
Cobalt.....	Chloride	Yellow, white	Pale green	Copious black
Copper.....	Proto chloride	Yellow, brown	Lilac	Brown
Copper..... ..	Nitrate	Green, gray	Deep brown	Brown and black
Gold.....	Muriate	Brown	Green	Yellow
Iron.....	Neutral sulphate	Purple	White pale blue	Black, abundant
Iron.....	Per sulphate	Black, blue black	....	
Iron.....	Per muriate	.....	Prussian blue	Black, abundant
Lead.....	Nitrate	Dingy yellow	White	Brown and black
Manganese....	Neutral muriate	Dirty yellow	White	Copious yellow
Mercury.....	Acid nitrate	Yellow	Greenish white	Black
Mercury.....	Do.	Do.	Do.	Do.
Mercury.....	Cerro : sublimate	....	White	Do.
Molybdenum..	Chloride	Brown	.....	
Nickel.....	Sulphate	Yellow green	Gray	Black
Osmium.....	Aq: sol: oxide	Bluish purple	.....	Metallic
Palladium	Muriate	.....	Olive	Brown
Platinum.	Chloride	Brownish green	Yellow	Pale brown
Silver....	Nitrate	Curdy brown, dirty yellow.	Cream colour	Brown
Tellurium.....	Chloride	Yellow	.....	
Tellurium.....	Sulphate	.....	.....	Black
Tin.....	Acid chloride	Straw colour, yellowish	White then yellow and bluish	Deep orange
Tin.....	Acid per chloride	Fawn, colour do.	Pale yellow	Apple green
Titanium.....	Acid muriate	Brown red : blood red	Deep blue (from acid)	Black
Titanium.....	Neut : sulphate	Blood red	Sap green	Green
Uranium.....	Sulphate	Dark brown; reddish	Deep brown	Blackish brown
Zinc	Acid chloride	Dirty yellow	Yellowish white	Straw copious

TABLE OF RE-AGENTS.

To be used in conjunction with the foregoing Alphabetical List of Tests.

1 Ammonia.	10 Muriatic acid.	19 Potash, iodide.
2 ,, carbonate.	11 Muriates.	20 ,, prussiate.
3 ,, hydrosulphuret.	12 Oxalic acid.	21 ,, red prussiate.
4 Copper, metallic.	13 Oxalates.	22 Soda, phosphate.
5 Galls, tincture.	14 Potash.	23 Sulphuric acid.
6 Iron, metallic.	15 ,, carbonate.	24 Sulphates.
7 ,, protosulphate.	16 ,, chromate.	25 Sulphuretted hydrogen.
8 Mercury cyanuret.	17 ,, bi-carbonate.	26 Tin, proto-muriate.
9 ,, protonitrate.	18 ,, bin-oxalate.	27 Zinc, metallic.

ALUMINA—Numbers 1, 2, 3, 14, 15, 17, 22 of the above tests produce a voluminous precipitate. 12, 20, 21 and 25 produce no precipitate.

ANTIMONY—1, 2, 12, 14, 15, 17, 20, 22 produce white precipitates, 3,25 produce a red, or orange precipitate, 27 precipitates metallic antimony in a black powder.

ARSENIC—25, produces a bright yellow precipitate; but see the article No. 39, in the foregoing dictionary of tests.

BARYTA—2, 15, 22, 23, 24 produce a white precipitate; 14 and 17 also if the solution is concentrated. 1, 3, 20, 21 produce no precipitate, neither does 12, but if the solution be very concentrated a precipitate appears after some time.

BISMUTH—1, 2, 14, 15, 17, 20, 22 white precipitates—16, 21, yellow precipitates—3, 25 black precipitates—19, brown precipitate—12 crystalline precipitate after some time—27 metallic precipitate of black powder—5 produces an orange precipitate.

CADMIUM—1, 2, 12, 14, 15, 17, 22 produce white precipitates. 20 white passing into faint yellow. 3, 21, 25 yellow precipitate. 27, metallic precipitate of small glancing grey spangles, or dendritical leaves.

CERIUM—1, 2, 3, 12, 14, 15, 17, 20, 22 produce white precipitates. 21, 25 produce no precipitate. Hydrosulphurets produce a brown precipitate becoming deep green. Accum.

CHROMIUM—1, greyish blue precipitate. 2, 3, 14, 15, 17, 22 light green precipitates. 16 deep brownish yellow precipitate. 25 no precipitate. 12, 20, 21 no precipitate. 5 brown precipitate. (Prussiates, green precipitates, Accum).

TABLE OF REAGENTS.

[illegible]	[illegible]	1 [illegible]
2 [illegible]	[illegible]	2 [illegible]
3 [illegible]	[illegible]	3 [illegible]
4 [illegible]	[illegible]	4 [illegible]
5 [illegible]	5 [illegible]	5 [illegible]

Acetate—1. [illegible] 2 [illegible] 3 [illegible] 4 [illegible] 5 [illegible] 6 [illegible] 7 [illegible] 8 [illegible] 9 [illegible] 10 [illegible] 11 [illegible] 12 [illegible] 13 [illegible] 14 [illegible] 15 [illegible] 16 [illegible] 17 [illegible] 18 [illegible] 19 [illegible] 20 [illegible] 21 [illegible] 22 [illegible] 23 [illegible] 24 [illegible] 25 [illegible] 26 [illegible] 27 [illegible] 28 [illegible] 29 [illegible] 30 [illegible] 31 [illegible] 32 [illegible] 33 [illegible] 34 [illegible] 35 [illegible] 36 [illegible] 37 [illegible] 38 [illegible] 39 [illegible] 40 [illegible] 41 [illegible] 42 [illegible] 43 [illegible] 44 [illegible] 45 [illegible] 46 [illegible] 47 [illegible] 48 [illegible] 49 [illegible] 50 [illegible] 51 [illegible] 52 [illegible] 53 [illegible] 54 [illegible] 55 [illegible] 56 [illegible] 57 [illegible] 58 [illegible] 59 [illegible] 60 [illegible] 61 [illegible] 62 [illegible] 63 [illegible] 64 [illegible] 65 [illegible] 66 [illegible] 67 [illegible] 68 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[illegible]

Carbonate—1. [illegible] 2 [illegible] 3 [illegible] 4 [illegible] 5 [illegible] 6 [illegible] 7 [illegible] 8 [illegible] 9 [illegible] 10 [illegible] 11 [illegible] 12 [illegible] 13 [illegible] 14 [illegible] 15 [illegible] 16 [illegible] 17 [illegible] 18 [illegible] 19 [illegible] 20 [illegible] 21 [illegible]

TABLE OF RE-AGENTS.

16 Potash, chromate.	20 Potash, prussiate.	24 Sulphates.
17 ,, bi-carbonate.	21 ,, red prussiate.	25 Sulphuretted hydrogen.
18 ,, bin-oxalate.	22 Soda phosphate.	26 Tin, proto-muriate.
19 ,, iodide.	23 Sulphuric acid.	27 Zinc, metallic,

IRON—*peroxide.* 1, 2, 14, 15, 17 cause reddish brown precipitates. 3 black precipitate. 25 milky white. 20 immediate dark blue. 21 no precipitate. 22 white precipitate.

LEAD—1, 2, 5, 10, 12, 14, 15, 17, 20, 22, 23, 24 produce a white precipitate. 3, 25 give black precipitates. 27 metallic precipitate in the form of blackish grey shining spangles. 16, 19 produce a yellow precipitate; the precipitate by 16 when digested in caustic alkali assumes a fine scarlet colour.

LIME—1, 2, 14, 15, 17, 22 act the same as they do on barytes. See Barytes in this table. 12, 13 produce a white precipitate; 23, 24 also produce a white precipitate, but the solution must be concentrated, and not dilute. 3, 20, 21 produce no precipitate.

LITHIA—22, if ammonia be added, produces a white precipitate; 12, no precipitate.

MAGNESIA—1, 15 produce a bulky precipitate, soluble in muriate of ammonia; 14 produces a voluminous flocculent precipitate. 2, 3, 13, 17, 20, 21, 23 produce no precipitate.

MANGANESE—*protoxide.* 1, 14 white precipitates changing to brown and black. 2, 15, 22 white precipitate not altered by exposure to air. 3 yellowish red precipitate. 20 white or pale red precipitate. 21 brown precipitate.

deutoxide. 1, 2, 14, 15, 17, 22 brown precipitates. 20 greyish green precipitate. 25 milk white precipitate.

MERCURY—*protoxide.* 1, 3, 14, 25 produce a black precipitate. 17 white precipitate, turning black on boiling. 10, 12, 20, 22 white precipitates. 19 greenish yellow precipitate. 16 red precipitate, *peroxide;* 1, 2, 12, 22 white precipitates. 14, 21 yellow precipitates. 3, 25 black precipitates. 19 cinnabar red precipitate. 20 white changing to blue.

MOLYBDENUM—(The molybdates of potassa and soda give a precipitate with almost every metallic solution). 9 gives a white precipitate in solutions of molybdenum, so do the muriates of zinc, and manganese. The muriate of cobalt gives a rose coloured precipitate, and 26 a blue precipitate. 5 produces a bright yellow colour and 20 a dark brown precipitate.

TABLE OF RE-AGENTS.

1 Ammonia.	6 Iron, metallic.	11 Muriates.
2 ,, carbonate.	7 ,, protosulphate.	12 Oxalic acid.
3 ,, hydrosulphuret.	8 Mercury cyanuret.	13 Oxalates.
4 Copper, metallic.	9 ,, protonitrate.	14 Potash.
5 Galls, tincture.	10 Muriatic acid.	15 ,, carbonate.

NICKEL—2, 14, 15, 17 apple-green precipitates. 12 no immediate precipitate, but after some time a greenish precipitate. 20 white precipitate tending to green. 3 black precipitate. 25 after a time solution blackens.

OSMIUM—5 purple changing to deep blue. 3 yellow. Solution of lime and of carbonate of soda produce a yellow colour:—solutions of lead, yellowish brown.

PALLADIUM—7 precipitates metallic palladium. 8 bright yellow precipitate, but not immediately. 20 olive. 25 dark brown. 26 brown precipitate in nitric solution.

PLATINUM—1, 2, 14, 15, 17 cause yellow precipitates. 7, 8, 12, 22 produce no precipitate. 26 deep reddish brown colour. 19 the same with a precipitate. 3, 25 brownish black precipitate, but 25 not immediately. 27 metallic platinum in black powder 20 changes solution from yellow to green.

RHODIUM—1, 14 yellow. Muriate of platina gives a yellow precipitate. Alcohol and water a rose red colour. 3, 25 brown precipitate.

SILVER—1, 14 brown precipitate. 2, 7, 10, 11, 12, 15, 17, 20, 26 produce white precipitates. 22 yellow. 19 white inclining to yellow. 21 reddish brown. 3, 25 black precipitates. 4, 6, 27 precipitate oxide of silver.

TELLURIUM—is soluble in the nitric, nitro-muriatic and sulphuric acids. The nitric solution is permanent when diluted: but the nitro-muriatic lets fall a submuriate on the addition of distilled water. The sulphuric solution is of a deep blue or purple colour. Heat precipitates the metal white; but if diluted with water, black. 5 produces a flaky yellow precipitate.

TIN—*protoxide*. 1, 2, 12, 14, 15, 17, 21, 22 cause white precipitates; 20 white gelatinous precipitate. 19 white flocculent precipitate inclining to yellow or red. 3, 25 yield dark brown precipitates. 27 metallic tin in the form of small greyish white spangles.

TABLE OF RE-AGENTS.

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17 ,, bi-carbonate.	21 ,, red prussiate	25 Sulphuretted hydrogen.
18 ,, bin-oxalate.	22 Soda, phosphate.	26 Tin, proto-muriate.
19 ,, iodide.	23 Sulphuric acid.	27 Zinc, metallic.

TIN—*peroxide.* 1, 2, 14, 15, 17, 22 occasion white precipitates. 12 19, 21 no precipitate. 3 yellow precipitate if solution be neutral. 25 yellow precipitate, but not immediately. 27 a white gelatinous precipitate.

TITANIUM—1, 14 give white precipitates. 3, 20 green precipitates. 5 brownish red precipitate.

THORINA—1, 2, 3, 14, 15 produce precipitates. 12, 20 produce a white heavy precipitate. 22 white flocky precipitate. 21, 25 produce no precipitate.

TUNGSTEN—1, 2, 14, 15 white precipitate. 5 brownish red. 20 dirty yellow. 25 no precipitate.

URANIUM—1, 14 cause yellow precipitates. 3 dark brown. 20 fine brown. Hydriodric acid, yellow. 5 chocolate brown precipitate in neutral solutions. No precipitate by zinc, iron or tin.

YTTRIA—1, 2, 12, 14, 15, 17, 20, 22 all produce a white precipitate. 21, 25 produce no precipitate.

ZINC—1, 2, 3, 12, 14, 15, 17, 20, 22 produce white precipitates, some of which are gelatinous. 25 produces a white precipitate in neutral, but not in acid solutions. 21 yellowish red precipitate. 5 no precipitate.

ZIRCONIA—1, 2, 3, 12, 14, 15, 17, 20, 22 produce voluminous precipitates. 21 and 25 produce no precipitate.

TABLE OF RE-AGENTS. TO BE USED IN CONJUNCTION

	Ammonia	Carbonate Ammonia	Hydrosulph: Ammonia	Tincture Galls
1 Antimony.....	White	White	Red, orange	White, straw colr.
2 Arsenic.....	.....	.....	Yellow	.....
3 Bismuth.....	White	White	Black, brown	Red, yellow orange
4 Cadmium.....	White	White	Yellow	None
5 Cerium.....	White	White	White	Yellowish
6 Chromium....	Grey, violet	Light green	Light green	Brown
7 Cobalt.....	Blue, green	Red	Black	Whitish
8 Columbium....	.....	.....	Light brown	Red
9 Copper.....	Blue	Blue	Black, brown	Brown, Green
10 Glucina.....	Voluminous	Voluminous	Glucina	.....
11 Gold.....	Yellow	Yellow	Dark brown	Green, brown
12 Iridium.....	Yellow	.....	.....	Color discharged
13 Iron protoxide.	Flocky white chg. brown§	White	Black	Purple
14 Iron peroxide..	Brown	Brown	Black	Purple
15 Lead.....	White	White	Black	White, yellowish
16 Manganese,ox:	White chg. black	White	Yellowish, red	Dirty yellow,
17 Deutoxide....	Brown	Brown	Yellowish, red	.....
18 Mercury oxide.	Black	Black	Black	Orange, yellow
19 Peroxide.....	White	White	Black	Yellow
20 Molybdenum...	.....	.....	.....	Brown
21 Nickel	Blue	Green	Black, yel. green	Grey, green*
22 Osmium.....	.....	.....	Yellow, metallic	Blue purple.
23 Palladium	Orange	....	Brown	.....
24 Platinum.....	Yellow	Yellow	Brown	Green, brownish
25 Silver.....	Brown, dissolves	White	Black, brown	Yellowish brown
26 Tellurium.....	.....	.....	.....	Yellow
27 Tin, protoxide.	White	White	Brown, orange	Straw colour
28 Tin peroxide..	White	White	Yellow, green	Yellowish fawn
29 Titanium.....	.....	.....	Black or green	Red, brown
30 Thorina.....	Gelatinous	Precipitate	Hydrate	.....
31 Uranium.....	Yellow	White	Blackish brown	Chocolate
32 Yttria.....	White††	White††	Yttria	.....
33 Zinc.....	White gelatinous	White	White	Yellowish
34 Zirconia.....	Voluminous	Voluminous	Voluminous	.....

§ Chg: means changing. †† Voluminous. * No change (Henry).

Note.—Prussiate of potash is represented to turn solutions of titanium green, red,

This remark is applicable

WITH THE FOREGOING ALPHABETICAL LIST OF TESTS.

	Oxalic Acid	Potash.	Carbonate of Potash.	Prussiate of Potash.	Phosphate of Soda.	Sulphttd: Hydrogen.
1	White	White	White	White	White	Red, orange
2	.....	.....	.....	....	.....	Yellow
3	Crystals	White	White	White	White	Black, brown
4	White	White	White	White	White	Yellow
5	White	White	White	White	White	
6	Red, green	Light green	Light green	Green	Light green	
7	White, red	Blue	Red	Green	Blue	Black
8	.....	.....	.....	Olive	....	
9	Greenish white	Blue	Blue	Brown, reddish	Greenish white	Black, brown
10	....	Voluminous	Voluminous	.....	Voluminous	
11	Gold, green...	Green, black	.....	Green,	.....	Black metallic
12	.....	Yellow	.....	Colour flies	White, changing green	
13	Yellow crystals	Flocky, white chg. brown	White	Blue, white	White	White
14	Yellow	Brown	Brown	Blue	White	Black
15	White	White	White	White	White	Pale red
16	Crystals	White changing black	White	White, pale red	Brown	White
17	.....	Brown	Brown	Green	White	Black
18	White	Black	Yellowish	white, greenish	White	
19	White	Yellow	Brown	White, greenish	.....	Black
20	Dark grey	.....	.....	.....	White, greenish	Blackish
21	Greenish white	Green	Green	White, green	.....	Metallic
22	....	.....	.....	.....	.....	Brown
23	.....	Orange	....	Olive, orange	.....	Brown
24	..... .	Yellow	Yellow	Yellow, (none)	Yellow	Black metallic
25	White	Brown	White	Whitish colour	.....	Black
26	.....	.....	....	.....	White	Brown
27	White	White	White	White yellow	White	Yellow
28	.....	White	White	Gelatinous	.....	None
29	Curdy hydrate†	....	.....	Green, red, brown, blue	White flocky	
30	White heavy	Gelatinous	Precipitate	White heavy		
31	Precipitate	Yellow	White	Red, brown	.....	Brown
32	White	White††	White††	White	White	
33	White	White	White	Gelatinous	White	White
34	Voluminous	Voluminous	Voluminous	White	Voluminous	

† Solution must be hot. †† Voluminous.

brown, and blue. A sufficient variety; but so, different authorities say the test acts likewise to other cases.

TESTING BY THE BLOW-PIPE.

Abbreviations. P. means platina P. w. platina wire. P. fo : platina foil

Substance.	On Platina.	On Charcoal.	With Soda.
1 Alumina.....	No change	No change	Swells : infusible
2 Antimony, *oxide*	Fuses readily, sublimes in white fumes: *precipitated* oxide burns like tinder into antimonious acid.	Is reduced	P: w : fuses into a clear colourless glass which becomes white on cooling
3 Baryta.....	Infusible	Infusible	On ch. the hydrate & carbonate fuse and are absorbed
„ Hydrate...	Bubbles : fuses	Is absorbed	
„ Carbonate..	Fuses readily into a glass enamel white when cold.	Effervesces becomes caustic and is absorbed	
4 Bismuth.....	.....	Flies off in fumes leaving a mark with red, or orange edges, which may be dissipated in R. f. without colouring the flame. Oxide, instantly reduced	
	(Oxide) fuses readily, mass dark brown : yellowish on cooling. In very intense heat reduces and perforates the foil.		
5 Cadmium, *oxide.*	No change	Soon dissipates: leaves a red or orange yellow powder on the ch.	On p : w : not fused on ch. reduced; sublimes and leaves a circular yellowish mark.
6 Cerium, *oxide...*	Oxide becomes peroxide	Per. ox: does not alter	On ch. not fused, soda absorbed ; white or greyish white oxide remains on the ch.
7 Chromium *oxide.*	No change	No change	On p. w. and ox. f dark orange glass: opaque and yellow on cooling. R. f opaque, glass green on cooling On ch. absorbed but not reduced
8 Cobalt *oxide*....	No change	No change	On p. w. pale red by transmitted light, grey, cold.
9 Columbium *oxide*	No change	No change	Combines with effervescence but not fused, nor reduced.
10 Copper *oxide*....		Ox. f. black globule; flows over the charcoal; under surface reduces. R. f reduces with strong heat gives a bead of metal	On p. w. fine green glass, hot: on cooling colourless and opaque. On ch. absorbed and reduced
11 Glucina.....	No change	No change	No action
12 Iron, *oxide*.	Ox : f: no change	R. f. blackens and becomes magnetic	On ch. absorbed and reduced: not fused.

Ch: Charcoal. Ox : f: oxidating flame. R : f: reducing flame.

With Borax.	With Phosphoric Salt.	Remarks.
1 Fuses slowly : clear glass	Clear glass	Fine blue glass with nitrate cobalt when cold, strong heat.
2 On ch : dissolves freely glass yellowish, hot; nearly colourless, cold: strong R f; glass becomes opaque and greyish	P : w: and ox: f: glass yellowish, hot: colour flies on cooling.	
3 The hydrate and carbonate fuse readily with effervescence into a clear glass which becomes opaque when flamed	As with borax but they foam and intumesce ending in a clear glass	A globule of different shades of red which flies on cooling with nitrate of cobalt
4 (Oxide) ox : fl : colourless glass, R : f: partly reduced: muddy greyish glass	(Oxide), ox : f: yellowish brown glass, hot: colourless but not quite clear, cold. R : f: clear and colourless glass, hot: opaque and greyish black, cold	
5 On p : w : yellowish glass, colour flies on cooling. On ch glass bubbles cadmium reduced, sublimes, and leaves yellow oxide.	Dissolves in large quantity, clear glass: on cooling milk white	
6 Ox. f. fine red, or deep orange yellow glass: colour flies on cooling: cold, yellowish tint, enamel white by flaming. In r. f. loses its colour	Ox. f. fine red glass, colourless when cold, and quite limpid	
7 On ch. fuses difficultly, glass emerald green. On p. w. and ox. f. the colour flies, and glass becomes yellow brown. When cold a faint green tinge	Green glass	
8 Fuses readily, deep blue glass	Fuses readily, deep blue glass. Colour violet by candle light	With sub. carb. of potash black glass when cold
9 Colourless clear glass becomes opaque by flaming.	Fuses easily, glass permanently clear	
10 Ox. f. fine green glass which in r. f. becomes colourless, hot: but cinnabar red and opaque when solid	Ox. f. like as with borax r. f. glass usually red, opaque and like an enamel	
11 Clear glass with a large proportion of the assay.	Same as borax	Black or dark grey mass with nitrate cobalt
12 Ox. f. dull red glass becomes clear and yellowish or colourless by cooling. On ch and *r. f. bluish green glass*	Same as borax	

Substance.	On Platina	On Charcoal.	With Soda.
13 Lead, *oxide*.....	Minium becomes black when hot; at incipient redness changes to yellow oxide, fusible into orange coloured glass	Orange glass reduces into a bead of lead	On P: w: clear glass becomes yellowish & opaque on cooling. On ch. instantly reduced
14 Lime.....	No change.	.....	.....
* Do. carbonate.	Becomes caustic & alkaline, emits bright light.	.....	.....
15 Magnesia.....	No change.	No change	No action.
16 Molybdenum....	Fumes and fuses; brown yellow on cooling; in R: f: blue; intense heat, brown.	Fuses and is absorbed and partly reduced	On P: w: effervesces; clear glass: becomes milky on cooling. On ch. fuses and reduced.
17 Nickel, *oxide*....	No change.	No change	On ch. absorbed and reduced, not fused.
18 Tellurium, *oxide*.	Fuses and fumes.	Fuses: effervesces: reduces	On P: w: colourless glass, white on cooling. On ch: reduced.
19 Tin, *oxide*.....	Takes fire and burns like tinder into peroxide.	R: f: peroxide does not fuse, but reduces in a strong prolonged heat	On P: w: effervesces: tumefied infusible mass. On ch. readily reduced
20 Titanium, *oxide*..	No change.	No change	Fuses into a clear dark yellow glass; white or grey white on cooling, and crystallizes with evolution of great heat. On ch: not reducible
21 Tungsten.....	R: f: blackens: not reduced	R: f: blackens: but not reducen	On p: w: dark yellow glass; crystallizes on cooling; opaque white or yellowish On ch. r. f. reduced
22 Uranium, *oxide*..	.....	Peroxide, becomes oxide, blackens but does not fuse	On ch: brown yellow: not fused
23 Yttria.....	No change	No change	No action
24 Zinc, *oxide*.....	Yellow, hot: white, cold: does not fuse, give out great light at a high heat & white fumes which condense like wool	———————	On ch: not fused: reduced with flame; white fumes which cover the charcoal
25 Zirconia.....	Infusible: emits intense light	Infusible: emits intense light	No action

Gold .....Platina.....
Iridium.....Rhodium.....
Palladium..... ..... } These metals have no action on the fluxes

With Borax.	With Phosphoric Salt.	Remarks
13 On p: w: clean glass, yellow hot; on cooling colourless.	Clear colourless glass	
14 Clear glass opaque by fl:	Fuses in large quantity; a clear glass	With nitrate cobalt an infusible black or grey mass.
* Fuses with effervescence, with more carbonate, clear glass: crystallizes on cooling.	Fuses with effervescence	Ditto.
15 Clear glass opaque by fl:	Fuses readily; clear glass: opaque on cooling if saturated with magnesia	Flesh colour when quite cold with nitrate cobalt
16 On p: w: clear glass in ox: f: on ch: and r: f: glass becomes dirty brown, but not opaque.	On p: w: and ox: f: greenish glass while hot: colourless cold. In r: f: becomes opaque: dull blue, hot: clear fine green on cooling: and on ch: same phenomena.	
17 Ox: f: orange yellow, or reddish glass: becomes yellow or nearly colourless on cooling.	Same as with borax, but the colour flies almost wholly on cooling	
18 On p: w: clear colourless glass, white on cooling on ch: grey and opaque	.....	Metallic tellurium heated in a glass mattrass first gives off vapour, and then a grey metallic sublimat of tellurium. In a tube open at both ends, it emits abundant fumes, which condense in a whit e fusible powder
19 Fuses with great difficulty; permanently clear glass.	Same as borax.	
20 On p: w: fuses easily; glass colourless, becomes milky white by flaming. R. f. glass assumes a dark amethyst colour, but transparent. In large quantity on ch: and r: f; glass dull yellow; when cold, deep blue	Ox: f: clear; colourless glass. R: f: on ch. glass yellowish, hot: on cooling, first red, then very fine blueish violet	Black or greyish black with nitrate cobalt.
21 On p: w: and ox: f: clear glass: not opaque by flaming	Ox: f: yellowish glass: r: f: fine blue glass. If it contains iron, blood red glass. Tin makes it green or blue	
22 On p: w: dark yellow glass in r: f: becomes dirty green	On p: w: and ox: f: clear yellow glass: cold, straw color, slightly green. On ch: r: f: fine green glass	
23 Clear glass with a large proportion of the assay: opaque by flaming	Same as with borax	With Nitrate cobalt black or dark grey mass
24 Ox: fl: fuses easily; clear glass, becomes milky by flaming	Nearly the same as borax	
25 Clear glass with a large proportion of the assay: opaque by flaming	Same as with borax	

IV.—*Essay on the Language and Literature of the Telugus.*—By Charles P. Brown, Esq. *of the Madras Civil Service.*

(Continued from our last.)

63. The Telugu Poems may be divided into two classes; popular and classical. The *popular* works (sāmānya cāvyamulu) are principally written in (dwipada) uniform couplets: and are much in the familiar style of Ovid, Gay's Fables or Scott's Marmion. The *classical* (mahā cāvyam) are usually in (padyamulu) stanzas: and may be compared to the Odes of Horace, or Gray. On the principles adopted in western criticism the taste displayed in the former class is often worthy of approbation. Even in these, bombast, immorality, bad taste and childish conceits, frequently occur. But these rhetorical flourishes are far more prominent in those poems which are written in stanzas; doubtless each of these admired works contains a *kernel* of really pleasing poetry, but this is preceded by many a page of ill judged rhetoric, wherein the poet is evidently a mere grammarian, "a word catcher (as Pope says) who lives in syllables." He rejoices in synonymes, and the dictionary is never out of his thoughts. In many stanzas (particularly in the metre called sisa) the same thought is thrice reiterated with a mere change of phrase. Thus "*the fair maid decked with these jewels entered the presence of the king. The bright damsel arrayed with these gems passed into the court of the prince. Such were the adornments of the beauteous nymph when approaching the royal threshold.*" Such passages possess an undeniable value as regards the foreigner, who will find these stanzas a most convenient substitute for the Amara Cosha and similar vocabularies of synonymes. But the taste they display is paltry enough.

The absence of these and other pedantries renders the poems written in couplets much more agreeable to a foreigner: who will value them for that simplicity which is a fault in the estimation of learned brahmins. Besides, most, perhaps all, the Dwipada poems are the composition of sudras; whereas the Padya poems are in general the work of the sacred tribe: yet the great boast of the nation, the one Bhat'tu Mu'rti, or "inspired bard," who wrote the Vasu Charitra was himself a Sūdra.

With a few exceptions all the poems are founded on a popular story borrowed from the Purānas: which the poet alters at his own pleasure till it deviates as widely from the original as Byron's Don Juan, or Milton's Agonistes deviate from the original ground work.

64. Most of the popular fables have been framed in verse both in couplets and in stanzas. But no poet that I recollect has written in

both styles; unless in the *sangitas* which will presently be mentioned. The dwipada version usually appears to be the oldest, for the style is comparatively simple, and we may often detect expressions, borrowed thence, in the Padya version. The two versions of the Rāmāyan appear to be independant of one another; but in other works (as the Basava Purān, or the Prabhu Linga Līla), the padya version evidently is a superstructure, and introduces conceits and extravagancies which deviate from the original more widely than Dryden's and Pope's imitations of Chaucer vary from the original. On the other hand there is no dwipada version of the Mahabhārat, though the tale of Nala and several other legends imitated from it are composed in couplets.

One class of the poems written in padyams consists of the *Satacams* or anthologies; which are similar to the *centuries*, or *garlands* which some old fashioned English poets composed: being a series of songs, or separate epigrams, bearing a general resemblance in subject, metre, and chorus.* Some of these are of acknowledged poetical merit, as the Bhascara satacam, the Ecāmra Linga S., the Cālahasti S., the Dāsarathi S.—others are of a lower class such as the Sumati S., the Caluvai S., the Cōdanda Rama S., the Cāntā Lalāma S. and others again, as the Vemana Satacam, the Siddha Rāma S., the Sampagamanna S. are acknowleged to be in the mere colloquial dialect, and are composed with no scrupulous regard to the rigorous laws of rhyme and elision. Though deficient in elegance of phrase these rustic songs are not devoid of poetical merit, and are attractive to a foreigner on the ground of exhibiting a familiar style, and a great variety of useful expressions. —These *centuries* are again divided as appertaining to (nīti, yōga, and sringāram) morals, mysticism, and love.

65. In one description of poems alone the "couplets" are mingled with "stanzas." This class is called (Sangītamul) "musical compositions" such as the Sītā Calyanam, the Lanca Vijayam, the Garadāchalam, &c. wherein the variety of tunes, or modulations (padamulu) introduced is entirely different from the classes hitherto noticed. Under this head are comprised the various comedies (natacamulu and bhāgavatamulu) which are performed by the public (bogamvandlu) dancers and actresses. Finally there are other ballads (cathalu) of great length framed in a peculiar chant, on principles different from all other sorts of poetry. Some of these as the Bobbili Catha (or Ranga Rao Charitra), the Nāgamma Catha, and the like, are chiefly preserved by oral recitation without having been until now committed to writing. These

* Many of these Satacams have been printed at Madras: a second edition of Vemana, much extended, has lately been finished; to which an English translation, separately printed, is subjoined.

are every where popular: though despised, as illiterate, by professed scholars. The name *Yaxa-gānam*, or "melodies" is appropriated to the *Sangitamulu* first mentioned: and discriminates them from the *Cathas;* which run in one uniform metre with a chorus constantly reiterated.

66. A superstitious monotony, far from pleasing, and imitated from the Purānas occurs in the commencement of every (padya-cāvyam) poem. The Jangama books alone deviate from this routine, and are for this particular reason much disliked by bramins.* The preface first extols Vishnu or Siva under some attributes that designate the poet's creed. Then the author extols the patron and himself in no measured terms, specifying the respective genealogies. Yet he rarely mentions the date when the poem was composed. Then follows a request made by his patron that he will undertake this tale. Thus far is called the Avatārica or preface. He now commences by describing the Naimisha forest (the Academus of India) with the hermits (muni), or philosophers who there vegetate. These commence an enquiry regarding the hero; and resort to some mighty teacher (yogi) usually Suca (the parrot), or Nārada (Mercury) who consents to gratify their curiosity. He begins with the birth of the hero, and this terminates the first (āsvāsam) canto which is denominated the Cath'ārambham or introduction. The story commences from the second book. And each canto opens and closes (āsvāsa garbham) with high flown panegyrics on the munificent patron.

67. The following list comprizes all the most popular poems with the names of the authors. The more celebrated compositions are marked in capital letters. The (T) is used to denote that the text has in the last few years been completed and corrected by the aid of various manuscripts. In this operation fifteen copies were compared for the Dwipada Rāmāyan, twelve for the Mahabhārat, eleven for the Bhāgavat, and smaller numbers for poems less corrupted by time.

Such as are marked (c) have, besides a corrected text, a commentary written in familiar Telugu which explains every word The learned men whom I employed to frame these commentaries were required to give a literal rendering: but the art of criticism is yet in its infancy among the Hindus, and much remains to be effected, both in abridging and amplifying these scholia.

68. The first poet to be mentioned is BHATTUMURTI, in whom his countrymen delight as greatly as the English admire Milton. His most celebrated poem is the VASU CHARITRA: which is now issuing from the press with an ample commentary. The poet's name was Rāma Rāzu:

* The Jangamas refuse even to write *Sri Rama* at the commencement of books and letters. Indeed they discountenance every one of the braminical superstitions.

the name Bhattu Mūrti, or *Mirror of Minstrelsy* being an epithet, which has now become his sole appellation. He had originally designated the Vasu Charitra after his own name as the Rāma Rāzu Bhūshanam. Two other works of his, the Narasa Bhūpāliyam and the HARISCHANDRA NAL'OP'AKHY'ANAM are also highly celebrated. In the latter he has imitated the Naishadham by framing an entire poem with two meanings. For in one interpretation of the words, they apply to the monarch Harischandra; in the other to the spouse of Damayanti.

The Narasa Bhupaliyam is thus named after the *nominal* author Narasa Rayalu, the poet's royal patron, who died in A. D. 1430. In like manner Calidasa is stated to be the author of the *Magha:* but the writer, whoever he was, has distinctly attributed it to his patron "the merchant Magha." This mode of adulation is followed by Hindus at the present day, for they often propose to publish in the name of an Englishman books written by themselves. It must however be allowed that no deception is seriously intended, and the *adoptive* author never really gets credit for the work.

69. The style exhibited in Bhattu Murti and his followers will never meet with much applause among European critics. The rapture it excites among his countrymen will be rightly valued when we recollect the state of Hindu taste. The ingenious Thomas Hood has in many of his Facetiæ manifested a power of punning which would have gained him a very exalted seat on the Indian Parnassus. For the most admired poets revel in learned quirks, the (slesha) double and triple meanings of words both Sanscrit and Telugu; in (chhēkam) jingle of sound: in a rhapsodical sublimity (utprēxa) which answers pretty closely to what the French poets call *charades:* performing innumerable feats of perverted ingenuity which as Dr. Johnson says "are so difficult that we are inclined to wish they had been impossible." To learn the most admired verses of these poems by memory is a task imposed on many a Hindu schoolboy, but to teach him the meaning is never even attempted. It will not be easy to persuade the Hindus that a mere exercise of memory is not meritorious. The English reader cannot expect to derive much gratification from a poem which is avowed to be so obscure that even the most learned pandit is in many places obliged to confess his inability to understand many pages unless by the aid of previous study.

Some assert that this poet likewise wrote the Pānchāli Parinayam or Nuptials of Draupadi, but I have not met with any poem bearing that name. It only remains to remark that the title Bhattu Mūrti was bestowed upon him by his royal patron Krishna Rāyalu, who was the son of a handmaid of Narasa Rayalu and succeeded to his throne.

70. In noticing the faults of style in the Telugu *higher* poets it is but just to notice that they are free from that sort of bad wit which is

called (bandha cavitvam), or verses written in whimsical figures. Among the dwipada poems this conceit is unknown: but few of the *modern padya* poems are free from it. The learned commentator on the Dasāvatāra Charitra has in such passages left the verses unexplained, and states that he did not pretend to unravel intricacies which all the greater poets had despised. I mention this conceit only with a view to warn the reader that such verses are unworthy of study. For he is often advised by bramins to turn his attention to a variety of intricate refinements which further experience will prove to be worthless.

71. Allasāni Peddana, author of the MANU CHARITRA, or Swārōchisha MANU CHARITRA (c), who also wrote the VISHNU CHITTIYAM or Amucta Mālyada (on which we have a good commentary about a century old), and the Rasa Manjiri, which last is not now known to be extant. The Telugu version now read of the Rasamanjari purports to be written by one Ananta. Perhaps this is a name assumed by the author. Peddanna was a Bramin, and received from his royal patron Krishna Rayalu the title of Andhra Cavita Pitāmaha, or sire of Telugu Poesy—which, tradition says, was denied to Bhattu Mūrti on the ground of his being a Sūdra.

In the preface to the Vishnu Chittiyam the poet mentions other works which he had composed. These have not come to light, nor do I even find them quoted in Appa Cavi.

72. Muccu Timmana (the Ovid of the language), author of the Párujāt A'paharan'am (T) and the Vāni Vilāsam. This is a modern author who wrote less than a century ago. He wrote the Rasica Jana Manobhirama, and many other poems.

73. Tennala Ráma Lingam, author of the Pandu Ranga Vijayam. The style of this poet is remarkably intricate; as is noticed in the following popular epigram on the four poets now named :—

" *Allasāni Peddan allica jigibigi*
Muccu Timman Arya muddu palcu
Pāndu Ranga vibhuni pada gumbhanambu nu
Cāca māna Rāya nīkĕ tagura."

" The rhetorical powers of Peddana, the sweet notes of Timmana, the abstruse eloquence of Ráma Linga, all unite in thy lays, O (Bhattu mūrti) bard of Cācamána !"

The secondary meaning which some pretend to find in this epigram is not worth notice.*

* Style is fancifully classed as that of the *grape*, *plantain*, and *cocoa-nut*. Of these the first, *drāxa pácam* is exemplified in the Telugu Ramayan; being quite easy. The second, *cadalī pacam*, wherein *part* of the fruit alone is eatable, is assigned to a more refined dialect: and the third, *nārikéla pácam* designates the degree of rhetorical obscureness which we find in the third poet here named. These phrases are frequently used in the conversation of learned men, and I notice them here because they are unmentioned in any work hitherto printed.

This Ráma Lingam is usually mentioned as a humourist and a profligate. I have not met with any complete copy of his poem, and I observe that the volume now extant is often attributed to another writer.

74. Srī Nátha, translator of the NAISHADHAM, the KASI KHANDAM (T) and Bhīma Khandam from the Scánda Purán. It is also said that he wrote the Marudraja Charitra, the Hara Vilásam, and the Sáliváhana Sapta Sati. But I have not met with these books.

Srinatha is also said to have written a series of songs called the Vīdhi Natacam of which only about thirty have been preserved by oral tradition. Some of these have considerable beauty: but others, written perhaps by his imitators are far inferior.

75. *Pingala* SU'RAPA RAZ, author of the R'AGHAVA P'ANDAVYAM (C), the Cala Pūrnodayam, the Prabhávati Pradyumnam, and the Linga Puránam. This last is not now extant.

76. *Chēmacūra* VENGAL RAZ, author of the Sáranga Dhara Charitra in Padya metre (T) and the Subhadra Parinayam also called *Vijaya Vilāsam* (C).

Canuparti Abbaya, author of the Aniruddha Charitra (C) also called Usha Parinayam, and the Purūravas Charitra (T): which is also called Cavi Raja Mano Ranjanam.

Erra Pregada—who translated part of the (Aranya Parvam) third book of the Mahabharat (T): he likewise wrote the Hari Vamsam in Telugu.

Potu Razu, the translator of the Bhagavat, (T) which has already been described. The poet had two auxiliaries; Gangaya who executed the fifth book; while the sixth was written by Singanna. Poturaz likewise wrote the Narayana Satacam; and having honoured Vishnu as the deity, in the Bhagavat, he wrote likewise the Vīra Bhadra Vijayam in honour of Siva.

77. *Dharani Dēvula Nagaia*, author of the Das Avatara Charitra (C), a very popular poem; being a highly coloured description in ten books of the adventures of Vishnu, or Krishna.

We may here observe that the great popularity of the Bhāgavat or Life of Krishna arises from its combining all the reveries of mysticism with broad licentiousness. The poetry of the Telugu version by Pōtu Rāz and his coadjutors being disapproved* as tame, some modern Telugu

* It is hard to reconcile the extraordinary popularity of the Telugu version of the Bhagavat, with its condemnation by strict grammarians. They frequently tell us that Appa Cavi entirely disapproved it, as is shewn by his never naming it. But he names many other volumes with condemnation, and a more reasonable cause may be, that it was written after his days. The style is very florid and undeniably beautiful, though much amplified: for instance, in describing Krishna's sports with the nymphs there are many hundred lines which the poet has added to his Sanscrit original.

poets have undertaken to model the amiro s descriptions anew—neglecting the theological discussions. Hence arose the Dasā vāra Charitra or novel of the ten appearances: and the yaxa-gānam Bhāgavatam —that is, the tale of Krishna arranged in musical melodies. In these books (as in the Rādha Mādhava Samvādam and the Dévi Bhāgavat) the principal heroine is Rádha, a nymph wholly unmentioned in the original Bhágavat, and who owes her origin to the poetical imagination of Jaya Déva, the Theocritus of India, author of the charming Gita Góvinda.

The well known poem called Ahalya Sancrandana Vilasam. or the intrigues of Indra (Jupiter and Alcmena) is the seventh book of the Dasavatara Charitra. There is also a separate poem bearing the same name in five books: but this is a mere cento of verses borrowed from various poets. The author's name is Mulugu Papaya.

It may be worth while to remark that though the Telugus possess no stated version of the four most celebrated Sanscrit poems, (the Mágha, the Cumára Sambhavam, the Mégha Dúta and the Gíta Góvinda), their bards have extracted and adapted all the most attractive scenes. I am aware that the Raghu Vamsam has been translated, as also the Sacuntala—but these are the work of ordinary Telugu composers, vastly inferior to the celebrated originals.

78. Narasimha, author of the Cavi Carna Ras'ayanam, or adventures of Mándhátа (c), a poem which has received very high applause.

Sēsham Venkatapati, author of the Tara Sasanca Vijayam (c), or "Stella and the Genius, a Romance." This is an exceedingly popular work.

Vencata Nátha (a Cshatriya), author of the Telugu translation of the Pancha Tantram (c). This was originally a "moral" work; but as treated by the Telugu author it properly belongs to the romantic class.

To these may be added a long list of popular novels and "histories" (Charitra) such as the Surábhani Eswaram (c), the Rádha Mádhava Samvádam (c) and the Ila Deviyam (c), also called Rádhica Santwanam: this is written by a poetess who has very elegantly remodelled the Rádha Madhava Samvadam into a new form: wherein she has polished and perfected the style wherever it was rustic. The Cuchel-ōpakhyan (T) in three cantos is likewise a very popular work.

79. But whatever popularity has been attained by these poets philologists with one voice declare Ticcanna to be the unrivalled model of style in the Telugu language. His first work seems to have been the seventh book, or supplement (uttara canda) of the Ramayan which bears the name of Bhascara. Ayyala Bhatta and Mallic Arjana were Bhascara's coadjutors: the former completed the sixth book and the latter wrote the fourth and fifth. After the seventh was completed by

Ticcanna, he gained the epithet Sōmayagi or Auspex for he bears this name in the Mahabharat. Yet regarding so popular an author we have no biographical accounts, and it is only surmised that he lived before the era of Krishna Rayel.

I have mentioned the remote age usually assigned to Nannaia Bhatta but perhaps we may safely place him in the century preceding that which we have conjecturally assigned to Ticcanna.

Second to Ticcanna, in critical estimation, stands Allasani Peddanna who has already been spoken of: and next to him, as regards beauty of style, stands Ayyal Raz RamaBhadraya, author of the Ramabhyudaya.

80. All the poets now named appear to have written before A. D. 1700—excepting Muccu Timmanna and the author of the Das avatára charitra; the last century produced but few other poems of any note: one is the Balaráma Vijayam (also called by the pedantic name Prabandha Rája Sirō Bhūshanam), and another is the Bahulásya charitra. These are little more than imitations of the Tára Catha, Das Avatára charitra and other well known tales: but the modern poets conscious of their inferiority to the older bards attempt to outstrip them in grossness of immorality. The Satyabhama Santwanam, a very favourite modern work is conspicuous for its bad taste in this respect. These poets certainly do not go to that unutterable excess of filthy whimsies which we too often meet in the Mahabharat, but their superior elegance and brilliant adornment perhaps only render them the more pernicious.

The Jangama or Saivite literature is as remarkable for innocence as that of the Bramins is for vice. But the Saiva poems will furnish ample subject for another essay. The Lila and the Tale of Sarangadhara, from which selections will now be offered, belong to this class.

81. Among modern poems high applause is given to the Bhanumati Parinayam,* which is a pretty close imitation of the Vasu Charitra. The Telugu versions, likewise, of the Bilhanam, and the Krishna Carnamritalu are, as well as the Cama Cala Nidhi, very popular poems of the 18th century. Among modern writers the highest place however is conceded to Muccu Timmanna, who (particularly in his Nila Parinayam) has used a vast variety of obsolete phrases which excite an irrational admiration. The same taste is displayed in the Satyabhama Santwanam.

82. This dialect is called Açça Telugu (or pure Telugu), a name justly due to many thousand lines throughout the Puranas and poems.

* Distinct from the Bhanumad Vijayam, a Saivite poem which will be elsewhere noticed.

As here applied however, it denotes an Euphuistical dialect (to borrow a phrase from Scott's "*Monastery*") which certainly never was spoken, and goes upon the principle of excluding, if possible, every Sanscrit word. Many of the phrases used in Açça Telugu are supposed to be Canarese words: but the same opinion is held regarding many of the obsolete expressions we meet in the Telugu Mahabharat. The truth perhaps is that these words were originally used in one language and in the lapse of time transferred to the other. In like manner Chaucer, Spenser, and Shakspeare use several words which at the present day are not English but Scotch, or German.

83. The Hamsa Vimsati (7) calls for notice as exhibiting a variety of singular Telugu expressions. This poem is the work of Ayal Raz Narayanappa whose father translated the Ramabhyudaya. It is in five books containing twenty tales; which for morality are parallel to Boccacio or the Tales of a Parrot. But the aim of the work is to embody the various words used in every dialect of Telugu, one tale is regarding a weaver, the next describes a potter, the third a forester, and so forth; and the poet has ingeniously introduced every expression which each particular line of life may illustrate. In fact it is on the plan pursued by Corderius in his Latin Dialogues, or by Buonaroti in his Italian comedies.

84. The Suca Saptati (7), or tales of a Parrot (a separate poem, in three books) seems intended as a supplement to the Hamsa Vimsati or tales related by a Phœnix. In a poetical point of view the Suca Saptati is superior to its predecessor; and, for the sake of variety in amusement, it introduces much of the rough primitive dialects and strange pronunciations found in various parts of the Telugu country. Many of the minor poets have recorded such varieties of dialect but no where do we find them so fully displayed as in the two works now mentioned.

85. We will now proceed to adduce specimens of the most popular POEMS. A few lines of the original will be given in the English character for the satisfaction of those who may wish to compare the poetical language with that of every days conversation. But the entire extracts being too prolix for admission in this journal will be printed separately in the original character.

The first selection is from the Dwipada Rámáyan (7) which though remarkably easy in style ranks as a (cávyam) standard classic. So clear and flowing is the verse that several good judges consider it even more easy than Vemana or the Prabhu Linga Lila which however are far more attractive to the English reader.

I did not at first recommend it to the reader because portions of it are rather above the reach of a beginner: but it has one strong recommendation. For it faithfully reflects the Hindu mind and acquaints us with all its qualities whether amiable or objectionable.* In this respect every page of the Dwipada Rámáyan is worth perusal: and, whether in this or other compositions, the reader should make himself thoroughly acquainted with the Dwipada style of poetry before he proceeds to the *padya cávyam.* He may find this counsel beneficial though his native assistants may recommend another course.

The following extract from the Aranya Cánda or 3d book of this version of the Rámáyan gives the tale of Sīta, the heroine, being stolen from her lord by the giant Rávanásura. To delude the hero, Rama, Márīchi (a giant) assumes the appearance of a golden deer. The poet describes its radiance, and then proceeds as follows:—

86. "The fairy hind was of extraordinary beauty: as it rambled about, "chewing the cud, with a tail as freakish as that of the peacock; the "whiteness of the belly gleamed through the bowers; again its reddish "sides glistered like amber; when vaulting it looked like the rainbow— "or, as it sprung up it flashed like lightning. The forest herds of deer "were startled at its singular appearance: for it lay as in ambush and "its form was suddenly seen now here now there: one while it drew "near, and then as though startled it bounded aloft, rushing through "the thickets—then with a leap it took refuge in a bower. One while "it put its nose to the ground wagging its tail and pricking its ears at "distant sounds. Then it pricked one quivering ear and flew like the "wind: then it reposed on a grassy spot: then rising it drew near the "hermitage, it scratched its ear with one foot and shook the high flow- "ering boughs with its horns so as to pour the blossoms on the soil."

While it thus strayed among the bowers of the recluses, the blooming Sita with tinkling anklets came out of the arbour to collect the opening

* The Ramayan written in couplets is more faithful than other versions in its adherence to the Sanscrit text. I may mention one remarkable instance. In the 129th chapter of the sixth book (Yuddha Canda) is a long description of worship offered by Rama and his companions to the lingam, or symbol of Siva, to atone for the sin of slaying Ravanasa: who is declared to be a sinful wretch and meriting death, but his being a bramin renders it a mortal sin to slay him. This legend inculcates the adoration of Siva; and likewise shews that the sin of braminicide may be removed. This passage occurs in Ranga Natha's version, and also in the Telugu Adhyatma Ramayan; though not in every manuscript: and the entire legend is omitted in Bhascara's and in two other versions, and is even wanting in the Sanscrit copies which we possess in Southern India. Now the Ramayan is more highly honoured than any other poem; it is considered as absolute scripture; and yet sectarian bigotry has led Bramins thus to mutilate a document which they profess to hold in the highest veneration.

flowers: at the sight of this fairy fawn she was filled with surprise; she called to the lord of men, her spouse, and thus addressed him.

Never till this day did I see so charming a creature as this—how I long to recline, O prince, on a couch formed of its skin. O thou leader of the solar race, pursue this creature, strike it, and bring me its hide—yet why? I wish thou couldst catch it without frightning it, which would be far better:—O my spouse—we should keep it at our leafy dwelling, and when our appointed term finishes let us take this golden fawn home to the city and shew it to the king and to my aunts and cousins:—how they will be delighted at such a present! (70—95).

Thus spoke Sita in affectionate tones; Laxmana listened to her and thus addressed Rama: was there ever, brother, seen so bright hued a fawn? Can it be that a brute creature has such wondrous colours? It must be a mere delusion, unfit to be credited! surely it must be a vision raised by (asura) demons—besides, possibly it is the hermit Marichi who lives here, for he is a cruel demon and continually roams the forest in a superhuman form. Have not we heard so—possibly it is that fiend—perchance he has come here to tempt us into ruin. Do not then set your gentle heart on this and be disquieted, or entertain the thought of catching the fawn. Besides—though the lady of Videha (i. e. Sita) should be so simple, be not thou so foolish O prince of men!

At these words Rama looked on the bright countenance of Sita; he smiled, and thus addressed Lacshman (96—110).

Why be agitated at this, O son of Sumitra. Though even it were a giant-raised vision certainly will I bring the deer home, and I will slay the mightiest giants that can come; believe these two points—one or the other will I do: for I will chase it, I will slay it, and give the hide to Janaca's daughter. After so long a time she has made only this one request. Can I neglect Sita? can I decline the deed she points out? stay thou with her affectionately, neglect not the lady of the bower.

He said and committed all to Laxmana; and gently taking his bow from his brother's hand, he bent it, and duly set out, like Siva when he set out in pursuit of the *Lion-giant* who carried off the sacrifice.

* * * * * * * *

"He went on slinking behind the bush stooping as he walked, bending and running alongside; whenever it looked back he stood concealed, he was on the point of catching it, it escaped, and he was vexed. He held the bow and arrows ready to shoot, he laid his footsteps softly on the soil so as to make no sound, as he observed its traces, he eyed its path, and goings (neppu, an obsolete word), and concealed himself. Here it is—I'll catch it—Here it comes—see—Its mine, cried he merrily."

" Thus thought he, but the deer caught a glimpse of him from afar—it let him draw near; but as he stretched to seize it, it bounded from him and fled. Alas cried he in anger, as it stood to gaze at Ráma. Then it fled to the horizon while the foam flowed from the corners of its mouth—it seemed out of heart; then looking at the huntsman it sprung up elastic and fled at speed, while the skies seemed to flash with its brightness; then it vaulted* away; its tongue flashing like lightning bright as a waving torch; for it moved as rapid as a potter's wheel circling at speed. Then it paused as though faint, it seemed to drop close to him—then like a goshawk it flew up to heaven. Ráma was now wearied as well as astonished: he paused, he looked around—but now the creature to cajole him stood still—but as he formed the idea of shooting it, again it vanished: then as he gave up the hope and turned homewards, behold it was again at his side, like a vision; and carried the son of Cácustha who was now wearying, further and further, for deluding his glance, it fled into inaccessible hills (112—150).

Seeing this Ráma perceived that this was a fairy hind—he exclaimed Where, O my foe, wilt thou hide from me? * * * * * * *

So saying he levelled the celesti al arrow at the prey—which instantly rolled over and now laying aside the fairy form, uttering a delusive shriek, cried " O Lacshmana! O Sīta!" (155—165).

Then stretching his prodigious giant corpse on the soil, the wretch gave up his life—it seemed as though all the giants and their prince Rávana fell: as though their capital, Lanca, perished.

When this fairy deer fell on the earth, the lord of Sīta was well pleased: for he clearly saw it was indeed Márīchi: he remembered with approbation the words of his brother. How deeply, thought he, will he and the bright eyed daughter of Janaca grieve at hearing their names uttered in the dying shriek of this deluder: for he imitated my voice exactly: I marvel where they are and what has become of them.

So saying he mournfully pondered. But the dreadful cry reached the ears of Sīta, and struck her with horror to the earth: then when she recovered her senses, she gazed wildly around and was utterly downcast.

Then in her agitation she raised the weeping cry, and gazing on Laxmana, she exclaimed. Alas! son of Sumitra, what may this be that has befallen us this day: surely Ráma cries on thee with weeping voice. O hero, listen to that voice! wilt not thou give ear to it? or does it not reach thy ear? thou shrinkest not—thou shewest no ter-

* (I use various English words to convey the various Telugu synonymes employed. The phrase here is *cuppinchi.*)

ror, or horror, thou grievest not—what is this? while my heart heaves violently with horror and despair! Alas! he went alone into the forest. It is late—and he cometh not—surely he hath this day fallen into the hands of the giants. Delay not—go, I pray thee, to the prince! (166—200).

She spoke, pouring floods of tears and Laxmana replied thus to the child of Janaca.

Mother, why art thou alarmed? surely no evil shall ever befall thy spouse Rama. Dost not thou know the valour of thy beloved lord? Is it right to give vent to words so agonizing? surely this is the scream of some demon who wishes to terrify thy heart. What hath such a pitiful shriek to do with the hero of the Sudar* race. O daughter of Janaca wherefore art thou thus agitated? I will without hesitation follow the prince Rama: and shall the giants who oppose him maintain their footing? they are no more than crickets that exult against wildfire. They will in the end fall into it and turn to ashes or like the mighty serpents that raise themselves against the eagle and perish in his talons—or like a herd of elephants that rush upon the lion† (200—244).

No, I am afraid to leave thee—no—be not weary of me—plant these my words in thy heart. Be not grieved. O daughter of the king of men. At these words the fires of wrath arose in the heart of the lady and grieved, she thus addressed the son of Sumitra.

Thou! art thou faithful towards Rama! why art thou this day so base? even though thou hearest Sri‡ Rama calling on thee by name, thou art, like a foe, filled with hatred in thy heart—is this becoming?* * * * * *

Thus spoke Laxmana with his eyes filled with tears, and as his heart could bear no more he exclaimed Mother, I am gone, I will without delay bring thee thy lord, grieve not!

He said, and departed. But first he drew seven circles round the bower, and said Mother, pass not these limits, and should any one venture to cross these lines, the intruder shall instantly pay for it with his head.

Then he addressed the god of fire, saying. Be not careless. I commit the dame to thee!

* The two most ancient royal houses of India are traced up, one to the Sun, the other to the Moon.

† Which is supposed to feed on elephant's flesh alone. Here and elsewhere I omit the passages which are verbose or needless in a mere version.

‡ Sri is equivalent to saint; and St. George would be called Sri George. Here Sita proceeds to violent language, and as usual finishes by threatening to drown herself.

Then he respectfully bowed to the dame, and anxiously bent his way towards Rámа. The god of purity (fire) guarded Sita, and to delude her foes he formed a fairy image of her* which shone most glorious: so that all would have taken her for the real Sita 245—265.

At that moment Rávaná the giant arose with agitated heart. In one hand he bore a staff, in the other a scrip: in his forehead was an upright mark, and on his fingers he wore large rings of blessed grass with the sanctified thread across his broad breast: his right hand carried a large rosary: he was robed in clayed dust colour vest, with a necklace ... of the blessed tulasi tree, and he walked along stooping with the weight. His body was emaciated, he wore sandals, and a weather beaten umbrella; his hair was rolled up in a large bunch;—in all points indeed he was a feigned friar (sanyási), and walked along counting over his beads and muttering his breviary. He dreaded lest the real monks (muni) should see and detect him; his head tottered with hoar antiquity:—he sidled and stole along peeping to see where the fair one lay concealed. Then he would halt and exclaim Hari! Hari† then a little recovering he drew near the skirts of the bower. At this sight the rural deities filled with alarm exclaimed,—Alas this sinful wretch is come to bear away the innocent Sita! he now stood at the door in the exact garb of a monk. The daughter of Videha instantly arose, supposing that this hypocrite was in truth a real hermit: she folded her lily hands [and incautiously crossed the magic circles drawn around her. These words are spurious]. The lady paid him all due reverence, which he shuddering received and as he viewed the damsel, he spoke thus.

Lady how is it that thou dwellest in this desolate retreat of the forests: how art thou left here alone? art thou Venus, or Psyche, or Juno or how can loveliness so divine be found among the dames of earth-roaming mortals?

* * * * * * *

Who art thou, O fair one, why art thou wearing away life in this wilderness, O tell me. (268 319).

He spoke and Síta reverent replied, I am the spouse, O saintly one, of the stainless hero Rámа. My sire is Janaca, and Dasaratha is my uncle: my name is Síta. As the exalted Dasaratha hath banished us,

* The circles of fire and the delusive shape are mentioned neither in the Sanscrit original nor in the two Telugu versions named Bhàscara Ram, and Adhyatma Ram: the verses do not occur in all the manuscripts and are evidently spurious.

† Equivalent to Ave Maria.

Rāma hath come to this wilderness with me and Lacsmana: we three have taken up our abode in this retreat as steadfast recluses. But a golden hind appeared to me, and looking at the prince I requested its hide—he is gone to seek it: after which I heard a dreadful cry of "O Lacsmana," which pierced and dwelt in my ear. In my grief I reviled Lacsmana and bade him begone: he is gone: and returneth not: I know not which way to turn.

She spoke, and looking at the hermit said Reverend Sir tell me your name and why you are come to this place.

The prince of Lanca scrupled not to lay aside for awhile his humble guise and thus replied (320-334).

Lady of the gentle eyes hear! I am the ruler of Lanca in the midst of roiling ocean. I am the chief of giants, the son of Visravas, and brother of Cuvéra (Plutus), lord of Yacsas (Gnomes) and universally victorious: by name, Rávana [or Briareus] he who in battle faces and vanquishes both deities and giants. Lady! I heard of the riches of thy blooming face, and am come, full of eagerness to behold it. Why O dame shouldst thou thus pining dwell with a paltry fellow in the wilderness? all my realm, O bright eyed lady shall be at thy command with its wealth—for thy comfort and pomp there are bright chariots, and all other princely vehicles: and in the palaces thou shalt be waited upon by the wives and daughters of fairies and demigods, genies and giants. When the light of thy footsteps shines on my realm it shall blaze as with a wall of rubies. O Lady, the lilies of thine eyes shall shed their radiance like a triumphal wreath over my gates. Thy sweet smiles shall shine as the summer moon over the ocean of my happiness. Come come to my city of Lanca (335-362).

He said: at these words Sita was indeed filled with alarm, but like a spirited woman she looked upon him with scorn, and plucking up a blade of grass,* she turned her heart to Rāma and bending her eyes on the grass she thus spoke, without even looking at the enemy of gods.

Fellow! is it fit for thee to address me thus? surely ambrosia was created for deities and not for dogs! what face hast thou to dare to speak to me who appertain to the god-like Rāma? be decent and be gone to thy noble town. If thou wilt not go away by fair means, and if thou ponderest on any iniquity, know that my noble lord is matchless in archery: it was he who burst the bow of Siva and who smote the heads of the giants. He will reduce thee and thine to nothing! thou art to him no more than a fox is to a lion, or a fly to an elephant, or

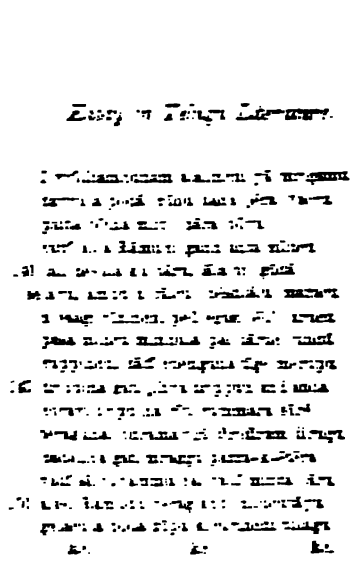
* A common action, expressing, I do not care for these words.

a streamlet to the ocean, or a crow to an eagle! so vast is the difference between him and thee. Be wise then and retire to thy Lanca (363-384).

She spoke but the giant looked furiously at the daughter of Janaca, and throwing off his guise, in his insolence, as love stirred his heart he shook with eagerness and the gems that adorned his ten heads faded away: then had love more power than his twenty arms! he shone glorious in gemmed panoply, as the flames of love lighted up his visage. Dreadful was his form, and at the horrid sight as he advanced to her, poor Sīta fainted before him, she sunk down like a forest blossom before the rushing gale. The five faced giant beheld her drowned in tears, and with panting bosom and dishevelled tresses and broken garland while her whole form shuddered with anguish. He instantly seized the lady of the bright eyes, and placed her on his car; driven by fate to bear with him *her* who was, to him, the goddess of death, this foe of the gods sprung from earth, and hurried his steeds along the skyey road."

We will now insert the original text of a few lines in the English character, to shew how far the poetical dialect deviates from Sanscrit as well as from the colloquial Telugu.

Anina Rāmudū Sītayanan ambujamu
Ganugoni, navvi, Laxmanu çūchi, palike:
Cheliimpan ētiki Saumitri, inta
Ila rākasula māyal edurunē nannu
mrigam aina coni vattu mēt'i raccasula
tegan ēsi pori buttu delasi I rent'i
tempu mai Laxman'a dīni ven dagili
çampi charmamu tech'i, Janaki—k' ittu
inni nāll'acu s'elavu I cōrkē vēd'e
Chinna buttune—Sita cheppina sēta?
hitamativ ai pūni I parnā s'āl'a-n
ativa ēmaracumIv' ani-y-appaginchi
yallana Raghu-Rāmud' anujuni chēta
vill andi mō pet'tī verav oppa vedāli
yāga mrigambu munn arṭhi mē conina
yā gaj āsura vairi anuj jennu mīri
çoncuçu poda marunguna ponchi ponchi
gruncuçu nantanta gūdā bāruçunu
magudī sūçutāyunu maruguna nīlachi
taguluçu dappanga tamacam anduçunu
villun ammula vesa vērchi chē patti
yallana charanāmbul avani pain iduçu
çappudū gāc' undā zādā gangonuça
çoppuna neppunu sūchī d'āguçunu
adē chērē battēdan adē chēra vachēn
adē lō badīyēn ā cani chelanguçunu.



The reader will perceive from this extract that the style of the Dwipada Kávyas, though poetical, is clear, easy, and free from pedantry. The next extract is taken from a very popular poem, now about to be published at Madras. It is the tale of Sáranga Dhara written in the Dwipada metre: the other version written in *padyams* by Chémakúra Venga Rau is remarkable for its purity and sweetness of style: but the Dwipada version is suited to a conversational strain, and therefore more useful to a foreigner. The style in some places proves that this poem is ancient, but it is familiarly read at the present day. It exemplifies the mere dialect of poetry which like the style of Burns shews more genius than classical exactitude. The author states that he composed it in couplets as an improvement upon the story as told by Chémakúra Apanna. To furnish a notion of the Hindu romances (not connected with puránic legends), I will give a summary of this story. It is considered by Brahmins as very immoral: it is precisely similar to Byron's tale of Parisina: but the brahminical criterion of morality is oddly inconsistent: it condemns such narratives while it sees no harm in the fictions that fill the Mahábhárat and Bhágavat.

TALE OF SARANGA DHARA.

Introduction: genealogy of the hero: his birth. His father had a portrait of Sáranga Dhara taken, and sent it to other kings: one of whom offers his daughter Chitrángi to be wedded to him. Description of her charms. The prince's sword being sent to her she is wedded to it and brought home. But his father on seeing her was so greatly enamoured that he persuaded her that the painting represented not his son but himself. Hereupon he made her his second wife: the first who was still living being the mother of Saranga Dhara.

The king one day goes to the chase, the poet gives a lively description of hunting in all its details. Saranga Dhara happened to be at play with other boys, a favourite pigeon escaped from his hand, and entered the window of the tower, wherein Chitrāngi was seated, talking with her parrot. The whole description is minute and lively: she caught the pigeon, and desired that the boy might be sent up stairs to her. The minister's son in vain warned Saranga Dhara, against entering the seraglio; warning him of the peril of conversing with women. The prince rejected his advice, and entered the seraglio. Description of the palace, and the ornaments of the chambers. Interview with the princess. He fell at her feet but she at once gave way to her passions, and was violently enamoured of him. He replies to her flatteries by declining all her civilities a long dispute between them after which he makes his escape and retires.

Chitrāngi being now driven to desperation disfigured herself in a soiled dress as is usual in mourning. Description of evening: night fall and the rising of the moon. At dawn the king returns she accuses Saranga Dhara of having outraged her. The king's fury: he details the charge to his ministers: their horror: they counsel him to ascertain the truth from the boy. The message sent back by Saranga Dhara. The king commands that he shall be put to death: and delivers the royal seal as a warrant to the executioners, who were ordered to cut off his hands and feet, and leave him to perish in the forest. He is carried to the place of execution: the horror and grief that fill the city, where Saranga Dhara was a great favourite.

The king now retired from the court, and lay down on his couch in deep grief. Description of evening.

Saranga Dhara's mother hearing the dreadful tidings repaired in agony to Chitrāngi, and fell weeping at her feet.

The poet describes the king consulting whether he ought to slay his son Saranga Dhara at the instigation of his young wife.

The minister now advises the king to exercise patience: he tells the well known story of the weasel killed on suspicion of killing an infant which it had saved from a serpent; and to exemplify the necessity of caution he narrates the following fable.

TRANSLATION.

In old times there was a prince named Vaidarbha, who had no offspring, and was fond of a scarlet parrot whom he reared: indeed he passed most of his time in talking with it, regarding it as a son. He lavished all his affections on it, and it was so well instructed that it would salute by name any one whom it saw. After some time passed in this manner there arrived a flock of other parrots from the western isles which filled the park; and at the king's permission his favourite parrot went to

converse with them: at last it accompanied them to their home in the isle of Salmali. Here she rejoiced in the variety of strange trees, and the nectareous mango above all. She was assured that those who ate of it should, though old, recover the bloom of youth she considered that her prince would be benefited by this fruit; which she therefore cropped in her beak to bring it home to the palace.

But there was a serpent lying near the tree who saw what she did and in wrath exclaimed. Surely I had come to obtain this fruit, and have waited here for a year in anxious expectation enduring every hardship, and now I can get neither good nor bad of it.* Is it fair for thee to carry it off? Give it me!

But the parrot rose up in the air, and so far from granting his request bent her way home to the palace, and laid the fruit before the king, relating affectionately all that had passed. The prince was delighted, and thus addressed his wife in the chamber. If I avail myself of this, I shall indeed regain a youthful form, but, lady, this will benefit myself alone. I therefore think it wiser to plant this as a seed, let it sprout, and become a great tree, loaded with continued fruit, and the fruits shall be distributed to the aged to restore them to juvenility. Thus shall I acquire the fame of a virtuous deed. His spouse assenting to this he planted the noble fruit, he duly watered it, it sprouted, and grew to be a tree.

But the serpent who erst remonstrated with the bird did not fail to pursue her, and took up his abode in a termite-hill at the foot of the tree, rejoicing to think he would now be revenged. After a while the mango tree bloomed, and shot forth its branches, flowering gaily, and bearing abundance of fruit. At last one mature fruit fell on the soil, and he satiated his malice by biting it so as to infuse mortal poison into it: he filled it with venom, and then returned with all speed to the isle of Salmali.

The watchers in the grove perceived that a fruit had fallen. They took it to the king who rejoiced over it, with his ministers, and said "surely this is the first fruit! let us therefore present it to a bramin, and then shall we securely enjoy the rest. He therefore sent for the (raja-purohita) royal confessor, and reverencing him, requested him to eat it. The bramin ate the envenomed fruit, the poison struck him, and he gave up the ghost. The people were mute with horror, at beholding that highest of crimes the murder of a bramin. The prince was alarmed at this horrid event, he cursed his fate, and it occurred to him that the parrot had brought him this ill fated boon, wishing to cause his

* This and similar vulgarities are continually met with in the Telugu poems: even in the Ramayan and the Vasu Charitra: and such we find in Spenser and Shakspeare.

perdition. He exclaimed death has not befallen me but a sin worse than death: surely this wretch is not fit to be called a parrot! let me cut the sinful miscreant to pieces. He therefore sent for the jewelled cage, and filled with fury, grinding his teeth with rage, cruel as a forester who destroys birds, he seized the parrot in his left hand, and without considering what he was doing, while it screamed out he slew it.

Now listen. There was in that town an actress who was now aged. She had in her youth been celebrated for her talents in the dance and song so that she was amply patronized. But now that she was old, her juniors were incessantly flying at her, and tormenting her and smiting her, so that they drove her out of the house, and she took refuge in the next street. She reflected, surely, in my youth mere words and harmonious notes obtained me large gain: for the applause of the multitude was lavished on me. Now my fate has made all men my foes, and as the proverb says "instead of dealing in roses I am come to selling faggots." Who in the world will endure to live after losing the fashion? It is better for me to resolve to die by partaking of the celebrated poisoned mangoes so that I may at once relinquish my life.

Full of these thoughts she at midnight stole to the enchanted mango-tree, and out of the piles of fallen fruit she picked out one, and devoured it. She instantly found herself a girl of twelve years old: she was greatly delighted, and as the eastern sky reddened towards dawn she returned home dancing and singing, as she passed through the high street so that all who saw her were filled with astonishment. This was reported to the king who was incredulous. But when he saw this dansatrice in the bloom of youth he called her to him, and by the hands of his servants collected the fruit, and in the presence of the people delivered them to his ministers who took them, and distributed them to all. Hereupon venerable couples who had been wedded for a century were miraculously restored to youth.

But when the king reflected on the good brought about by the parrot he was filled with grief at the folly he had committed. Alas, thought he, I reared it as a son, and then sitting at my ease, in perfect coolness I have broken faith, and slain my hapless favourite. So saying he drew his sword, and gave up the ghost.*

And when she thus saw her lord perish before her face, the royal dame accompanied him in death.

Therefore reflect that if you slay your son as this king slew the parrot without due consideration, you will repent the deed.

* Suicide is perpetually mentioned in the Hindu writings as no sin.

THE STORY NOW CONTINUES AS FOLLOWS.

Saranga's mother now approaches the king weeping, and touching her lord's feet, and praying that her son may be delivered to her that they may depart from the country. The king not relenting she entreats the intercession of the spectators, praying a sight of her son. This is granted. The interview is very finely delineated. The arguments used by her friends to console her. Evening now coming on, the executioners separate him from his mother, and convey him to the fatal spot in the wilderness. Description of the forest. He prays their mercy in vain, and at last they cut off his hands and feet. 411-472.

He is left to die: but his senses return: his lamentations: followed by reflections that these evils must be the result of sins committed in a former birth.* He hears a voice from heaven confirming this idea: stating that in a former stage of existence there was a king who had two ministers named Jayanta and Sumanta. To the latter the king entrusted supreme power, and the former wishing to be avenged, bribed one of the queen's handmaids to place his rival's slippers under the royal bed. The troubles that result from this fraud. The blameless Sumanta is put to death. His son was in a succeeding birth thy father and Jayanti is thyself: hence result these torments. This Chitrangi was the treacherous handmaid. Thus spoke the heavenly voice.

It now fell night. The horrible plight of the maimed wretch. His groans were heard by a (Siva-yogi) hermit, who lived on the mountain. He put on his (*yògaràga*†) shoes of swiftness, and was transported to where the victim lay. He accosted him, enquiring who he was. He relates all that had happened, and a long conversation terminates in the lopped limbs being miraculously restored.

It now dawned. The executioners returned to the king, and related regarding the voice heard in the sky: the king's anguish—he sends for Chitrangi who persists in her assertions, and requests that their tale may be proved by producing the amputated limbs. At this moment the heavenly voice was again heard, revealing the truth, and establishing the innocence of Saranga Dhara. Chitrangi is put to death with universal execrations. After sundry miraculous occurrences Saranga Dhara is restored to his father, and at his prayer Chitrangi is likewise raised to life. The poem concludes with a description of general rejoicings. Saranga Dhara renounces the worldly state, and retires to the wilderness as a hermit, where he acquires supernatural powers. The poet concludes by stating that he wrote this poem as an improvement on the version written in *stanzas* by an older bard.

* Here again we meet with a principle that pervades all the writings of the Hindus: "the result of acts committed in a former birth" being referred to as the one solution of all evil or good which we meet in this life. It implies a vague reference to the equity of providential dispensations.

† These are described as seven-league boots worn by hermits on active service.

In this short abstract of the tale, it has been necessary to omit the romantic incidents, various conversations, moral precepts, and poetical descriptions which every where adorn the pleasing original. It must be acknowledged that all the popular "novelists" are of tedious length, but their minuteness of description furnishes the student with an ample stock of phrases, and as is elsewhere noticed spares him the necessity of following the native fashion in committing versified vocabularies to memory.

The next extract is borrowed from the Lila (Prabhu Linga Lila), or HISTORY OF ALLAMA some details regarding which may perhaps be given in another essay. It is an allegorical poem much in the style of the Faery Queene. The metre is dwipada, and another author has in modern times put the same story, nearly word for word, into the *stanza* metre. That version is in point of eloquence far inferior to the more ancient poem.

In the present canto the poet describes the birth of Maia (Phantasy or Cybele), the goddess of delusion: that is, NATURE: who in this allegory is supposed to be born in human form, for the purpose of trying her temptations upon Allama, or "the virtuous man" (the Hercules of Prodicus which Lowth and Shenstone have versified): she is ultimately enamoured of him, and dies of hopeless love, on his vanishing from her grasp. Allama, a human appearance of Siva (or Saturn-Osiris) is described as the god of beauty and wisdom (Apollo-Adonis), and in the fable regarding Maia we may trace an analogy to that regarding Venus and Adonis.

LILA—OR PRABHU LINGA LILA—CANTO III.

There is a country named Belagoli lying on the south of *Méru*] king of hills. All who dwell in that land are worshippers of the Lord of all: all of them are veracious. All the heroes that dwell there are steadfast in the ways of uprightness; all are noble, all are virtuous: their virtue proceeds in due course nor does any sinner ever tread its streets. In the midst of this land is a city bright as the sun; can we call it the abode of the goddess earth: or shall we call it her face? Its name is Banavasi.*

To narrate its splendour is beyound the powers of Bramha! Its groves are filled with blossoming mango trees and areca trees; with budding lemon trees and plaintains; with the fruiting artocarpus (jaca) and citron. Also the charming asóca and (málúra) oak trees with the (sarja) pine tree and the date; the golden champaca: the (vacula) mi-

* In the Soonda country, on the south west coast of the Peninsula.

musops and (bhunja) the flowering birch: these and thousands more filled the fragrant groves. These were tenanted by the linnet, the parrot, and the redbreast in endless flocks: they sported around, singing merrily. The fragrant Kétaki, the oleander, the laurel, the (pagada) coral and giant jessamine with the spherical species of jessamine and mountain roselle, and larger *curuvinda* and the (párijáta) amaranth: the various jessamines called *vásantica* and viravádi *jáji* and the smaller jáji and the (chámanti) orange-marigold; for at all seasons these flowers call upon the devout to worship their God. They blossom without intermission, and perfume the breeze as they lie scattered through the parterre. The piazzas therein erected were plaistered with musk, and around them were spacious streets: these were adorned with dolphin crests and gay garlands which were daily renewed throughout the town. And the floors were sprinkled with *gomayam* dissolved in essence of sandal shedding a sweet perfume around. And who is it that, tipsy with these intoxicating scents wanders around the banks of the lakes, and stealing upon the sleepy-eyed maidentouches her bosom with glee? sportively tossing up her veil he plays with her jetty locks he takes every liberty,—he stirs the spirit of merriment; for, roaming like a lover through every alley of the town, welcome to every cheerful heart he strolls at will? It is the vernal breeze, Vertumnus himself.*

* * * * * * * *

'The height of those bastions the depth of that fosse? angels may 'tell the one and demons† the other! no other can comprehend it who 'then can even imagine the loftiness of the towers, and sky-touching 'pinnacles?

'The roars of the elephants, the clang of their bells; the gaudy 'heralds, and their fluency of tongue: the resounding cries, the min-'gled voices and echoes, and the clamour of the people who can des-'cribe?

* * * * * * * *

The poet now describes the king named Mamacara (Egotistes), and his wife named Mohini (Formosa) whose child is (Maia) Illusion. He then proceeds as follows:—

'Now Egotistes and Formosa were delighted at their little daughter 'Maia, and could not keep their eyes off her; all their thoughts were 'bent on her; never was her figure out of their mind: they would clasp 'the babe to their bosoms, nor would let her grieve; they laid her at 'their side, and could not keep away from her a moment and surely,

* In this passage the other version is bombastic.

† In his Christian poem, the Tembavani, Beschi introduces such flowers of rhetoric into his Tamil composition.

'cried prince Egotistes this cannot be a child of ours! it must be a fairy 'babe! let then her name be MAYA.

'The nurses gave her the breast, they anointed her head and bathed 'her nicely, and then wiped her dry, and laid her on the lap; they gave 'her butter and honey, and touched her eyes with collyrium: they put 'a mark on her forehead with ashes, for luck, and spread out a clean 'sheet, in which they affectionately laid her: then with loud voices 'they began the lullaby, till she fairly fell asleep. The cradle was 'richly adorned with gems that reflected her image; which she took for 'another child, and playfully stretched over her hands towards it: she 'gently passed from her mother's arms to the arms of her father: and 'prettily embraced her papa's neck, all in a tremble with delight as 'they gave her kisses, and she played about full of glee. They deck-'ed her feet with fair rings and anclets which rang as she stamped in 'tottering along. Then they put rings and gold bracelets on her wrists, 'and a pretty gold fig leaf adorned her forehead. They next put on a 'gold necklace of the oleander petal fashion with rows of large beads of 'fine gold.

'Thus completely decked out, she most merrily sported about with 'the other girls: while the hearts of her parents, nurses and playmates 'were filled with joy. Thus did Máya pass her infancy. All others 'were astonished at her cleverness, and praised her with a thousand 'mouths. But very shortly Máya (perfect as a teacher of gymnastics), 'might have given lessons even to elephants and swans in elegance 'of swimming gait. In musical melody she rivalled the linnet and the 'nightingale; in prettiness of accents she might have had parrots for 'pupils. After a while she began to bloom in youth: for the tricksy 'maid often used childish words but kept her thoughts to herself: she 'soon learnt to roll the eye, and use the artful beckon with the hand; 'or with the frown of anger on her brow, and frolicksome fun in her 'breast. Those who eyed these intoxicating charms at once turned 'fools, and fell in love with the girl. Then as she attained fuller ma-'turity, her manners were formed! what a bloom, what loveliness, 'she displayed! what a grace in walking! that delicate waist, that 'swelling bosom! that forehead! those swimming eyes! those elegant 'hands, that smiling countenance! those flowing tresses! surely in 'these charms the sweet Máya outshone all other women!

'Now the king built a palace as the abode for Máya [Delusion] who 'holds the universe in her power. He raised the walls blazing with 'gold and rubies; therein he placed courts, abodes, streets, and great 'storehouses; he encouraged all trades, he appointed men skilled in the 'elegant arts to teach poems and plays to the damsel.

'In the next place the Prince Mamacára contemplated disposing of 'his daughter in marriage.' &c. &c. &c.

In the next extract is described the death of Maia for love of Allama (or Atys—Saturnus). Her companion Vimala (a personification of *Purity*), dies with her.

CHAPTER VIII.

'But when Allama thus vanished, Máya was filled with the deepest 'affliction; she cast her eyes on her playmate Vimala and exclaimed, 'with downcast looks—"Now with what grace can I venture to appear "in the presence of [Parvati] the Queen of Heaven: how can I ap- "proach the courts of Hara (Jupiter) and his awful spouse? Surely "I alone out of so many attendant ministers ventured on this arduous "task! Alas sad Destiny!"

'Thus exclaimed she, grieving in her very soul: but the king of men 'now entered the grove in quest of his beloved daughter; after some 'search he found in a remote spot, with her handmaidens, his child, all 'woe be gone and sunken with grief. The prince and his spouse affec- 'tionately raised and embraced their daughter, exclaiming, "What 'dreadful grief, my darling has Siva poured on thee! There is even now "a mountain chief, son of a king, who has sent to demand thee in "marriage, but thou hast to-day thrown thyself away, and become the "victim of a minstrel! how canst thou have fallen into this sad state? "How many counsels has thy mother given thee in vain at midnight! I "am leader of all the hill chieftains, and thou dost not even think on me "my sweet babe! Did ever any body ramble in this way like a rover "from house to house, and break the established laws of custom? or "do they ever thus depart from the commands of their parents? It is "too late! what is the good of building a bank after all the lake has run "dry? come, arise, mount into thy litter, and return home."

'But Vimala viewed the king, and in bold accents thus replied: "She promised the Queen of Heaven that she would in a moment seize, "and bring him to her. Such were her words, uttered in the presence "of Siva, before she descended on earth; and she has failed of accom- "plishing what she swore to do. She and I will immediately depart to "Olympus. Have done then with these vain lamentations. Return "to the City. Fare ye well!"

'She said and Vimala and Maia instantly took their way to the "Olympic regions.* But the queen and her lord were overwhelmed 'with grief, they groaned and cried saying "Alas my daughter, my 'daughter!" rolling on the earth they were defiled with dust, wallow-

* A phrase understood to denote sudden death: probably suicide.

'ing and wailing, "thou art gone," cried they—melting, distracted 'they cried alas alas; agitated with anguish and beside themselves, 'wringing their hands, and beating their breasts, Alas cried they, my 'beauty, my charmer, my own delight, my sister, O shall the day ever 'come when I forget thee?'

'Thus cried they still in their affliction, when the noble Ahancára '(the king's minister) approached them. Why exclaimed he, "why "this grief when it is too late! is it possible for mortals to avoid the "doom fixed by the deity? surely the fair Maia dwelt among us for a "certain object, and she is now gone; she is no more a daughter of "yours: surely you have heard this in the last words of Vimala; then "why should you grieve any longer. If we do not return to the royal "dwelling the hearts of men will be filled with uneasiness: all our "dependants will quit our banners, and will betake themselves to other "princes."

'Such were his counsels to Mamacára, lord of men, who lent an ear; 'he brought him back to the palace, where he continued to rule the 'land prosperously.

'Meantime Maia and Vimala stood, "there" in the presence of 'Sancara's awful Queen: they hung down their heads and drew lines* 'on the floor. The goddess at once perceived that Allama had not fal-'len in the hands of Maia: her gay cheer vanished, and she drew a 'deep sigh: the daughter of Olympus did not approach her lord, but he 'perceived all the fact: forthwith he proceeded to the dwelling of his 'fair spouse, and with overflowing affection consoled her: then, not de-'sisting from his first intent, the vanquisher of Pluto thus addressed 'the dame, in words that conveyed a double import. "It is easy "enough to snare thunderbolts, and roast them like larks; it is easy to "handle serpents and fiery dragons; to seize and draw out the fangs "of death; but where shall we find him on earth who will be able to "tempt and conquer Allama?† what is woman? and what is woman's "resolution? But never mind; the affair is over, O daughter of hills! "forget the grief that has filled thy heart."

'Thus he addressed her; but she replied saying--when I sent Maya 'on earth in my stead, surely thou wentest thyself in the guise of 'that Allama, and thus hast thou succeeded, and I have lost: now pray 'be quiet.‡ He replied, listen Parvati, you had the presumption to 'concentrate all your (tamasam) powers of delusion, and moulded it 'into woman; her you sent to earth, and you have brought this ridicule

* With the toe: a Hindu expression of regret.

† Allama being an emblem of the deity.

‡ The Homeric simplicity of phrase gives an odd appearance in a translation, here as elsewhere.

'on yourself. Him who is endowed with the highest innate bliss you 'looked upon as a mere mortal. Can delusion or illusion contend with 'him? Is he subject to any of the (cáya guna) ties of the flesh?

'But the queen listened to the reiterated arguments of her spouse, and 'now wearied she replied thus alas what avails my much speaking? 'after defacing me you present me a mirror! what am I that I should 'lay the blame on you: thou art the very fountain of goodness: then 'pardon me.

'The god gazed on his fair spouse, and kindly said, be patient if pos- 'sible this once: I will myself heal all thy grief. She arose and rever- 'ently saluted him, and with deep devotion she folded her hands and thus replied: In what way wilt thou do away this affliction?

'Then to the goddess replied that chief of gods.

'Send down to earth that pure spirit of (sátwica) benignity which 'is in thee: let her be filled with faith and self denial, being entirely 'released from the law of works. For wherever dwells faith (bhacti) 'there shall the lord (Prabhu) abide. Therefore shall he voluntarily 'draw near to where thy Benign spirit (satwica cala) dwells, he shall 'shew forth his own form, and full of grace shall he bestow exceeding 'gladness on the damsel.

'The goddess listened and replied great is thy goodness. Forth- 'with she sent the spirit of love (satwica cala) on earth, and now was 'restored to heartfelt comfort.'

What has now been cited from the poems written in couplets may suffice to shew the general turn of that class of literature: a few specimens of those poems which are framed in stanzas may perhaps be produced in a future paper. Indeed the *caviams* are like the odes of Horace written in an elevated style which cannot be competently represented in a prose translation, unless we were to use such a dialect as is found in Darwin's poems.

The higher branches of poetry in Telugu as in other cultivated languages, can seldom be enjoyed by foreigners. Indeed among natives few alone have by long study become familiar with all the refined phrases, the historical and mythological allusions that occur. And we may reasonably entertain a doubt whether so complete a knowledge is worth the toil of acquisition. But those popular authors who have furnished the extracts now made, are, after moderate application easily comprehended, and will furnish an ample stock of useful and agreeable reading.

INDEX TO THE PRESENT ESSAY: THE NUMBERS REFERRING TO THE PARAGRAPHS.

V.—*Sixth Report of progress made in the Examination of the* MACKENZIE MSS., *with an Abstract Account of the works examined.*—*By the Rev.* WILLIAM TAYLOR.

A.—TAMIL.

a. Palm-leaf manuscripts.

1. *Bhágavatam*, No. 12—Countermark 18.

This manuscript, with another, incomplete copy were adverted to in the beginning of the fourth report; and the four first books were therein abstracted.

The following is a continuation.

Fifth book, or *Cándam.*

The story of the eldest son of *Svayambhuva manu*, is begun by the narrator. The name of the said son was *Priyavrata.* He was taught by *Nárada*, and declined to comply with his father's request, that he would solicit possession of his father's kingdom. *Brahma* came and expostulated with him; on which he consented to be crowned, or instituted, to the kingdom. On devolving his charge *Svayambhuva* retired to the *tapóvanu*, or wilderness of penance. *Priyavrata* married a daughter of *Visvacarma* (artificer of the gods), and had ten sons. Three of them were devout, and obtained final emancipation. The other seven sons acted agreeably to their father's directions. *Priyavrata* had three other sons, by another wife. He reigned a long time. A celestial car, sent from *Vishnu*, came down. Mounting this car, he surrounded the mountain *Maha-Meru* seven times, in seven days. The tracks of the wheels formed the seven seas; the intervals between them are the seven great *dwipas*, or islands. The name of the seas, and intermediate *dwipas* are given: (see Or. Hist. MSS. vol. 1, p. 48). The seven obedient, and secular, sons of *Priyavrata* were instituted to the kingly rule of the said seven *dwipas.* Subsequently *Priyavrata* obtained beatification. *Agni druhva* married, and had nine sons by *Purvasidhi* his wife, who was a special gift from *Brahma;* and who, on dying, returned to the *Satya loca*, the highest orb, or *Brahma's* world.—The nine sons aforesaid, ruled over nine divisions of *Jambu dwipa*, which divisions were called after their names. *Agni Druhva*,

inconsolable for the loss of his wife, had many great sacrifices performed: and at length rejoined her in Brahma's world. *Nabhi*, the eldest of the nine, performed a sacrifice, directed to *Vishnu*, for the sake of offspring. *Vishnu* appeared, and gave him a promise that he would himself be born as the son of *Nábhi*. This promise was accomplished in the birth of *Rishabha* (always reckoned among the subordinate incarnations of *Vishnu*, and a leading personage with the *Jainas*). Both father and mother relinquished their rule; giving it into the hands of *Rishabha*: they then retired to an ascetic life, and finally were beatified. *Indra* gave his daughter in marriage to *Rishabha* (symbol for a felicitous marriage). *Bharata*, and one hundred other children, were born; and as *Bharata* ruled the country, it was called *Bharatacandam* (the country south of *Himalaya*). The different portions of his sons are specified. Some of them performed ritual ceremonies, and became Brahmans. *Rishabha* relinquished all his possessions; and went away, followed by his children. He advised them to leave off the use of ceremonies, and to practise justice, and charity, with similar instructions; which (in their place) are of superior character.

Paricshit, interrupting the narrative, enquires of *Suca* why *Rishabha* relinquished his possessions. *Suca* replies, detailing those reasons; the tendency being to enforce such a renunciation. Death of *Rishabha*. Account of *Bharata*. He was guilty of misconduct; and, as the result, in transmigration was born as a deer. Doing penance, his former sense returned; and, in another transit, he was born a *Brahman*. A chief being without children vowed to present to *Durga*, a *Naraball*, or human sacrifice. *Bharata* was caught by the people, sent out for the purpose, and by them was forcibly carried to a shrine of *Cáli*. He was painted red, and covered with red flowers, and other ornaments. The said *numen* was greatly incensed; came forth; drew her sword; cut off the heads of the people, who had brought the purposed victim; danced about, holding their bleeding heads in her hands; drank the blood as it streamed from those heads; and then retired within her dwelling, satisfied. The *maha purusha* (or Brahman) thought that certainly *Vishnu* was present (as a preserver), and then retired to the fields again. It so happened that a king of *Sindhu-desam* became desirous of going to visit a sage, who had obtained high repute for teaching the *tatva* system. The people of this king pressed the before mentioned *Brahman* as a palanquin bearer. He meekly yielded; but, in the effort, was quite inferior to the other bearers: and could not carry his burden even, or without jolting. The *raja*, being displeased, enquired why the other palanquin bearers com-

plained so much of the newly pressed bearer. The result led to a discourse on spiritual matters, between the *raja* and the *Brahman*. The *raja* was so much pleased with this discourse, that he took the *Brahman* to be his *guru*, or spiritual preceptor. The latter avowed himself to be *Bharata*, recounted his past history; and then taught the king of *Sindhu*, spiritual knowledge, turning on the vicissitudes of earthly things. The *raja* returned to his own country. The *Brahman* (i. e. *Bharata*) left off keeping the fields, which office had been assigned to him by his former master. He now wandered about; passed the remainder of his life without control; and at his own pleasure.

The posterity of *Bharata* follows in succession. Afterwards there is a full description of the seven *dwipas*, seas and other matters, according to *Pauranical* geography. The channel of one river is filled with flowing juice of mangoes; they who partake of this *amrita*, or nectar, overcome death. The account of the different regions is full and particular. In *Pushcara-dwipa* the day and night is said to consist, taken together, of a year (which of course is the case near the polar regions): no distinction of caste is observed there. Beyond is *Chacravali-giri* (apparently the north pole), and beyond that a golden country (region unknown). The sun goes round *Chacravali-giri*; and, in that land, reverses its order of rising and setting.

A transition is then made to the stellar sky, or world of the stars. The inferior worlds are noticed; their rulers and inhabitants are described, down to *Naraca*. A description of the pains, penalties, and severe inflictions visited on the guilty in *Naraca* is given. It is minute, circumstantial, revolting; and it fails of the awful sublimity of the Christian revelation, on this point, as to simplicity and grandeur: inasmuch as the details sometimes verge on the ludicrous; and, in other instances, are shocking, without being impressive.—With the enumeration, on this subject, as indicated, the fifth book concludes.

Remark.—Upon the slightly altered plan of my reports, the abstract of one book, at a time, may be proportionably sufficient. According to inferences by Sir W. Jones, *Svayambhuva manu* has been identified with Adam, the progenitor of mankind. That such, however, is the reference of the name in this document I greatly doubt: the facility with which the same names are applied to different persons, at distant places, and periods of time, may easily reconcile any discrepancy. That *Priyavráta* is said to have had ten sons, I desire to be noted; without, at present, drawing any inference therefrom. As to further, and following matters it does not seem needful for me to make any special annotation.

2. *Sevendhi St'hala puranam*, or legend of the fane at Trichinopoly, No. 25—Countermark 34.

This document is divided into thirteen sections, a brief abstract of which is herein added.

1. The usual invocations, and panegyric of *Ganésa*, &c.

2. The glory of the hill on which the fane is built. Even wild beasts lived in harmony on it, and sacred *rishis* dwelt there. *Gautama-rishi*, coming to visit them, narrated, at their request, the excellencies of the place, as he had received the statement from *Sanatcumara*, who had received the same from *Subrahmanya*. *Trisira* dwelt here; and from him it derived the name of *Trisira-mali*. The rock is a splinter from *Cailasa*, originating in a quarrel between *Vayu*, and *Adi-seshan*. It acquired the name of the southern *Cailasa*.

3. The penance of *Brahma* at this place: the legend of the lie told by *Brahma*, as related in the *Scanda purana*, and *Arunachala puranam*, is introduced; and *Brahma* being doomed by *Siva*, in consequence of that falsehood, was told that the evil denounced would be removed by doing penance on this hill.

4. The legend about *Agastya*, *Gautama* relates a conversation between *Siva*, and *Náreda*. The latter of whom told the former that the *Vindhya* mountain was not to be compared with *Trisira-mali*. *Agastya*, being sent from *Cailasa*, was directed to visit this hill, and afterwards to proceed to *Pothaiya-mali*. *Agastya* accordingly stamped on the *Vindhya* mountain, with his pilgrim's staff, reducing its level thereby. He afterwards visited *Trisira* hill, and then went on to *Pothaiya-mali*, in the extreme south.

5. The legend of *Indra*. The celestials of *Indra's* world, being unable to bear the oppression of *Chemban*, an *asura*, complained to *Indra* their chief; who, under directions from *Siva*, killed the said *Chemban*; and then, by doing penance at *Trisira-mali*, effected an expiation of the crime.

6. The legend of the *tirt'ha*, or sacred pool. *Uma* asked *Siva* the place of this retreat: in reply he designated *Trisira*, a hill. She then desired that a reservoir of water might be formed there; and *Siva* directed *Ganga*, in his hair, to provide one; which accordingly was effected, in which *Uma* afterwards bathed.

7. Legend of the sacred town. *Gautama* tells the *rishis*, that *Trisiras* was one of the relatives of *Rávana*. He came to this hill; and there, of his own accord, rendered homage to *Siva*. He built a shrine,

and a town, at the foot; surrounded by walls, and battlements. He received from *Siva*, at his solicitation, the privilege of having the rock, and town, called after his name; and after residing there some time, he died.

8. Legend of gifts obtained. *Gautama* informs the *rishis*, that *Rama-Chandra*, *Hanumán*, the five *Pándavas*, and many other distinguished persons, paid homage here, and received the benefits which they sought: in consequence of which the fane became highly distinguished.

9. Legend concerning *Sára-maha-muni*. A certain *Brahman* did penance at *Himálaya*; and, in a subsequent transmigration, was born at Benares. After other changes, he was born as *Sara-maha-muni*; and, doing homage at this place, acquired the gifts which he desired; whence this place became highly distinguished.

10. Legend of *Sura vátittan*. One of that name visited this celebrated hill, with a great number of followers; and, after erecting various buildings, he ruled here, as a district chieftain.

11. The same subject continued. States the marriage of the same person, with a woman of foreign birth; after which he added other buildings, and continued his rule.

12. The destruction of *Uriyur*. *Sara-maha-muni*, before mentioned, had a garden planted with the *Sevendhi* flower plant. A person was in the habit of stealing these flowers; and presenting them to *Parantaca** *Cholan*, the king. The *muni* one day detected the thief, and complained to the king; who took no notice. In consequence of this neglect the ascetic performed penance, and made application to *Siva*; who sent a shower of mud, which destroyed *Uriyùr*. The king, with his wife, fled; his wife was pregnant, and cast herself into the *Cáveri*. The King, fleeing on horseback, was overtaken by the mud-shower, and killed. By the favour of *Siva*, his wife was taken out of the *Cáveri* alive; and was entertained by a *Brahman*. She was delivered of a son in *Jambu-diru* (a small island in the *Caveri*), who was brought up by the *Brahman*. When search, by means of an elephant, was made for a king, the elephant found out the young man; and put the usual wreath of flowers on his head. He was installed as king, and as the Brahman had marked his feet with charcoal, he acquired the name of *Cari-Cála-Cholan*.

13. The legend of *Tayuman*. The origin of *Caveripum-patnam*, is ascribed to certain women casting their garlands into the *Caveri*. That town was very flourishing, and a *Chetti*, or merchant, was especially distinguished. He had a daughter, who was married to a person at

* "The destroyer of foreigners," an epithet; other books, gave him other names.

Trichinopoly, named *Tana-cuttan.* Her father named *Athan cuttan,* died, when she was in an advanced stage of pregnancy; and as she had no attendants at the time of her delivery, *Siva* himself assumed the shape of a mother, and performed the office of *accoucheuse;* which the celestials beholding showered down flowers. Whosoever pays homage to this same *Siva,* will receive all manner of benefits.

Remark.—The manuscript is complete, and in very good order. The earlier legendary portion points to a time when there were no Brahmans in the country; when it was a province of *Lanca,* or Ceylon (in all probability connected therewith by an isthmus); and antecedent to *Rama's* invasion: which also apparently preceded the visit of *Agastya,* who first led on colonist *Brahmans,* and directed them to various localities in the *Peninsula.* The mythological treatment of *Brahma,* can hardly escape remark: however that I pass by, as a common matter in *Saiva St'hala puranas.* The 10th section would be obscure, but for a glossary afforded by a *Mahratti* manuscript, written at Tanjore, and abstracted in my Fifth Report. By its help *Sura vátittan* is identified with the first of the series of *Chola* kings. The 12th section has heretofore received abundant illustration: see, in particular, remarks on the *Chola patayam* in my Second Report. The 13th section upsets altogether the fiction of *Tayuman-nalli* as a founder of the shrine: and enables me to perceive, that the wealth of the famous merchant of *Caveripum-patnam* (see Tamil MS. book No. 1 Third Report) when renounced by himself went, in a great measure, to this place; so that *Siva,* by means of his *Brahmans,* became administrator to the effects of the bewildered man, when unable to take charge of them himself. Such, in my view at least, is the interpretation of the enigma of *Siva* becoming "a nourishing mother" designated by the term *Tayumàn,* or the Sanscrit *Matri-bhuvésvara.*

3. *Mahratta* and *Tuluva-desa charitra,* or, an account of the *Mahratta,* and *Canara,* countries.

No. 234—Countermark 57.

This manuscript consists of loose leaves; for the greater part unconnected. At the first reading it disappointed me; and was laid by. But reading it over after having abstracted the *Carnataca rajakal,* this book appeared to possess great similarity, in such fragments as were at all connected. On comparison, it was found to consist of portions of

another copy of that work. By means of it I have been enabled to complete the restoration of the larger lacune in the *Carnataca rajakal*, which is now complete, with the exception of only one palm-leaf, not recovered.

Note.—The leaves, and writing, are recent in appearance: a little injured by insects, which is of no consequence, as the work is otherwise nearly complete.

4. *Mahrattiya rajakal, Tuluva rajakal, kyfeyutt*; or account of the Mahratta, and *Tuluva* kings, No. 235—Countermark, wanting.

The manuscript has not the beginning: since according to the number of the palm leaves, 26 are wanting: the eight following ones down to 34 are regular; but the whole is a mere fragment. The 27th alludes to kings of the *Cali-yuga*, it contains the mention of *Hara-Pratápa-deva rayer*, and his descent is deduced from *Janamejaya*. The manuscript has a discrimination of the five countries, and languages, comprised under the term *Pancha-Drávidam*. From *Rameswram* and *Malayalam* to *Calahastri* is the Tamil *Dravidam*. From *Calahastri* to Ganjam is the *Telinga Dravidam*. From Mysore to Golconda is the *Carnataca Dravidam*. From *Golconda*, to *Puna*, *Sattara*, &c. is the *Mahrashtra Dravidam*. From *Sattara* and *Puna*, to the southward of Delhi is the *Gazeratti Dravidam*. The five *Gaudas* are then defined. Mention of the race of *Janamejaya* down to *Saravgad'hara* the last of that dynasty. Four names are given as the dynasty of the *mantri*, or minister, of *Vicramaditya*. There is then a mention of some kings of the *solar* line: with the name of *Vicrama* at the close; apparantly meant for *Vicramáditya*. *Sáliváhana* is next mentioned, with an interval of more than 2000 years; not accounted for in the dates. *Bhoja raja*. Transition to *Cari-Cala-Cholan*, and his works on the *Caveri*. Other *Chola rajas*; one of whom is said to have ruled as far as to Ougein. Special notice is taken of *Rajendra's* endowment at *Tiru-ottiyr*. He is also represented as having patronized Tamil literature: contrary to other documents he is represented as the father of *Adondai*. However both *Rajendra* and *Kulottunga* (elsewhere termed father of *Adondai*) are both titular names. *Sundara-Chola* is the last one mentioned.

Remark.—This manuscript I also find to be a fragment of the *Carnataca-rajakal*, and it is of no consequence; as that portion is complete in the restored copy. What remains of this fragment is damaged. The label does not bear all the usual marks. But from the consecutive Nos. 234 and 235, and the title taken together, I conclude that these two copies

are those entered in Des. Cat. vol. I. p. 200, art. 13, under the head of *Tuluva desa katha.*

5. *Cusala nátaca*, the drama of *Cusala*, the son of *Rama-Chandra*, No. 113—Countermark, wanting.

The former portion of this manuscript contains the said drama, entirely in verse of the *viruttam* kind. It is complete, and in good order.

The latter portion is a prose version of the adventures of *Nala-raja*, according to the episode in the *Mahabharata*. It is in good order, but not quite complete at the end: a few leaves only remaining to be written.

Another copy of the drama No. 114, ought to be in the collection, according to the Des. Catal. but it is not now to be found therein.

6. *Cusala-nataca*, the same, No. 115—Countermark, wanting.

This is a copy of the drama only, in verse, with a prose version, and some musical indications, as is gathered from the remains; but the whole manuscript is so greatly injured, by insects, as to be almost destroyed, and quite irrecoverable.

Remark.—The story of *Nala* needs here no further observation. The drama is founded on the birth of *Cusala* and *Lava*, sons of *Rama* of *Ayodhya*; of course with the additions and inventions customary, in dramas.

Note.—The drama is entered in Des. Catal. vol. 1, p. 213. art. ii.

7. *Agastyar vaidyam*, a medicinal work by *Agastya*, No. 79—Countermark 242.

This work contains 1500 stanzas, on medicine, ascribed to *Agastya*. The book is complete, and remains uninjured.

It is entered in Des. Catal. vol. 1, p. 258, art. i.

8. *Vaidyam Munnur*, No. 88—Countermark 248.

This work on medicine, also ascribed to *Agastya*, should contain 300 stanzas. This copy is however not complete: at the beginning thirteen leaves are wanting. From the fortieth leaf, five others are deficient. It is thenceforward regular to the eighty-seventh leaf, and the remainder, at the close, is not found. It is otherwise in good order, and preservation.

It is entered in Des. Catal. vol. 1, p. 250, art. v.

9. *Tiru-mulur-Vaidyam*, No. 92—Countermark 255.

This also is a medical work, complete in sixty-two palm leaves, and not injured by insects.

It is entered in Des. Catal. vol. 1, p. 260, art. x.

10. *Vaidyam Nápattettu*, or forty-eight stanzas on medicine, No. 91—Countermark 251.

A tract on medicine, ascribed to *Agastya*, which should contain 48 stanzas; it wants the last one: the remainder is complete, and in good order.

It is entered in Des. Catal. vol. 1, p. 259, art. vii.

11. *Ullam udiyan*, No. 67—Countermark 230.

12. Another copy, No. 68—Countermark 229.

These are copies of a work on astrology and divination. The literal rendering of the title is "the possessor of the interior," whether it relate to thought, mind, or purpose. The title is also that of an individual to whom the work is ascribed; but I rather think that, the author's real name being unknown, the title of the work itself became in progress of time applied to him, as a distinctive appellation. The work is popular; and takes in a great compass of matter, on the subjects to which it relates. These are the influences of the planets; the effects of the signs of the zodiac; and similar matters purely astrological: and in divination, it teaches the art of discovering things lost, or things concealed, and of explaining to persons what they may hold folded up in their hand, or what may be the secret purport, or intent, of their minds. In a word, it is on the occult sciences, for which Egypt and Chaldea of old were famous; which rule in this country, at present, with absolute sway over the superstitious minds of the people; and of which remnants are found in every country of the globe.

The composition of these two books is mingled verse and prose; but the latter predominating. I regret that I cannot make the subject one of study: even my examination of such a work must necessarily be superficial. But I do not hesitate to state my opinion that, subordinate to a good knowledge of the history and mythology of the Hindus, the next thing, in point of importance, is an intimate acquaintance with their occult sciences. By the means of this work, and similar ones we may acquire a better knowledge, than we as yet possess, of the Hindu celestial sphere; absolutely requisite in order to solve the astronomical

enigmas which abound in their historical and mythological works; but more than this we may get at the key which unlocks the popular mind. Strong as may be the bond of caste; powerful as may be the spell of mythological fable; neither are stronger than the astrological conjuration, which holds the people under a charm, more potent than that effected by Prospero's wand; and has in past ages, even down to the present, rendered high and low orders alike subject to the astrological Brahman: not daring to stir a step, or do a single thing, of any moment, without his permission first obtained. So varied and combined, so intricate and confused, are the various connected parts of astrological lore, that a state of passive inaction is the only safe position for a genuine *Hindu*; and his guide can shew cause, or reasons, almost at his pleasure to cause him to move, or to stand still. That this despotic influence should be known, and expounded, for the benefit of rulers, legislators, and teachers, surely must be highly desirable.

As to the condition of these two copies, No. 67 is incomplete; some palm leaves in different places, to the extent of forty-three, are wanting; neither is it complete at the end. It is a recently copied work; but notwithstanding is slightly touched by insects. No. 68 is complete, and wholly uninjured: the leaves and writing are quite recent.

NOTE.—Both copies are entered in Des. Cat. vol. 1, p. 254, art. iii.

b. MANUSCRIPT BOOKS.

Manuscript book, No. 15—Countermark 227, *Subrahmanya Cadavul*, an astrological work.

The title only means "lord Carticeya;" apparently technical, in consequence of the invocation being not addressed, as most usual, to *Ganesa*, but to *Cumara*. The *rishis* are honoured, the plan of the work is given, and then a variety of astrological particulars follow as to friendly, and unfriendly, aspects of planets, influence of zodiacal signs, lunar asterisms, and similar matters, in somewhat full detail. The work is a thin folio. It is cleanly written, on strong country paper; and is in perfect preservation. It is also complete.

An entry occurs in Des. Catal. vol. 1, p. 254, art. i.

Manuscript book, No. 19—Countermark 228, *Sarvardha Chintamani-jyotisha*, a work on astrology.

This book on the same general subject, does not seem to be complete; since only about one-third is written on, and the break appears abrupt. The ink is a little pale; but the paper good, and in good preservation.

Abstracts of such works are impracticable. Both of these fall within the compass of remarks, which will be found elsewhere made on the importance of a full development of native astrology.

It is entered in Des. Catal. vol. 1, p. 254, art. ii.

Manuscript book, No. 15—Countermark 908.

Section 1. Rules of observance in the *Onam* festival in Malayalam.

A general festival of four days corresponding with the *Dipali*, dated from *Maha Bali*, and the circumstances of the *Vámana avatára*, said to have been transacted in the Malayalam country. During this festival, bathing, putting on new cloths, looking at spectacles, or joining processions, are the matters detailed; referring to manners and customs, but also shewing how carelessly *Hindu* fiction deals with distant times and places.

Section 2. List of books in the library of the Travancore *raja*.

A catalogue amounting to 181 books is given, the titles, being written both in Telugu, and Tamil, characters. Sections 3 to 5, relate to district productions in Travancore, and to revenue details: a considerable portion of the book is occupied with mere tabular lists, which might have been of statistical value to a District Collector at the time.

Other sections from 6 to 18, inclusive may be seen specified in the Descriptive Catalogue, vol. 2, page 108; but, in the book itself, they are now in confused arrangement, sometimes are mere memoranda; and, in other cases are rough translations from the Malayalam. On looking over the whole, it is found, that the contents (where of any value), are anticipated by abstracts of Malayalam papers, and, for the rest, the matter appears to require no further attention. The book would need restoration, did the contents merit it: which I judge not to be the case; and therefore pass it as it is.

B.—TELUGU.

a. Palm leaf manuscripts.

1. *Varáha-puránam*, No. 103—Countermark 290.

The subject of this work was translated from Sanscrit into Telugu verse of the kind termed *Padya-cávyam* by *Singhaiya cavi*, son of *Gauda nayak*, in the time of *Narasimha-raja*, son of *Timma raja*, whose genealogy is prefixed; whence it is deducible that he was the poet's patron.

The following is a brief notice of the contents.

1. *Adhyáya*, or section. *Adi varáha* (or *Vishnu*), at the request of *Bhumi devi* (the earth personified) narrates the creation, the formation of the elements, the formation of solids and fluids, the origin of *Brahma* and other gods, and states various matters relative to *Casyapa*, *Atri*, *Náreda*, and other rishis; also concerning *Indra*, and the regents of the eight points (of the compass), and the various genera of living beings: these matters are stated in some detail. During the *Manwantira* of *Chacshusha Manu*, a king named *Parivriddha-rayen*, divided his kingdom among his sons, and became an ascetic in the *Naimisáranya* wilderness.

Section 2. *Raibyan* a king became desirous of acquiring mystical knowledge; relinquished his kingdom; and went to the same wilderness as an ascetic.

Section 3. His grand son, named *Sudhyumna*, acquired great power and fame; and, among other exploits, went to the world of *Indra*, giving an occasion to describe the *apsaras*, and other attendants of *Indra's* court.

Section 4. *Indra* being conquered by the said *Sudhyumna*, went to the presence of *Vishnu*, who protected him in his celestial kingdom. Further occasion is taken by the poet to describe the world of *Indra*; its buildings, shrines, attendants; their magnificence, ornaments, and the like; the model being the metropolis, and court, of a *Hindu* king.

Section 5. This portion of the work is entirely occupied with the narrative of *Dacsha's* sacrifice; the origin of *Vira Bhadra*, from the

anger of *Siva*, and other matters; which, having been heretofore given from the *Bhágavata*, need not here to be repeated.

Section 6. Mentions the transmigration of *Dacsha's* daughter, and wife of *Siva* after death; when she became the daughter of *Himala*, or *Parvata-rayen;* and, after a long penance by *Siva*, was again married to him as *Parvati.*

Section 7. Contains details concerning the four *yugas*, and the progressive degeneracy of mankind, from virtue to depravity.

Section 8. The ten *avatáras* of *Vishnu* are described. Further an account is given of the materials, from gold and silver downwards, proper to be made use of in forming images, or symbols, of those incarnations. Those persons who present offerings to such shrines, and who feed and clothe the *Brahmans*, have their beatification assured.

Section 9. *Vishnu* repeats the instructions which were given by *Durvasa-rishi* to *Bhadrásura*, a king. They relate to ceremonials on certain days; especially the *Ecádasi*, or eleventh day of each lunar fortnight, and dilate on the merit of gifts, and offerings, to *Brahmans;* which, in effect, is the substance of the said instructions.

Section 10. Mankind enjoying great plenty, and many persons having acquired wisdom, or initiation into mystical knowledge, the jealousy of *Indra* was thereby excited, so that he went to the presence of *Vishnu* and complained. *Vishnu*, after some reflection, determined on the introduction of various irregular systems of doctrine; such as the *Jainas*, *Páshandas*, and *Bauddhas*. It was effected by means of certain Brahmans going to the presence of *Gautama rishi*, without being attentive to the usual courtesies, and the reverence becoming to be paid. In consequence he denounced on them the doom of going back to earth; full of intellectual skill, but destitute of right knowledge, and a good state of mind. These persons, under the said perverted bias, introduced the perversions of the aforesaid systems.

Section 11. Concerning *Maheshásura*. This person acquired great power: so that he conquered on all sides, and none could resist him, but fled away. An appeal was consequently made to *Parâ-Sacti;* who, as *Durga*, encountered the said *Mahéshásura;* and, at length, killed

him with an arrow. The incidents of this combat are given in some detail.

Section 12. Relates to modes of initiation into the *Saiva* and *Vaishnava*, systems of credence. The benefits of reading this *Purána* are stated, and respectful mention is made of *Vyasa*, through whom, instrumentally, all the *puránas* were declared to mankind.

NOTE.—This manuscript is a little old in appearance; two or three leaves, towards the conclusion, are damaged, by being broken: the book is otherwise complete, and in good preservation.

It is entered in the Des. Catal. vol. I, p. 273, art. xvii; and is stated to contain "a translation of the entire *Varáha Purana*." The contents appear to agree with the summary of contents of the *Varáha Purana* given from a Sanscrit copy, vol. I. p. 45, art. xi.

REMARK.—The use of this *Purána* in illustrating mythology is considerable. In so far as historical enquiries are concerned the most remarkable sections are 10 and 11. The latter, in particular, very clearly relates to the great exterminating war made against the votaries of *Buddha*. The combat of *Durga* against *Mahéshásura* has been, by some, ridiculously termed the combat of personified virtue, against personified vice. No doubt there is personification, and mystic allegory; but not precisely to that said effect. There are several great wars indicated in *Hindu* story; some of them under a similar mystic veil; as:

1st. That of *Subrahmanya* against the *Asuras*.

2d. That of *Parasu Ráma* against the *Cshetriyas*.

3d. That of *Ráma* against *Rávana*, and other *Rácshasas*.

4th. That of *Durga* against *Maheshásura*.

And *Maheshasura*, in my opinion, is very propably only another name for the mysterious personage more usually in the south denominated *Sálivához na*.

The clue of symbolical writing which I have been enabled to get hold of in the course of these enquiries, will, I am persuaded, if patiently, and perseveringly followed out, by individuals more capable in the earlier languages than myself, ultimately tend to solve much of the marvellous, and paradoxical, contained in *Hindu* writings; and draw aside, at least a part of, the cloudy veil which now, like a fog of great density, hangs over, and obscures, our view of remote antiquity.

2. *Vencatesvara Mahátmyam*, the legend of the fane at Tripetty, No 102.

This is a manuscript of two hundred and two palm leaves, a little old; but in good preservation, and in fine hand-writing. It is the production

of *Srinivasi* otherwise called *Srinát'ha* or *Vencataraiya*; who was patronized by *Anavema reddi* of *Condaviti*. It is in the *dvi-pada* measure; and relates wholly to the various shrines, *tir'thas* (or pools), and other localities, deemed sacred, on the *Vencatáchala* hill, at Tripetty; considered simply as a *Vaishnava* fane, without any reference to its former character, as a *Saiva* fane, antecedent to *Rámanújácharya*. Of course the entire production is comparatively modern; and consistent with the era of *Srinivasi*.

It is entered in Des. Catal. vol. I, p. 274, art. xviii. together with a valuable notice of the shrine at Tripetty; not entirely deduced from this legend, but with additions from other sources. It is to be noted, that though *Tondimán Chacravarti*, the first founder is said to have lived in the beginning of the *Cali* age; yet, from many sources of deductions, we can prove him to have flourished at a much later period. For the rest, the place owes its distinction to its being near the capital of the *Yádava*, and the *Chandragiri*, kingdoms.

3. *Mantra sárárt'ha dipika*, the concentrated light of devotional formularies, No. 119—Countermark, wanting.

This is a work of an ultra *Vaishnava* kind, maintaining all things to be in *Vishnu*, and *Vishnu* to be all things. It contains also an outline of various formularies, according to the different votaries of *Ráma*, *Crishna*, and other impersonations of *Vishnu*. Men, animals, and inanimate things, are only forms, or manifestations, of portions of *Vishnu*. The *tatva* system, relative to the union and harmony of mental and corporeal faculties, and results produced thereby, is found among the other matter. The rise, celebrity, and death, of *Rámanújácharya*, the champion of this ultra *Vaishnava* system, is given. Mention is made of some shrines of *Vishnu*, but subordinated to the leading doctrine of the work, as to his all-pervading, and all-absorbing essence. It would indeed be a work strictly monotheistical, were it not for the admission of local shrines, multiplied *avatáras*, and the pantheistic idea of matter being the body or clothing, of a pervading soul.

The manuscript is complete, and in very good preservation. I should suppose it to be valuable, as a work explanatory of the system of *Ramanuja*, and his followers: which is one of great influence, and credit, in various parts of the peninsula.

Note.—It is entered with a brief, but accurate, indication of the contents in Des. Catal. vol. I, p. 349, art. 372.

4. *Hamsa vinsati*, or twenty (tales) of a swan, No. 77—Countermark, wanting.

This book contains a poem in five *asvásas*, or sections, written by *Naráyana*, in the *Pádya Cavya* measure. The introduction of the series of tales relates to a king of Ougein, who had all the excellencies of *Harischandra*, and other famous monarchs; to whom a *yogi*, or ascetic, was introduced. This ascetic was a great traveller, having visited Bellary, Madras, and many other places; on which account the king deferred to his superior judgment as to the surpassing attractions of a lady of whom he was enamoured. After some time the king was absent from his spouse, who was inconsolable. But a bird (*hamsa*) of the genus *anser*, narrated a variety of tales, in order to amuse her, to divert her attention, and to console her with hopes of his return. The author pays his respects, in the usual form, to *Allasani Peddana*, *Tikana-Somayáji*, and other distinguished poets; from which circumstance, and the mention of modern towns, the work may be considered of recent composition; and, except perhaps as a poem, it is of no value. It is complete, and in good preservation. Part of the leaves are very recent; part somewhat older.

It is entered in Des. Cat. vol. I, p. 325, art. xxii.

5. *Narayana-dyāna-padyalu*, verses on the meditation of *Vishnu*, No. 107—Countermark 384.

This is a fragment of a manuscript, a little old in its appearance; written in the *dvi-pada* metre; and containing stanzas of hymnology, in praise of *Naráyana*.

It is complete from the first to the ninth leaf: the remainder is wanting.

The above title is taken from the Telugu; the label in English having been worn off. I do not know where to find the entry in the Des. Cat. It is not found under the above title.

6. *Vicramarca Charitra*, or tale of *Vicramáditya*, No. 64—Countermark 463.

Same title No. 65—Countermark 464.

These books contain the tale concerning *Vicramáditya*, and his attendant *Vetala*, or familiar demon; popularly well known; and needing here no abstract, No. 64, is old; in regular order, as to the paging from p. 1, to 165; but it is considerably damaged; not so much from internal perforation of the book-insect, in the ordinary way, as from the eating away of portions of the edges: the work externally as it seems, of termites. It contains thirty-two stories complete. At the beginning the narration of them is ascribed to *Siva* as told to *Parvati*.

No. 15, is recent, in a neat hand-writing; slightly punctured, and injured within, by insects; for the rest in good preservation. It contains only two of the tales complete.

Note.—These manuscripts are entered in the Des. Cat. vol. I, p. 343 art. lxvi.

7. *Vedanta rahasyam*, the substance or essence of the *Vedanta*, No. 120—Countermark 472.

This is a rather singular work to meet with, in this collection; conveying an emotion of pleasurable surprise. It is the production of a Telugu Brahman, by birth; but of one who had become a Christian, by profession: and is written both to explain, and to advocate, the Christian religion. The author has studied the *Vedanta* system of *Vyasa* and his followers; and, as that is the substance of the *Vedas*, so in this book he gives the substance, or essence of the Holy Scriptures, especially of the New Testament. Various portions of the contents of both the Old and New Testament, are adverted to, or narrated; and the superiority of the Christian religion is enforced. The *Bhágavatam*, *Bhágavatam*, and *Scandam*, are adverted to by way of contrast, and confutation: and idolatry is strongly condemned. The term *Sarvéswara* (common among Roman Catholics) is employed to designate the Supreme Being: whose unity, as opposed to polytheism, is maintained. The names of some Patriarchs are mentioned, and compared with the name of *munis*, such as *Vasishta*, *Visvamitra*, and others. Familiar to Hindus. A recommendation of the Christian religion; the necessity of baptism; and the great blessings of deliverance from the power of evil; are other portions of the contents. The author gives his name as *Anandábhi*, son of *Timmaya* of *Manjala giri*, of the *Atreya-gótra*, or family. As *Anandábhi* is the same, in effect, with *Ananda rao* or *Ananda-rayer*, I am enabled to recognize the author as being the same with *Ananda-rayer*, a Brahman, of whom at different times I have heard, and read, something: but with whose entire biography I am not acquainted. From a gentleman, who personally knew him, I have learned that he was accustomed to make use of some such work as this, in daily conversations, and discussions, with *Brahmans* and others. I was further glad to hear, that this gentleman regarded him as a sincere, though in some respects, an imperfect, Christian. He was in the employ of the Reverend Messrs. Crain and Desgranges, of Vizagapatam; and, as I conjecture, composed this book at the suggestion of one, or both of them. It is written in the *Pádya-cáryam* measure: and divided into four *cadyiyas*, or sections. The seventh, eighth, ninth, and tenth,

palm leaves are wanting; all besides is in regular order; and the manuscript is in very good preservation.

NOTE.—It is entered, with a general indication as to the contents, in the Des. Catal. vol. 1, p. 349, art. 73.

8. *Rama raju vijayam*, the triumph of *Râma raju*, No. 43—Countermark 309.

This book, otherwise entitled *Narapati vijayam*, is an encomiastic poem on *Râma râju*, the son-in law of *Crishna rayer*; who was, at first, the minister of *Sada Siva*, and, at length, usurped the sovereignty; but was afterwards killed in battle against the Mahomedans at *Talicotta*. It is, by one authority, ascribed to *Timma-raj*, one of the eight poets of *Crishna-rayer's* court; on which point I am doubtful. The subject is, at the outset, a genealogy, deduced from the usual *Chandra vamsa*, or line of *Hastinapuri*: after the close of that race, it branches off into what is termed the *Sinha-culam*, or lion tribe. It comes down, through the *Chalukiya* race, to *Râma-raju* himself; and thence forward is extravagant in its panegyric. It must be observed, that the genealogical list is very lengthy; as including the whole of the lunar line, in the most ancient portion; and quite as many names in the more modern series. How far the author had the means of access to records, subsequent to the cessation of the *Chandra-vamsa*, I cannot tell; but it is in that portion that the list would merit to be compared with the various other documents contained in this collection. It seems worthy of remark, that, while western, and southern, Peninsular records always mention *Vicramâditya*, *Sálivâhana*, and *Bhoja raja*, the records of the upper and eastern portion of Telingana usually continue the lunar line by transfer to the *Chalukiyas*; and a careful attention to this distinction may ultimately enlighten all that is obscure in the early centuries subsequent to the commencement of the Christian era.

NOTE.—The manuscript is old; written in a very small hand-writing; but remains without material injury. Some other work seems to have preceded it, as the No. on the leaves commences with 50: it is regular thence down to 75, where the writing leaves off, without having been finished (as supposed) by the copyist.

It is entered in Des. Catal. vol. 1, p. 297, art. ii. with the later portion of the genealogy, immediately preceding *Rama raju*.

b. MANUSCRIPT BOOKS.

1. Manuscript book, No. 18—Countermark 310, *Narapati-vijayam*, or *Rama raju vijayam*.

Narapati, is merely the titular appellation of the kings of *Vijayanagarum*. In a blank leaf is an entry in the hand-writing of Colonel Mackenzie, "Naraputty Vijaem, copied from the raja of Anagoondy's manuscript 1800." It is the same poem as the preceding: but is also incomplete. The ink is a little pale; the paper good; the first leaf loose: but, for the rest, in good order; and does not require further notice.

It is entered in Des. Catal. as above.

2. Manuscript book, No. 13—Countermark 810.

Section 1. Account of agricultural, and other details of twenty-nine villages, in the *Chinta-kunda* district.

The details are of minor interest, and do not call for particular notice. The district lies, I believe, a little to the north of Cuddapah.

Section 2. Account of the zemindari of *Mallala Samustanakula*.

In this section the details chiefly relate to matters of revenue; accounts of the *carnams*; and the like: of no material consequence.

Remark.—The book is in tolerably good preservation. The back is loose, and a few of the leaves slightly touched by insects, yet not calling for restoration, even were the contents of consequence; inasmuch as the ink is indelible; and the whole can be everywhere read with the greatest facility. It should, however, be looked at occasionally in order to prevent further damage, from worms or insects.

Manuscript book, No. 16—Countermark 813.

This volume, having reference to the Ceded Districts, contains local details relative to forty villages, and seven *agrahárams*, or brahmanical alms houses. It is a small quarto; and of course, with so wide a compass, the details are brief. They consist chiefly of notices of fanes, and of donations to them. A few dates of inscriptions are mingled; according to specimens already repeatedly given. Hence minute abstract does not seem to be required; especially as the book is written with permanent ink, is only very slightly touched by worms, and otherwise in perfect preservation.

Manuscript book, No. 5—Countermark 695.

Ancient record, containing the geography, and chronology, notice of *Carnams*, and limits of districts, of a part of *Telingana*.

The contents of this book run on in consecutive order, without break,

or division. For the sake of perspecuity, a brief index may be numbered.

1. A definition of the limits of the country, called *Condaviti*, with the boundaries on four sides; and a specification of its most remarkable features, as to rivers, hills, fanes, towns, reservoirs, and the like matters.

2. Names of kings or rulers, in the *Dwápara-yuga*. The *Chandra-Vamsa*, with *Vicramaditya*, and some other rulers, specified.

3. From *Salivahana* down to the *Mukundi* king *Pratapa-Rudra*.

4. A few names of the *Asvapati* race (in this place not designating Mahomedans); followed by mention of the *Gajapati*, or Orissa, rulers; and of the *Narapati*, or *rayers* of *Vijayanagaram*.

5. The *Ganapatis*, and the *Reddis*; with the specification of the periods of their rule over the Warankal country.

6. From *Crishna-rayer*, down to the Mahomedan conquest of his dynasty: dates, and details, are given.

7. A specification of village-districts, and villages, or hamlets, included within them, as comprised in the *Condaviti* principality, follows. This principality was under the rule of *Pratápa-Rudra*.

8. Detail of the *Gajapati* rulers, with their chief ministers, and the influence exercised by them over the *Condaviti* principality.

Mention of twelve different subdivisions of *Carnams*, or *Niyogi* Brahmans, who obtained grants of lands with *mirási* rights, and other immunities, inclusive of *agraháram*s, received from *Gajapati*, rulers, from *Pratápa Rudra*, or from the *Reddis*, during their rule; illustrating the colonization of the country by the secular Brahmans.

9. Details of grants, or privileges, bestowed by *Asvapatis*; who ruled on the north of the river *Crishna*.

10. Some mention of the rule of the *Narapati* princes, over the district; chiefly with reference to the grants and donations made by them.

11. Similar specification with reference to the grants made by the *Gajapati* rulers, during the period of their power.

12. Specific mention of grants made to particular Brahmans, by the *Reddis*, exclusive of more general ones, before adverted to.

13. The like specific mention of donatives to particular Brahmans from *Crishna Rayer*.

14. Reference to a particular *pergannah*, or country, having 11 included districts; which received immunities from the *Gajapatis*.

15. Donatives, to the same locality, from the *Asvapatis*, and from *Sadá-Siva Rayer*.

16. The usurpation of the entire country, by the Mahomedans;

their raising the taxation: renting out to Hindu managers, and other proceedings; close the document.

General Remark.—In the midst of much unimportant matter, there are historical materials scattered through this book, of some value The construction of the social system naturally gives a tincture to Hindu records. As with them, Brahmans, however needy, are higher in rank than princes, next to gods and even "gods on earth;" and since donatives to them are the highest possible act of virtue, or munificence; it will follow that historical records, especially when written by Brahmans, seem to notice princes, or rulers, only according to their munificence to fanes, shrines, and sacerdotal, or secular, Brahmans, with their eleemosynary dwellings. Hence the history of peninsular India, subsequent to the general influx of Brahmans, secondarily from upper Hindostan, and primarily from some as yet unknown region, usually is what may be termed hierarchical, since the epithet ecclesiastical cannot with accuracy be applied to it. With our different notions, allowance must be made for the structure of society in India; and, in re-edifying the materials, we ought not to despise them, as in some cases has been hastily done, because they are not formed after the Greek, or Roman, or Gothic, fashion. For the rest, we can shape them as we please, to make them fit into our building, subject to this remark. I think the materials in this book might merit a being brought out in full detail.

Note.—The hand-writing being small, and the country paper severely injured, by worms or insects, I have had the entire document restored.

C.—CANARESE.

a. Palm leaf manuscript.

1. *Sancara-Cadha,* account of *Sancara,* No. 75—Countermark 529.

This manuscript consists of two portions: the first relating to *Sancarácharya,* and the other to *Madhvácharya,* the founder of *Vidyanagaram* or *Vijayanagarum.*

1. The biography of *Sancara,* narrates his birth, in the Malayalam country; his peril in crossing a river, and devoting himself, by a vow to an ascetic life. He afterwards travelled to various places; and encountered a variety of marvellous adventures, needless to be detailed. At a more advanced period of life, he founded the monasterium of *Srin-*

geri. He was the champion of the *Advita* doctrine, that there is no distinction between God, and the human soul; and, as opposed to *Ramanujácharya*, maintained the perfect equality, and essential unity, of *Siva* and *Vishnu*. He is head of the *Smarta* sect, who profess to follow the *Smritis*, or law systems. There is no Hindu teacher whose opinions, and instruction, have had a wider influence than his; especially in the peninsula.

2. The other part relates to *Vidyáranya*, the founder of *Vijayanagarum*. He was the son of a Brahman; and was well instructed in the *Vedas*, and other learning. He performed penance, directed to *Devi*, for the acquisition of wealth: who appeared, and told him his request could not now be granted. He then travelled on pilgrimage; and, among other places, visited *Sringeri*, where he studied, and received thence the titular name of *Vidyáranya* or "forest of learning." He was purposing to visit *Vyasa*, in the north; and took with him a *rácshasa*, whom he met with near the *Vindhya* mountain. He went to *Cási*, and on coming back, passing through the *Tuluva* country, met with *Sangama-rayen*, who had five sons; among whom were *Hari-hara*, and *Bukha*; the former of whom by his advice and assistance was established as a king at *Vijayanagarum*. He again went to *Sringeri*, which shrine received munificent grants and privileges from *Hari-Hara-rayen*, and *Bukha rayen*. There are two dates given; one being Sal. Sac. 1265, as the period of the first visit to *Sringeri*, and 1258, as that of the foundation of the town of *Vijayanagarum*; they may be transposed, or seventy-eight may be read by conjecture for fifty-eight, or both may be fictitious. However *Vijayanagarum* was founded about that time.

Note.—This book is old; it is written on talipat leaves; and is in perfect preservation.

It is entered in Des. Catal. vol. 2, p. 35, art. xli. as "a short account of Sankarācharya."

2. *Nannaya-Charitra*, account of *Nannaya*, No. 69—Countermark 517.

This book in the *Hala kanada*, or old *Canarese*, relates to a teacher of repute of the *Vira Saiva* class, named *Nannaya*, not to be confounded with *Nannaya Bhatt*, a Telugu poet of eminence. This *Nannaya* was an ascetic, who had many scholars; one of whom took down the substance of his instructions, and recorded them in five books. The subject of these instructions turns very much on the fanciful *tatva* system, or the union, and results, of the corporeal, and mental, faculties. There are

also sectarial descriptions of *Siva*; of his paradise; and votaries. The language, I am told, is distinguishable from the ordinary phraseology of *Brahmans*; and it would seem as if *Basavapa*, head of the sect, was rather a warrior of the *Sudra* class, in which case *Nayaya*, and the scholars of the latter would be *Sudras* also. The system is ultra *saiva*; it neglects or despises the *Vedas*; and proceeds wholly on the *Tantras* or *Agamas*. There is, however, much that agrees with the more generally received system of *Hinduism*. While the *Vira Saivas* vary from other *Hindus*, they are the still more direct opponents of the *Jainas*; and the extermination of the *Jainas*, in the N. W. of the Peninsula, was chiefly effected by them. They are usually termed *Lingadharis* in the neighbourhood of Madras.

Note.—This manuscript is in appearance very old; it is complete. The leaves are in some places perforated by worms; occasionally obliterating some letters; though this injury is less than might have been anticipated. When first opened several small white worms were turned out of it, and these, in a month or two, would have rendered the whole illegible. A little care is necessary with these manuscripts, in occasionally opening, and drying them. It ought to be a special duty of some one individual.

The manuscript is entered in Des. Cat. vol. 2, p. 31, art. xxxii.

b. Manuscript Books.

Manuscript book, No. 5—no Countermark.

The contents of this document are partly in Mahratti, and partly in Canarese. The former has been before attended to (see 4th Report c).

The Canarese is now adverted to; in order that the book may be finally disposed of.

Section 1. (In Mahratti). It has a page of Telugu, in Canarese letters, relating to a wonderful tree, looking large at a distance; diminishing on approach; and disappearing on coming very near. It can only be found by the wise, and spiritually enlightened.

Section 2. Relative to *Chandra-drona parvatam*, is partly in Mahratti, with a supplement in Canarese writing, not differently sectioned, but which supplement is properly, a legend of *Dattátreya*.

It is in the Canarese character; but the language on examination was found to be Telugu. It relates to the sage *Dattátreya*, and his

matronly wife. Previous to retiring from his hermitage to a cave, for the purpose of entire abstraction from the world, he performed some *mantras* over a vessel of water, which he then gave to his wife; telling her to take care of their abode, while he was away; to entertain all good *rishis*, or devout men, with cordial hospitality; but if at any time, she should be molested by vulgar, or rude persons, she might sprinkle over them a little of the water in the vessel, and accompany the doing so with whatever wish she might please, and the same would be accomplished. *Dattátreya* thereupon retired to his cave; and, after some time, his wife received a visit from some *rishis*, on their journey, claiming her hospitality. She placed food before them, of which they refused to partake, unless she would accompany her serving it up with a degrading mode of menial servitude. She reflected for a moment; and, then sprinkling over them a little water, wished that they might become children, and the transformation was instantly accomplished. She then put the infants into a cradle, attended on them, and nourished them as such. The *rishis* became missing; and the celestials went to *Parvati*, to enquire about them; who narrated what had happened. The celestials waited on the matron; and, at their desire, she sprinkled water on the children and, by a wish, restored them to their previous form. They were dismissed; and, after bathing, went their way. *Dattátreya*, soon after opened his eyes; and, leaving his abstract penance, came out of his cave: on learning what had happened, he became of opinion, that it was not right to expose his wife alone, and subsequently he took her with him to the cave, when he retired thither. On doing so, the four colours (or castes) came, and watched at the entry. At length unable to bear the heavy dew, and the cold, they went away. One *Budda Saheb*, a Mahomedan, hearing of the fame of the hermitage, waited there, and preserved it. After some time *Dattátreya*, came forth, and gave him some instructions; of what kind is not specified.

Section 3. Legendary account of *Battadapur* in the Mysore country. This paper is in Canarese characters, but the language is a *Pracrit*, or corrupt Sanscrit It relates to a fane of *Mallicarjuna*. There are three brief *adhyáyas*, or sections; and the contents, besides some legendary matter at the commencement, relative to a dispute between two *rishis*, has the usual filling up of *St'hala mahatmyas*, relative to shrines and pools. Eight *tirt'has* are mentioned: that, is those of *Agni*, *Mucti*, *Gauri*, *Ganga*, *Rama*, *Airávata*, *Dacsha*, *Hanuman*; with details of merit, and benefit, of bathing therein. In the second section

the narrative is given of several persons of high repute, who worshipped at this fane; thereby reflecting lustre upon it. The third section has a special reference to *Arjuna*; to his penance at this place, and connected matters; whence it would appear, that the name of *Mallikarjuna*, as applied to the idol, was derived. The legend is put into the mouth of *Nárada* as related by him to *Gargara rishi*.

Section 4. Account of the *Gautama-agrahára*, in the *Anantapur* district of *Bidanur*.

The legend, in the Canarese language, is carried up to the time of *Janamejaya*, who visited this place; and, as his father *Parichhit* died by the bite of a serpent, consequent to offending a *rishi*, he, the son, had a serpent sacrifice performed on the banks of the *Tungabhadra* river: he then made large benefactions to this place; and in the *agrahára*, located various orders of Brahmans, who are specified by their *gótra*, or tribe, subsequently in the time of *Ballála-rayen* and the *Anagundi* rulers, the said privileges were continued. A local chief, the Mahomedans, the Peishwa, and others, are mentioned, as variously deporting themselves towards the shrine. Tippoo abrogated its privileges; but after the English had given over the country to the Mysore prince, its privileges were partially restored. A list of fanes, and of the names of eighteen head Brahmans, of different tribes, is added to the document. These, it may be observed, are expressly spoken of as introduced from the north. The name of each *puttar*, or head Brahman, need not be specified: occasionally two, or more, of these are of the same class; but the *gotras* mentioned are *Cassya*, *Agastya*, *Srivatsa*, *Gautama*, *Vasishta*, *Caundanya*, *Bharadhwaja*, *Haridasa*, *Jamadagni*. The place took its name because *Gautama* (or his tribe), first established an emblem of *Siva* there.

Section 5. Account of *Halli-honùr* in the same district.

At this place *Ballala rayen*, of the *Ballala* race, was cured of leprosy by bathing. In consequence, though himself a *Jaina*, he formed a high estimate of this shrine, at which he built a fane, and made various grants to Brahmans. He built an *agráharam* for them, termed *Halli Honúr* (Honore), and also constructed a small fort there. He ruled thirty years. His son was *Yarayanga-rayen*, who ruled forty-one years. His son was *Vishnu-Verddhana-rayen*, who ruled fifty years. His son *Vijaya Narasimha rayen* ruled twenty-three years; *Vira-Ballála-rayen*, son of the preceding, ruled forty-five years. In his time one named *Ganga sila-rayen*, in the service of the Delhi Padshah, came,

assaulted, plundered, and destroyed; and then went away. The son of *Vira Ballala-rayen*, was *Vira-Narasimha Ballala rayen*, who ruled sixteen years. His wife's son, named *Vira-somesvaren* ruled nineteen years. His son was *Vira-Narasimha Ballala-rayen*, who reigned forty-six years. In all there were nine of this race. The last of them *Ballala rayen*, is represented to have been a dissolute, and cruel person; and among other misdeeds, hung his elder sister, at the instigation of his wife. Thereupon his whole family became deeply afflicted, and imprecated upon him the loss of his kingdom. The Delhi-Padshah heard of these things; and gave his permission to the two brothers, named *Hari-hara rayen*, and *Bukha-rayen*, to make war upon *Ballala rayen*. They did so, for some time, without success; but at length obtaining the favour. and assistance of the sage *Vidyáranya*, they succeeded in overthrowing the power of *Ballala-rayen*, and upon the ruins of it founded the town of *Vijayanagarum* (in Sal. Sac. 1258), and its connected kingdom; of which *Hari Hara* was made the first king.

The names of thirteen of his successors are given, down to Sal. Sac. 1412 as follows:

	Years.
Hari-hara rayen	14
Bukha-rayen	31
Hari-hara-rayen	29
Vira-deva-rayen	17
Pravuda-Bukha rayen	16
Mallicarjuna-rayen	17
Runghana-Rama rayen	9
Singhana Vijaya Virupacsha rayen	10
Pravuda deva rayen	16
Virupacsha-rayen	4
Deva-rayen	6
Rama-rayen	13
Virupacsha-rayen	22

The total it is said makes one hundred and fifty-five years, which would agree with the interval between the two dates given, but the real total is two hundred and four; leaving the inference open that precise accuracy is not contained in the number of years ascribed to each ruler. Besides which some of the numbers, where double, are doubtful; as they may imply, and probably do in some cases imply, years and months. The total of one hundred and fifty-five is the right one to be followed, with an adjustment of the years of each king.

From Sal. Sac. 1412, down to 1486, eight persons ruled, as follows:

	Years.
Pravuda deva rayen, son of Pravuda Singha rayen..	5
Vira Narasimha rayen	2
Narasimha rayen.....	12
Crishna rayen.....	16
Sada Siva rayen.....	5
Achyuta rayen.....	12
Timmaiya.....	8
Rama rayen, in the name of Sada Siva rayen.....	22

In this statement there is a discrepancy of eight years. During the government of *Rama rayen*, in the name of *Sada Siva rayen*, one named *Chickadeva rayen* received the fort of *Hulli honùr*, and with it a country producing a revenue of nine lakhs, from *Rama rayen*, as a fief. After *Chickadeva*, one named *Sada Siva nayak* ruled four years. His son was *Santana nayak*. A list of successors, as local chieftains, or feudal barons of *Honùr*, follows; but the document at the end remains unfinished.

Section 6. Account of *Uduguni* in the same district.

The origin, in a legendary manner, is carried up to the time of the five *Pándavas*. The *Cadamba* dynasty afterwards ruled over this place. Of the *Rayer* dynasty, *Deva rayen* especially distinguished this place. In a discussion with the people of the country, occasion arose of approaching the foot of a tree where there was a large ant-hill, out of which a large guana lizard issued; fell upon the attendants of the local chief; and bit them severely. From this it was inferred that something special was connected with this ant-hill; and on digging it up, an image of *Hanuman* and of *Sala devi* were found. A fane was built for these images, especially for *Sala devi*, and from her name the word *Uduguni* is said to be derived. It is added that the *Cadamba* dynasty, ruled down to Sal. Sac. 1025. For a time it was not under any king. Afterwards the *Rayer* dynasty is adverted to, but, in both cases, only with a reference to matters connected with the shrine of *Sala devi*. A sássanam remains, whence it appears that in Sal. Sac. 1291, *Bukka rayen*, gave to the fane the two villages of *Muchari* and *Mudali*.

In Sal. Sac. 1416 the Padshah of Bijapur, captured the place, and gave it in charge to *Vira navadiyar*. The Seringapatam rulers acquired, at a later time, the sovereignty; and, at still later times, it was under the management of amildars.

Sections 8, and 9, in Mahratti, have been before noticed.

The Canarese papers in this book, with the exception of the paper concerning the fane of *Mallicarjuna*, are in a bad state as to preservation. The only sections of permanent value are four, and five. The entire contents of this book, No 5—Countermark 871, have now been abstracted.

Manuscript book, No. 4—Countermark 649.

This book contains a fragment, being the earlier portion of the *Panchatantra cadha*, or tale of the "five devices," a highly popular work, found in every language of India. In this copy the Mahratti characters are employed; but the language is Canarese. The paper is somewhat damaged by insects; but the writing perfectly legible. Being only a fragment, and that too of a very common, and popular work, restoration does not appear to be required.

Manuscript book, No. 7—Countermark 873.

This is a thin folio volume, in perfect condition; being written with indelible ink, on thick Europe paper, not even touched by insects. The writing is in Mahratta characters, but the language is Canarese. The contents are the revenue settlement of the *Rayalu*, or rulers of the country, for the district of *Dankeni cotta;* being, of course, details not requiring abstract in the present enquiry.

Manuscript book, No. 20—Countermark 866.

This is a similar book to the preceding; containing the same document in the Canarese characters, and language; the ink being a little faded. There is appended a comparatively brief paper entitled, *Rairaka*, or settlement of the rulers, and relating to the district of *Honahalli*, copied from an original record on a *Cadattam*, or painted-cloth folded. The ink in this latter copy is good; and the paper throughout in perfect preservation.

Manuscript book, No. 1—Countermark 887.

Section 1. List of ancient *rajas* procured in the *Sunda* district.

Certain kings of *Mágadha.* The *Cadamka* dynasty. *Trinetra Cadamba-rayen* was the first of them, who ruled forty-five years. His son *Mádhu* reigned fifty years: some other successions down to *Mayura verma.* His son was *Trinetra Cadamban.* The successions are continued down to an invasion by a *Concana* king, of the *Parpara* dynasty. Kings of this race follow, twenty-one in number. *Vira Camadeva-rayen* conquered the last of that dynasty. The *Ballala* dynasty. Their capital was *Dwára Samudram.* They are the *Oyisalas;* nine in number. *Hari-hara rayen* overcame them; and ruled in *Vidyanagaram.* The line of the *Rayers* is referred to, as having been before transmitted. Their becoming enfeebled, and ruling at *Annacondai,* is simply mentioned. The rule of some *Nayaks* or local chiefs, as supposed in the *Sunda* district, is stated. The *Chola* dynasty: some of the names are the same as in other lists, others are different; but we know that these kings had two or three titular names. A reference to *Ballalas,* who ruled in distant, and distinct, places; apparently without successor: one at *Trinomali.* A list of *Andhra* kings; town not specified. Loose mention of *Warankal,* and other, rulers. There is then a reference back to the *Saovirashta-désam,* and other countries, unconnected in form. *Malli raja,* is said to have ruled at *Ballaki-patnam* in the Bengal country; and *Bhoja raja* is said to have been his son. One or two *Udriya* kings are mentioned; and then a leap is made down to Madura: the name of *Sundara-Pandiyan,* occurs, with a transit immediately afterwards to the *Kerala raja.* After other scattered notices of individuals, a return is made northwards to Ougein, and *Vicramáditya.* Then a reference to Delhi. A return back to Madura, and to *Kuna Pandiyan.*

Note.—The only value of this paper is with reference to the *Cadamba* line, and succeeding races down to the conquest by *Hari-hara rayer.* All the rest is incoherent; both as to times and places, and mere names, such as a person might casually hear mentioned in conversation, as of those once ruling in India. There are no dates either of the *Cali Yuga,* or any other era. The ink and paper are in sufficiently good preservation to allow of reference to the first part, many years hence; if need be.

Section 2. Account of wild tribes in *Sunda* and *Canara.*

Nothing answering to this heading appears; and there are marks in the book of several sheets having been torn out, or otherwise lost.

Section 3. Account of the *Coramaru,* in the *Sunda* country.

There are four classes among them, some of their household, or domestic, customs are stated. Marriage settlements, and observances, mode of receiving proselytes into their class. They have no Brahmans amongst them. Many of them live professionally by theft. They are scattered; some in villages, some in wilds, or forests.

Section 4. Account of the *Cunumbi Mahrattas.*

The *Surya* race deduced from *Brahma*, down to *Vaivasvatu-menu*; and then a reference to *Paricshit*, and *Nanda*; from whom various races sprung by intermarriages. Hence the *Cunumbis* deduce their lineage; they are scattered in various countries; both in the north, and in the peninsula.

Section 5. Account of the *Banijagar* tribe of Telugu people.

Their household customs. Fourteen minor subdivisions among them specified. Their marriages. Mode of correcting offenders, and some other details; of no consequence.

Section 6. Account of the *Cudi Cumbhar*, or tribe of potters.

Various local usages, and customs. Marriages are only contracted by adults. They sometimes burn, and sometimes bury, their dead. They do not admit of proselytes from among other classes of people. These with minor details, form the subjects of this paper.

Section 7. Account of the *Gangadicar*, or gardeners in *Sunda.*

Their domestic, marriage, and other local, or peculiar, customs, are stated; but there does not seem any thing needing special note. In many points their customs have an affinity with those of the potter-tribe.

Section 8. Account of the tribe of *Manvettiyar*, or diggers of water reservoirs.

They have minor distinctions among themselves; and their customs are stated. They dig wells, reservoirs, channels for irrigation, &c., being, like the two preceding classes, very useful, though servile; and are apparently derived not from colonist *Hindus*, but from aborigines of the country.

General Remark.—Though the papers in this volume are in some degree curious, as to local tribes and manners, and the first of some little historical value, yet they do not seem to claim restoration, especially as the ink is tolerably good, and the paper, though very inferior, only in a slight degree damaged by insects.

Manuscript book, No. 2—Countermark 888.

Section 1. Legend of the fane at *Banavassi*, in the *Sunda* district.

Reference to seven *upa-puris*, or second rate towns (in regard to mythology) formed by *Brahma*. Among the seven was *Banacassi*. It had different names in different *yugas* Legendary matter as to *Saiva* emblems follows. The kings in the *Cali yuga* beginning with *Pariekhit* are adverted to. Several names that follow are those of *Mágadha*, down to *Nanda;* and a division of country among his nine sons. *Chandra gupta*, and nine of his descendants. *Pushpamitra* set the last of the nine aside; and assumed the sovereignty.

Remark.—Hence it appears that the only proper reference to *Banavassi* is legendary, and mythological. What is stated about kings all relates to *Mágadha*, or modern *Behar*.

Section 2. Account of the *Chennaiya culam*, the lowest tribe in the *Sunda* district.

Domestic, and marriage, customs. The paper is very similar to like statements in the foregoing book; and offers nothing worthy of special notice.

Section 3. Legend of the fane of *Sirisi*. Notice of two *Saiva* emblems. A fane of *Ganesa*, another of *Mariyammen;* to the last of which, a grant of lands was made; and it now receives an allowance from the Honourable Company. In another shrine there is an inscription dated Sal. Sac. 915, but its contents are not stated. Mention of a fort near at hand. A few other details follow, offering no special point of interest.

Section 4. Account of the *Concani* tribe in *Sunda*.

Reference to the formation of the *Gauda* and *Dravida Brahmans*, by *Brahma*. The narration of *Parasu-rama*, his destruction of the *Cshetriyas*, and gift of the country to *Casiyapa*. He then went to the *Malayala*, or *Kerala*, country, and introduced the *Brahmans* thither; the *Concanis* being among the number. The like account is referred to, in the paper, as being contained in the *Scanda-puranam*.

Section 5. Account of the *Cunchi vakkala* tribe in *Sunda*.

There are minor subdivisions among them; and their domestic, and marriage, customs are stated.

Section 6. Account of the *Melusacara* tribe in *Sunda.*

Some minor subdivisions. Their customs, and observances, are more Hindu-like, than those of other tribes before noted. The statement is however very concise.

Section 7. Account of the *Medari* tribe.

A brief reference to their customs, which resemble those of *Hindus.* The tribe has four subdivisions.

Section 8. Account of the *Padma-sali*, or weavers.

Eight subdivisions. Local manners; offering nothing, requiring special remark.

Section 9. Account of the *Hallapaica* tribe, or wild people in *Sunda.*

Domestic, and marriage, customs; with other details, under similar heads, as in preceding cases. There appears to be a mingling of aboriginal, and of Hindu, customs. Most of the tribes that have been described afford traces of resemblance to the *Condu-vándlu*, *Nayars* and *Maravas.*

Section 10. Account extracted from the *St'hala mahatmya* of *Banavassi* in *Sunda.*

The writer saw the whole legend in the old Canarese language. A special circumstance was by him extracted. To wit: *Mayura verma* established in his capital a *Brahman*, who had impressed him with reverence, by refusing to eat in a country wherein there were no *Brahmans*. *Chandrangaten*, son of *Mayura verma*, called a large colony of *Brahmans;* and located them in *Kerala*, in *Tuluva*, *Haigairi*, *Concana*, *Carada.* The first speak the Malayalam language; the second the *Tuluva* dialect, the third *Hala canada*; the two others different dialects of *Maharashtram.* *Parasu Rama* afterwards came to this country, bringing with him a colony of sixty four families, among whom he established his own *vaidica*, (ascetical*) system; but between these, and the others, there was no agreement. The Brahmans introduced by *Parasu Rama*, are called *chitta-pavanar*, and were brought from *Aryanád* (*i e.* upper Hindustan). The *Parpara* country Brahmans are called *Mâdhinyanal.* These were instituted to their rights and privileges, by the aforementioned *Chandrangatan*, son of *Mayura Verma.*

* Or conformable to the *vedas.* As *Parasu Rama* came from the head quarters of Hinduism, he most probably brought with him, a more regular system, than that of scattered emigrants, who went before.

The paper also contains a mention of kings of *Mágadha*, similar to the first section. [The conjecture arises that the *Cadamba* dynasty originated, in consequence of shaking off the yoke of *Mágadha*, of which country, probably it formed a distant province].

General Remarks.—The contents of this thin octavo volume may be judged of by means of the foregoing brief abstract. The accounts of the local tribes are not without use. The last paper is important; perhaps very important. It explains the early portion of the *Kerala-Ulpatti;* gives a further view of the location of *Brahman*-colonists; and indicates a time where there were no Brahmans in the country. Under such circumstances, it is not surprising that tribes of aborigines should remain in greater numbers, than in other parts of the peninsula; from which, as we have had abundant proof, they were, to a prevailing degree, exterminated.

Manuscript book, No. 4—Countermark 888.

Section 1. Account of *Rama-raja*, and his contests with the Mahomedans.

This section contains somewhat full details of *Rama-raja's* negociations, and battles, with the neighbouring Mahomedan rulers. A pompous, and very exaggerated, statement is given of the splendour of his throne, and the number of his obsequious attendants; including the kings of all the fifty-six countries of Hindu geography. A list of his army is also given. The attacks of the Mahomedan chiefs, separately, were foiled; but a grand confederation against him of five shahs, at length overthrew him, and conquered the kingdom. The date of Sal. Sal. 1486 (A. D. 1564), is given; and it corresponds with that of the battle of *Talicota*, which ended the power of the *Vijayanagarum*, kingdom.

Note.—This document will continue legible for some years. The paper is undamaged; but the ink is not throughout equally good.

Section 2. Account of the *Banijagaru*, or traders, of *Banivassi* in the *Sunda* district.

The few details which relate to this class of *Lingadharis*, and merchants, chiefly notice the protection, or otherwise received by them from *Sada-Siva*, downwards to the times of Tippu Sultan, and the English; and the whole, in any general point of view, is unimportant. A brief mention of weights, measures, and commodities, is appended.

Section 3. Account of *Banivassi* in the *Sunda* district.

The years contained in the four *yugas*. The subject of inscriptions is adverted to, and then particularized. *Vicramàditya* is stated to have made a very large grant of land to the fane, at this place; continued in force by *Bhoja-raja*. *Sinhana Bhupalan*, who ruled at *Rudraparam*, in the neighbourhood, also made munificent largesses to the same; and built certain *gopurams*, or towers, over the porches. His son was *Cali-Cala-Sudamani*. His son was *Sangha-Bhupalan*. A detail of *Jaina-rajas* follows. In addition to the mention of a few names, there is a specification of their books, and *sastras*, or religious productions. An inflated account is given of the power, splendour, and attendants, of the said kings.

Remark.—This document seems to me of some consequence. *Banavassi* is a place of known antiquity; and the fact that *Jaina* kings of great celebrity ruled there, at an early period, is to be noted. The document is written with permanent ink; and is, as to paper, in tolerably good preservation.

Section 4. Is in the Mahratta character.

Section 5. A list of chieftains of the *Sunda* district.

The commencement of the rule of these chiefs is dated in Sal. Sac. 1478 (A. D. 1556), and seven names are given, coming down to Sal. Sac. 1685 (A. D. 1763). They were, by consequence, chiefs who founded their power on the downfall of the *Vijayanagarum* dynasty; as was the case in various parts of the peninsula. A sort of copy of their seal is given; one contains the name of *Immadi arasapa-nayak* in Balbund letters, on the other, the word, *Nagaresvara*, and *Sada-Siva*, can be read; and also the titular phrase "a chief splendid as the moon;" but some injury by worms renders the connection, in so small a surface, not further legible. An imperfect copy of an inscription certifies the gift of some lands to a tribe of Brahmans; but the donors name, and other particulars, are wanting.

The whole of the remaining portion of the book is in Mahratta characters; see the end of the following Mahratti papers. In what herein precedes, sections 1 and 3 are of consequence. The name of *Banavassi*, as an emporium of commerce, appears in the classical writers; and it then seems to have been flourishing. The prevalence of the *Jaina* credence throughout the *Sunda* country, is worthy of notice; and, by comparison with the foregoing book, we may discern that the era of *Parasu Rama* was not so high up in antiquity, as *Hindu* exaggerations might lead any one to suppose.

D.—MAHRATTI.

Manuscript book, No. 47—Countermark 737.

Ancient record concerning *Narayan-varam.*

The commencement of this document adverts to the creation by *Brahma*, and then immediately refers to *Vaivasvata menu*; to his son *Ieshvaca*; and to the ten sons of the latter, who have names given to them that appear to be fictitious. Only four brief pages are thus occupied. There is then a marvellous anachronism in referring to *Cari-Cala-Chola*, and to a story which, in other documents, is connected with *Kulottunga Cholan*. In performing penance at *Seshachalam* he had a son by a *Naga canya*, which son is simply termed *Chacraverti* (aliter *Tondaman* or *Alondai*). This *Chacraverti* going to *Vencatáchala* had a vision of the god; and, on the hill, found a stone image which he caused to be enshrined, and endowed. He is then termed *Go-Chacraverti*, and his son is named *Sundhama raja*. His son was *Sura sira*, and his son *Narayana raja*.

The narrative then passes at once to *Mit'hila désam*, in the extreme north. A king of this country named *Govasambuna-raja* performed penance addressed to *Vencatáchala svami* (a form of *Vishnu*) accomplished as it seems, at *Vencatáchala* or Tripety: on the god appearing to know what he wanted, he requested to be allowed to reign over the neighbourhood of the fane, transmitting the kingdom to his posterity. The request was granted by directing the worshipper to go to his servant *Naráyana*, that ruled at *Narayan puri*, who would thereupon make over to him, the applicant, half of the said *Narayun's* kingdom; which gift, on application, *Govasambuna* accordingly obtained. The name of his eldest son was *Vencata raja*, whose three brothers were respectively named *Ubajala-raja*, *Acasa-raja*, and *Mitra-verma-raja*. The son of the last mentioned was *Acasa-raja*, who being instituted to the kingdom, the father retreated to do penance. *Acasa-raja*, having no child, made a golden image of a goddess which he purposed to worship; but was addressed by an aerial voice, instructing him to consider that image as his child, by the name of *Pasha-trivati*; and, upon doing so, a son should be born to him. In a neighbouring wilderness called *Udyana-vanam*, the *muni* named *Nareda*, when doing penance, saw a very beautiful female form, and on asking who she was, a reply was given that she was called *Pacsha-trivani* and was the child of *Acasa raja*. *Nareda* told her she would become the wife of *Vencatachala-svami*;

and, as he had said, the god came with great splendour, and was married to the said *Pacsha-trivati*; on which day a child was born to *Acâsa-raja*, afterwards named *Vasumbana-raja*; to whom he made over his rule, and retired to do penance. As *Vasumbana-raja* had no offspring he went to *Vencata-raja* of the aforementioned *Narayan-puri*, on whom he devolved the portion of the kingdom formerly conceded; and thenceforward the kingdom became one, under kings of the *Narayan-varam* dynasty.

The son of *Vencata-raja* was *Sindu-raja*. In his time a *Kiratan*, or barbarian, made great ravages as a freebooter; and, among other spoils, having forcibly taken away the cow of a *Brahman*, the owner went to *Sindu-raja* and complained. The *raja* assembled some forces, with which he pursued and overtook the plunderer, recovered the cow, and gave it back to the owner; afterwards continuing a prosperous rule. His son was named *Acanasana raja*, his son was *Paracruti-raja*, and his son *Adrica-raja*. His son *Mahitha-raja*. His son *Vicata-raja*, and his son *Ribunde-raja*. During his reign enemies invaded the kingdom (their name not specified), and overthrew the *Vencata-raja* dynasty.

There follows what for distinction sake may be termed the *Rama-raja* dynasty; containing a long list of names only, without any incident.

Remark.—So far as my abstract goes which I have made somewhat minute, and particular, there is a *vraisemblance* which, in the leading points, I consider to be assimilated to truth. We have in it in the early history of Tripety, from the time of its founder *Adondai*; but apparently only as a feudal chieftainship, merging in a larger one: the precise locality of which I feel at present unable to fix; but I think that *Naragana puri*, if a real name, must have been the metropolis of a chieftain only, somewhere in the immediate neighbourhood. As to what follows, the names are so numerous, and seem so much to run in cycles, with a repetition of nearly the same names, that it must I conceive either be an encomiastic genealogy of a local chief, or else pure invention; to which observation must be added, that, allowing for the preceding lapse of time from *Adondai*, there would not be space for the following genealogy, if reckoned downwards at the rule of even two or three years, for each ruler.

On the whole this document, from which I had expected something valuable, must be estimated as of very moderate authority, and importance; especially in the latter portion.

Legend of the *Svarna muc'hi* river.

This document is attached to the foregoing without any other note of distinction than a single blank space intervening.

It is merely a legend, ascribing the origin of the river to *Agastya*, who was instructed to form it by an aerial voice. Being formed it was called *Svarna muc'hi*, or golden faced; and it flowed through a district, wherein many anchorets, and retired devotees, dwelt. It runs near *Chandragiri;* is united with many other rivers; is considerable at *Tripety;* and joining the northern *Punar*, runs with it to the sea.

Note.—It remains only to observe, that the entire book is in moderately good preservation. The binding, and the ink, are both good. The country paper has been attacked, in the inner and outer margin, by worms; but the examination of the document has stopped their progress; and, with moderate care, the book will last a long time. The early portion alone is of any value.

Manuscript book, No. 46—Countermark 736.

Account of *Vencatésvara-svami* at Tripety.

Reference to the *pauranic* legend of a dispute beteeen *Adi-sesha*, and *Vayu;* in the course of which they passed over many mountains, and were told by *Vishnu* that their dispute should be ended at *Vencatáchala*. At this hill *Sesha* performed penance; and on *Vishnu* desiring to know what gift was wanted, *Sesha* replied with a request that *Vishnu* would reside there, which petition was accorded; and from the residence both of *Vishnu* and *sesha*, the hill is called both *Vencatáchala*, and *Sesáchala*. In *Cali-yuga* 4900, *Tondaman Chacraverti*, coming hither, determined on building a fane; being directed to do so in a vision. He in pursuance of his purpose erected one; and provided the means for celebrating annually a nine days festival. The bestowing of grants to this fane, is thenceforward the leading subject. A few descendants of *Tondaman* gave some largesses. The *Rayer* dynasty of *Vijayanagaram*, made munificent donatives; and some grants are said to have been accorded by the Mahomedans. The shrine is stated to be frequented by numerous pilgrims; and some detail is given of the sacred pools, and other local features of the hill of Tripety. There is a reference to a local incarnation of *Vishnu*, at *Sri Permatur*, near Conjeveram; and some matters connected with the incarnation of *Vishnu* as *Rama* the son of *Dasaratha*.

Remark.—The date of *Tondaman's* founding this shrine, is the point chiefly of value in this document. His offspring of two or three des-

cendants, are only mentioned by the appellative of *Tondaman*; and then *Acása-raja* is spoken of as having ruled at *Narrayana-varam*. The *Anagundi*, and the Mahomedan, rulers superseded all antecedent ones. The mention of them is however a secondary object. The contents seem derived by abstract of portions of the *st'hala mahatmya* of Tripety.

NOTE.—The condition of this book is much the same as that of the last mentioned one.

Manuscript book, No. 17—Countermark 883.

Official regulations of Tippu Sultan, as to trade.

These regulations are written in three languages, Persian, Canarese, and Mahratti. Any abstract of course is not here required. The book, in every respect, is in good preservation.

Manuscript book, No. 18—Countermark 884.

This book has an endorsement in Colonel Mackenzie's hand writing. "Tippoo's regulations found at Cancoupa, November 1800. C. M. K." These are in the same three languages; but very brief. The book is a thin octavo, written on Europe paper, nevertheless slightly perforated by worms; but on the whole in moderately good preservation.

Manuscript book, No. 6—Countermark 643.

Jnánasvari Certasubdácha-pariyaya, or a compendious Mahratta Dictionary of difficult words of various meanings, compiled from the *Bhagavat gita* in *Mahratti*.

This title prefixed sufficiently explains the purport, and contents, of this little folio. It remains therefore only to observe, that it is written on thick, and very superior, country-paper, the best I have ever seen, with indelible ink, and with a *calam* or reed, in bold letters of the *Bal-band* character, only a very slight variation from *Deva-nagari*. One perforation, by termites, through the cover and some of the last leaves of the book, alone prevents its being considered in perfect preservation. With common care it will last very many years.

Manuscript book, No. 65—Countermark 862.

The contents of this small quarto are four reports or journals, of *Nerâyan Rao* in his journeys through the Ceded Districts, in the consecutive years 1810, 1811, and 1812.

Subject to a general remark heretofore made on this class of documents, it only remains to note that this book, though slightly injured by book-worms, is written with indelible ink, on good country paper, and as a whole, is in moderately good preservation.

Manuscript book, No. 62—Countermark 752.

General account of the Carnatic, with the models of former rules copied from ancient records.

The earlier portion of the contents of this book relates to *inams*, (grants) or *jaghires* (estates) bestowed by the Padshahs, or Mahomedan rulers, on different fanes, persons, or special places.

After about thirty loosely written pages of the said matter, a document follows unexpectedly, which is of a historical kind. It commences with *Janamejaya;* and after the mention of a few of his descendants, passes to the line of *Jarasandha*, noticing several of the more remarkable events, and persons, of the *Mágadha* kingdom. Its transit is then to *Pratápa rudra*, and it very erroneously makes "*Bhojaraja* of Ougein" to be one of his descendants. Passing to the *Vijayanagarum* dynasty it dates the foundation of that town by *Vidyaranya*, in the 9th century of *Salivahana*, which is probably too early. It has most of the usual particulars concerning the *Rayer* dynasty, down to the confederation of the Mahomedans against *Rama raju*. It then details some proceedings of Mahomedan rulers, as far as to *Alemguir*, who employed and distinguished *Sahu raja* of the Mahrattas. Concerning these, there are some rather full details; and then a transition to the Mysore kings; the usurpation of Hyder; and the final subjugation of Tippoo by the English. This part of the book is in very good preservation.

The following contents are rules and regulations concerning cultivation, taxes, and the like as fixed by *Crishna Raja Udiyar* after his restoration to the kingdom of his ancestors, being assisted by *Purnaya* his minister. These rules were deduced after an investigation into early records, antecedent to the Mahomedan usurpation.

Remark.—It may thus appear that this document is not without some interest and value; though slenderly so in any historical point

of view, as we possess all that it contains in other and perhaps better documents. The whole of the writing is with indelible ink, on good Europe paper, entirely uninjured.

Manuscript book, No. 4—Countermark 888.

Sections 1 to 3. See the preceding Canarese portion of this report.

Section 4. Account of *Sonda*, the capital of the *Sonda* country.

This account ascends up to the time of a descendant of *Acasa raja*, of the *Tondaman* line at *Chandragiri*; who, in defect of posterity, is stated to have adopted *Vencatapati nayak* of the race of *Achyuta rayer*; and there seems to be an intimation, though the passage is obscure, that the said race were descendants of a more ancient dynasty at *Sonda*. The *Tondaman*, having a son born to him, dismissed the aforesaid *Vencatapati nayak* with some money and troops to make his own way; and he succeeded in fixing himself at *Sirisi*; having previously conquered *Chennapatnam*, and a small district around it, by the way. He took *Sirisi*; afterwards, built a town and fort there; to which he gave the name of *Chennapatnam*. He further assaulted a neighbouring fort belonging to a *Vedar* chief, which he could not take; but effected its appropriation, by giving his daughter in marriage to the *Vedar* chieftain. He began to reign in the town of *Chennapatnam*, which he had built; being crowned there in Sal. Sac. 1121 (A. D. 1198). His descendants, rulers at *Chennapatnam* were,

1 Rama raja.
Rama Chandra raja.
Vakta vadiyaru.
Arasapa Vadiyaru.
5 Rama Chandra nayak.
Arasapa nayak.
Rama Chandra.
Arasapa nayak.
9 Raghu nat'ha nayak.

Subsequently the Mahomedans in the time of *Vencapatinayak*, conquered the country. The son of that chief was named *Sada siva nayak*; a favourable report of whose capacity reaching Delhi, that Court placed *Sada siva nayak*, as their manager, in charge of the country. Various alternations occurred down to the time of Hyder Ali; who assumed the country after having pillaged it. Passing through the hands of Tippu Sultan, it came into possession of the Honourable Company.

Remark.—This document seems to be of some slight local importance.

Section 5. See preceding Canarese portion of this report.

Section 6. Account of a *Jaina matam* and of an ascetic, or hierophant of the *Jainas.*

(This section is Canarese in Mahratta characters).

Formerly what is now termed *Ahobala matam* was a *Jaina-matam*, that is shrine, or monasterium of *Jainas.* Some time subseqqently *Chamundi rayer*, of the race of *Pandurayen*, went to inspect the wilderness called *Bivar-gov*, and in the midst of it, clearing some ground he built a fane to *Góstésvara;* while the celestials came and performed all the usual rites. But the image of *Góstésvara*, assumed the habit of a *Jaina* image; and in different other places *Jaina* fanes were formed; several of which are specified, at the close of this brief paper, of only four pages.

Section 7. Account of *Beleti*, in the *Sonda* country, and of a race of kings.

An accountant, through defect of posterity, was going to do penance in the wilderness where he met with the fane of *Gostesvara svami;* to which he paid homage; and by doing so, obtained two sons, who on growing to manhood fought with a neighbouring *Vedar-raja*, and took his country; over which they ruled. They were named *Andaradiyar*, and *Andana-vadiyar*, and adopted the *Jaina* credence. One or two names of their posterity follow. The country was conquered by *Bhadra-nayak;* and his race succeeded, to wit, *Basavapa-nayak* (one illegible name), *Soma-sancara nayak*, *Vira-Bhadra-nayak.* They divided the country into two petty sovereignties. These increased their dominions: and took *Sirisi*, with other forts. The boundaries of their rule are specified.

Section 8. Account of some *Jainas*, who came by sea from the *Banga-desam.*

Some tribes of *Jainas*, styled *Samuntar* (as I suppose *Samunas*) came on board ship from *Banga-desa*, under the rule of *Anga-raja*, and *Ajala-raja.* These conquered, and took possession, of some country; of which the revenues are stated; the names of towns so captured are *Cudiyalu* and *Baracur.* After some time a chief named *Bakhtyala* fought with them; and, having conquered them, they went away to *Udapu.*

Remark.—This small fragment of two pages, may turn out to be of some use. *Cudiyalu* I believe to be the same as Mangalore: and *Baracur*, a town near *Udapu*, is stated to be a country or place between Mangalore and *Gokernam.* *Bangu desa*, I have usually understood to

be Bengal. If *Jainas* came thence by sea, it must have been a circuitous voyage; which induces me to think some other country intended. *Ajala-raja* is a name of great celebrity in *Java*, of *Hindu* origin. Query, whether the going to *Udapu* may mean sailing thither?

Section 9. Account of *Mirjan* in Canara.

In early times *Jaina-bhayar-devi* built a town and fort, by the side of a small river in the *Mirjan* district: which afterwards came under the power of the *Visiapur-Padshah*. One *Mallicar* son of *Bhatt* a *Brahman* of the *Hayga* class was seen by his preceptor asleep in the sun, shaded by the hood of a serpent; on which the preceptor asked what the said *Mallicar* would give him, on coming to the possession of his kingdom: which the young man treated as a jest. But after some time having obtained some wealth, he therewith raised a band of troops; and with it assaulted the dominions of the *Visiapur* ruler; took this district, and governed it eighteen years, till his death. It then reverted to the Mahomedans; but afterwards came under the *Nagara-raja*, or king of what is I believe usually termed *Nugger** in the province of *Bidanore*.

Section 10. Account of *Jinadanta* and other kings, from a writing by *Sivaiya Jaina Gaudu* of *Horanad* in *Canara*.

Anciently about two hundred and fifty years ago (some error in the date) one *Bairasa-vadiyar* a *Jaina* from *Uttara-madhyma-desa*, went to the country of *Sámána-maha-rayer*, son of *Jinadanta*, carrying with him an *amman* or image of a goddess, called *Padmávati;* which he placed in a shrine, near the country of the son of *Jinadanta;* and, by the merit of homage and offerings to that shrine, he conquered and acquired the whole of the said country for himself. There is some loose legendary matter; for instance, mention of a king who ruled many hundreds of thousands of years, which does not appear to be of any credibility, or consequence.

Section 11. Account of *Baracur*.

This account goes up to a high antiquity referring to the establishment of seven *Saiva* emblems by *Marcandeya-rishi*, said to be narrated in the *Marcandeya-puranam*. It is stated to be the locality of the throne obtained from *India*, and the seat of power of an *Isvara* (lord) who ruled thereon two thousand years (evidently meaning *Vicramaditya*). Afterwards

* Perhaps the *Nagara* of Ptolemy.

Salivahana ruled. The name of *Balipati*, as a titular name, occurs. As this locality was one of much commerce, many ships going and coming, it was judged expedient to celebrate a human sacrifice, on that account; and, as stated in the paper, a man was taken from one of the ships, and offered in sacrifice. *Buddha-panta raja* afterwards ruled. The narrative then alludes to the penance of *Vidyaranya swámi*; in consequence of which a shower of gold fell, which he made use of in fixing *Haka* and *Bukka*, two brothers in power, at *Vidyaranya*, and crowned or anointed them. Later down, this place came under the *Visiapur* government.

Remark.—This paper is of some little value: the abstract may however suffice.

Section 12. Account of some *Jaina* kings of *Hobhalli* and *Hosapatnam* in *Canara*.

One *Manu maha raja* came from *Uttara nád'ha*, a town so called, to this place. He was a *Jaina*. His son was named *Jina danta*, who forming an improper familiarity, with an outcaste person of the *Vedar* tribe, the father considered him to have forfeited his rights, and dignity: which the son learning sought safety in flight. There however the narrative abruptly ceases; owing to some pages of the book at the end being lost.

General Remark.—The Mahratta papers in this book are quite legible, and in tolerably good preservation; with the exception only of having been badly bound. The abstracts may suffice, in pointing to general indications of early *Jaina* rule in the Canara province. There is further an interest attaching to these papers from their relating to the site of ancient commerce with India; being the trade, as I suppose, which is indicated in sect. 11, though we should not, without such a guide, have imagined that it was thought needful to cement it with the blood of human victims. The port first made by Hippalus, in crossing the Arabian gulf, that is Musiris, is conjectured by Dr. Robertson (Disqu. p. 50) to be Merjee, or the *Mirjan* of sect. 9, but I rather venture to infer that *Muskica* the name of a district, was meant by Pliny; and in India almost every district had some leading town from which it originally took its name. Further the same writer conjectures the Barace of Pliny to be Barcelore, that is the *Baracur* of sect. 8 and 11, which is probably accurate. It is needless for me to attempt more than to offer a clue to any who may think the subject worthy of further investigation.

E.—PRACRIT.

Manuscript book, No. 9—Countermark 648.

Nigamágama-Sára, or the essence of the *Nigama* and *Agamas*.

The term *Nigama* is somewhat equivalent to "Scriptures," in a particular mode of usage. The *ágamas* are twenty eight books of *Saiva* principles. In this work the substance of the *Vedas*, and of those *Saiva* works, is professed to be given. It is a moderate sized octavo; and would be worth translation. It does not admit of abstract. The character is *Balband*; rather rudely written; and the language that of the *Brahmans* of the *Mahrashtira-desam*. The paper and ink are good. The writing may be fifty years old; though probably less.

The book is entered in Des. Catal. vol. 2, p. 100, art. vii.

Manuscript book, No. 3—Countermark 652.

Parasu Rama charitra, or account of the sixth *avatar*, the conqueror of the *Cshetriyas*, and founder of the fane named after him on the western coast.

This is a thin folio, in extremely good preservation, written with indelible ink, in the *Balband* character, and in language similar to the preceding; prevailingly Sanscrit, but with *Mahratti* intermingled, and forming a local *Prácrit*. The subject is the story of *Parasu Rama*, heretofore given: it contains the solar and lunar lines of kings. I do not find the book entered in the Des. Catalogue.

Manuscript book, No. 10—Countermark 641.

Do. No. 11—Countermark 642.

These are small, but thick, folios written in the *Deva-nagari* character, on superior country paper, with indelible ink. The contents are entitled *Gita Bhashya*, or commentary on the *Bhagavat Gita*, as contained in the *Bhishma parvam* of the *Mahabháratam*. The language is a mixture of Sanscrit *slocas*, with Mahratta interpretation; and forms a

doctrinal, or theological, work of repute. The work is complete; and in very good preservation. It is by *Jnánésvara*, alias, *Jnána deva*.

It is entered in Des. Catal. vol. 2, p. 97, art. iii.

NOTANDUM.—The first part of my sixth report, on the collation and examination of Mackenzie Manuscripts, here concludes.

MADRAS, *October* [illegible].

LITERARY AND SCIENTIFIC INTELLIGENCE.

[Although late, owing to the tardy appearance of the volume containing the Report, which has just reached us, we think it right to put on record the following notices of Desiderata, &c. published by the British Association for the Advancement of Science.—*Editor Madras Journal.*]

Reports requested, Researches recommended, and Desiderata noticed by the Committees of Science at the Newcastle Meeting.

REPORTS ON THE STATE OF SCIENCE.

Prof. Bache, of Philadelphia, was requested to furnish a Report on the state of Meteorology in the United States, for the next meeting of the Association.

Prof. Johnston was requested to prepare a Report on the present state of Chemistry as bearing upon Geology.

Mr. J. E. Gray, F. R. S., was requested to prepare a Report on the present state of our knowledge of Molluscous Animals and their Shells.

Mr. Selby was requested to draw up a Report on the present state of knowledge of Ornithology, for an early meeting.

Mr. Bryan Donkin (Secretary), Dr. Ure, Dr. Faraday, and Mr. Cooper were requested to Report as to the state of our knowledge on the Specific Gravity of Steam generated at different Temperatures; Mr. Donkin to act as Secretary.

Mr. E. Forbes was requested to Report on the present state of the knowledge of the Geographical Distribution of Pulmoniferous Mollusca in Britain, and the circumstances which influence this distribution.

The Council were requested to apply for a Report on the present state and recent discoveries in Geology.

Specific Researches in Science involving applications to Government or public bodies.

MAGNETICAL OBSERVATIONS.

Resolved,—1. That the British Association views with high interest the system of Simultaneous Magnetic Observations which have been for some time carrying on in Germany and in various parts of Europe, and the important results towards which they have already led; and that they consider it highly desirable that similar series of observations, to be regularly continued in correspondence with and in extension of these, should be instituted in various parts of the British dominions.

2. That this Association considers the following localities as particularly important:

Canada,	Van Diemen's Land,
Ceylon,	Mauritius, or the
St. Helena,	Cape of Good Hope;

and that they are willing to supply Instruments for the purpose of observation.

3. That in these series of observations, the three elements of horizontal direction, dip, and intensity, or their theoretical equivalents, be insisted on, as also their hourly changes, and on appointed days their momentary fluctuations.

4. That this Association views it as highly important that the deficiency yet existing in our knowledge of Terrestrial Magnetism in the Southern Hemisphere should be supplied by observations of the magnetic direction and intensity, especially in the higher latitudes, between the meridians of New Holland and Cape Horn; and they desire strongly to recommend to Her Majesty's Government the appointment of a naval expedition directed expressly to that object.

5. That in the event of such expedition being undertaken, it would be desirable that the officer charged with its conduct should prosecute both branches of observations alluded to in Resolution 3, so far as circumstances will permit.

6. That it would be most desirable that the observations so performed, both in the fixed stations and in the course of the expedition, should be communicated to Prof. Lloyd.

7. That Sir John Herschel, Mr. Whewell, Mr. Peacock, and Prof. Lloyd be appointed a Committee to represent to Government these recommendations.

8. That the same gentlemen be empowered to act as a Committee,

with power to add to their number, for the purpose of drawing up plans of Scientific co-operation, &c. &c., relating to the subject, and reporting to the Association.

9. That the sum of 400*l.* be placed at the disposal of the above-named Committee, for the purposes above mentioned.*

ASTRONOMY.

Sir J. Herschel and Mr. Baily were requested to make application to Government for increase in the instrumental power of the Royal Observatory at the Cape of Good Hope, and the addition of at least one assistant to that establishment.

SCIENTIFIC RESEARCHES IN INDIA.

Resolved,—1. That the British Association regard the measurement of an arc of longitude in India comparable in extent to the meridional arc already measured in that country, as a most important contribution to other facts illustrative of the earth's true figure, and, by a necessary consequence, to the progress of astronomy.

2. That the verification and comparison of the standards of the Indian and English surveys, as compared with the proposed Parliamentary standard, is indispensable to the correct knowledge of the meridional and parallel arcs.

3. That pendulum observations at the principal elevations, or contiguous plains, and on the sea-coasts, if possible, on the same parallels of latitude, will afford results of great value to physical science.

4. That observations for the determination of the Laws of Refraction in the elevated regions of the Himalayas, and at the Observatories of Madras and Bombay, will be a most important service to science.

5. That it is highly desirable also that magnetical observations should be made in India similar to those which are carrying on in other parts of the world, and which are justly regarded with so much interest.

6. That a topographical map of India, upon a large scale, accompanied by statistical and geological information, would be highly desirable.†

* The application to Government on this subject has been successful, the commission of an expedition to the Antarctic regions being entrusted to Captain J. C. Ross.

† These Resolutions have been submitted to the consideration of the Directors of the East India Company; and, in particular, the recommendation for magnetical observations been promptly acceded to.

ORDNANCE SURVEY.

Resolved,—That a Committee be appointed to inquire how far, in the future progress of the Ordnance Survey, the several metalliferous and coal-mining districts could be represented on a larger scale. The Committee to consist of Mr. Greenough, Mr. Griffith, Mr. De la Beche, and Major Portlock.

MINING RECORDS.

Resolved,—1. That it is the opinion of this Meeting, that, with a view to prevent the loss of life and of property which must inevitably ensue from the want of accurate mining records, it is a matter of national importance that a depository should be established for preserving such records of subterranean operations in collieries and other mining districts.

2. That a Committee be appointed to draw up a Memorial and to communicate with the Government in the name of the British Association, respecting the most effectual method of carrying the above resolution into effect.

3. That the Committee consist of the following gentlemen, with power to add to their number; The Marquis of Northampton, Sir Charles Lemon, Sir Philip Egerton, John Vivian, Esq., Davis G. Gilbert, Esq., J. S. Enys, Esq., W. L. Dillwyn, the President of the Geological Section of the British Association, the President for the time being of the Geological Society of London, the Professors of Geology at Oxford, Cambridge, London, and Durham, H. T. De la Beche, Esq., John Taylor, Esq., John Buddle, Esq., Thomas Sopwith, Esq.

Specific Researches in Science involving Grants of Money.

The following new Recommendations were adopted by the General Committee.

That it is desirable that the meteorological observations made at the equinoxes and solstices, agreeably to the recommendations of Sir John Herschel, Bart., should be collected together, as far as is practicable, and reduced to an uniform mode of expression, so that comparisons may be made of the same, with a view of deducing results that may lead to the improvement and elucidation of meteorology.

That Sir John Herschel be requested to superintend the same, and that the sum of 100*l.* be placed at his disposal for that purpose.

That it is desirable that the whole of the stars observed by Lacaille at the Cape of Good Hope, the observations of which are recorded in his *Cœlum Australe Stelliferum*, should be reduced.

That Sir J. Herschel, Mr. Airy, and Mr. Henderson be a Committee for carrying the same into effect.

That the sum of 200*l.* be appropriated to that purpose.

That it is desirable that a Revision of the Nomenclature of the stars should be made with a view to ascertain whether or not a more correct distribution of them amongst the present constellations, or such other constellations as it may be considered advisable to adopt, may be formed.

That Sir John Herschel, Mr. Whewell, and Mr. Baily be a Committee for that purpose, and to report on the same at the next meeting of the Association.

That the sum of 50*l.* be appropriated to defray the expences that may be incurred in this inquiry.

That 100*l.* be placed at the disposal of Sir D. Brewster and Professor Forbes, for the purpose of procuring Hourly Meteorological Observations, to be made at two parts in Scotland, one at Fort George, on the coast, and the other at some central part, at a great elevation above the sea.

That it appears to the Committee desirable to diffuse in this country the knowledge of the Scientific Memoirs published on the Continent, and that, for this object, 100*l.* be placed at the disposal of a Committee, consisting of Dr. Robinson, Sir John Herschel, Sir D. Brewster, and Professor Wheatstone, with power to add to their number, towards procuring the translation and publication of such memoirs as they may approve.

That Mr. Pattinson and Mr. Richardson be requested to undertake experiments to ascertain whether any perceptible Galvanic influence is exerted by the Stratified Rocks of the neighbourhood of Newcastle, and that 20*l.* be placed at their disposal to meet the expenses of such experiments.

That Dr. Arnott and Dr. Yelloly be a Committee for the purpose of improving Acoustic Instruments (in reference to diseases of the ear), with 25*l.* at their disposal.

That Mr. Cargill, Mr. Wharton, Mr. Buddle, Mr. Forster, Professor Johnston, and Mr. Wilson be a Committee for inquiries into the Statistics of the Collieries of the Tyne and Wear, with 50*l.* at their disposal.

That Sir John Robison (Secretary), and Mr. J. S. Russell, and Mr. James Smith be a Committee for instituting Experiments on the Forms of Vessels, with 200*l.* at their disposal.

Researches not involving Grants of Money or application to Government.

The Meteorological Committee was requested to furnish a System of Meteorological Instructions for the next meeting of the Association.

A Committee was formed, consisting of Mr. Greenough, Mr. De la Beche, Mr. Buddle, and Mr. Griffith, to draw up a proper form and scale of the Sections to be sent to the Geological Society by the engineers and proprietors of railways.

The following gentlemen were appointed a Committee to investigate the Salmonidæ of Scotland, and directed to place themselves in communication with Mr. Shaw, who has offered to submit his experiments on that subject to their inspection: Mr. Selby, Dr. Parnell, Mr. J. S. Menteith, Professor R. Jones, Dr. Neill, Sir W. Jardine, Bart., Secretary.

The following gentlemen were appointed members of a Committee [redacted] stituted for the purpose of investigating the Insects of the ge[redacted] *Er[redacted]na* and *Aphis*, which attack the Pines of this country; Mr. Spence, F. R. S., R. K. Greville, LL. D., Sir W. Jardine, Bart., Mr. Selby, Secretary.

The Committee on Diseases of the Lungs in Animals was reappointed.

The Committee for obtaining a complete account of the Fauna of Ireland was altered so as to consist of Capt. Portlock, Mr. R. Ball, Mr. W. Thompson, Mr. Vigors, Mr. Halliday, and Dr. Coulter, who was requested to act as Secretary.—*Reports, vol.* 7.

On Halley's Comet. By Sir John F. W. Herschel, *Bart. F.R.S., &c.*

"One of the most interesting series of observations of a miscellaneous kind I had to make at the Cape of Good Hope, was that of Halley's comet.—I saw the comet for the first time after its perihelion passage on the night of the 25th of January. Mr. Maclear saw it on the 24th. From this time we both observed it regularly. Its appearance was that of a round, well-defined disk, having near its centre a very small bright object exactly like a small comet, and surrounded by a faint nebula. This nebula in two or three more nights was absorbed into the disc, and disappeared entirely. Meanwhile, the disc itself dilated with ex-

traordinary rapidity ; and by examining its diameter at every favourable opportunity, and laying down the measures by a projected curve, I found the curve to be very nearly a straight line, indicating a uniform rate of increase; and by tracing back this line to its intersection with the axis, I was led, at the time, to this very singular conclusion, viz. that on the 21st of January, at 2h. P. M., the disc must have been a point—or ought to have had no magnitude at all! in other words, at that precise epoch some very remarkable change in the physical condition of the comet must have commenced. So far all was speculation. But in entire harmony with it is the following fact communicated to me no longer ago than last month by the venerable Olbers, whom I visited in my passage through Bremen, and who was so good as to show me a letter he had just received from M. Boguslawski, Professor of Astronomy at Breslau, in which he states that he had actually procured an observation of that comet on the night of the 21st of January. In that observation it appeared as a star of the sixth magnitude—a bright concentrated point, which showed no disc, with a magnifying power of 140! And that it actually *was* the comet, and no star, he satisfied himself, by turning his telescope the next night on that point where he had seen it. It was gone! Moreover, he had taken care to secure, by actual observation, the place of the star he observed ; that place agreed to exact precision with his computation ; that star *was* the comet, in short. Now, I think this observation every way remarkable. First, it is remarkable for the fact, that M. Boguslawski was *able* to observe it at all on the 21st. This could not have been done, had he not been able to direct his telescope point blank on the spot, by calculation, since it would have been impossible in any other way to have known it from a star. And, in fact, it was this very thing which caused Mr. Maclear and myself to miss procuring earlier observations. I am sure that I must often have swept, with a night-glass, over the very spot where it stood in the mornings before sunrise ; and never was astonishment greater than mine at seeing it riding high in the sky, broadly visible to the naked eye, when pointed out to me by a notice from Mr. Maclear, who saw it with no less amazement on the 24th. The next remarkable feature is the enormously rapid rate of dilatation of the disc and the absorption into it of all trace of the surrounding nebula. Another, is the interior cometic nucleus. All these phenomena, while they contradict every other hypothesis that has ever been advanced, so far as I can see, are quite in accordance with a theory on the subject which I suggested on the occasion of some observations of Biela's comet,—a theory which sets out from

the analogy of the precipitation of mists and dews from a state of transparent vapour on the abstraction of heat. It appears to me that the nucleus and grosser parts of the comet must have been entirely evaporated during its perihelion, and reprecipitated during its recess from the sun, as it came into a colder region; and that the first moment of this precipitation was precisely that which I have pointed out as the limit of the existence of the disc, viz. on the 21st of January, at 2h. P. M., or perhaps an hour or two later."—*Ibid.*

The second volume of the Macan and Macnaghten edition of the original Arabic of the Arabian Nights has just been published. Asia occupies the attention of Europe in our day nearly quite as much as it did at the time of the Crusades—all eyes are turned eastward. The politician looks to Asia for the solution of some of the most intricate and important questions in European diplomacy. Asia, the cradle of civilization, is now beginning to receive back the arts, commerce and literature which she gave. Even the British public, which used to think about India (five times in a century) as a place of transportation for younger sons and dowerless damsels, has begun to cast its self-worshipping eyes towards Asia: and as a sign of the times there are at this moment three translations of the Arabian Nights in progress. The first by Mr. Lane, in London, the second by Mr. Torrens, in Bengal, and the third by a German scholar at Stutdgart, whose name the writer of this notice cannot recollect. Manners, minor morals and the other conventionalities of Europe and Asia, were, and are, so different, that a verbatim translation of those celebrated tales never can be made into any of the vulgar languages of Europe—for instance, the beautiful story of Zobeida and her sisters in Galland's translation, is in the original so disfigured by highly *erotic* passages, as to be wholly unfit for translation into English—these passages are often in verse, possessing all the poetic grace and elegance, and more than the prurience of La Fontaine, or Beranger, or Lord Byron. A few of the new tales (in the Macan edition) are the very best, but to enjoy them it is necessary to be an Arabic scholar. Let no one despair: De Sacy's grammar and the (Calcutta) Kamoor* Dictionary, with two hours a day hard study, for nine months, will make a well educated man of average intellect perfectly competent to enjoy the Alif Laila. J. M.

* For sale at the College at a fifth of the original price.

Note to p. 271.

The necessity of noticing some remarks by Lieut. Campbell on Dr. Benza's nomenclature of Indian minerals, reminds the Editor, who enjoyed the pleasure and advantage of an intimate personal friendship with that lamented individual, that no record has been entered in this journal, which his contributions have given an imperishable value to, of the untimely death which put an end to his labours in the cause of geological science. Dr. Benza returned to Europe labouring under some not well defined paralytic symptoms; the result of a fall from his horse on the Neilgherry Hills, which caused some obscure injury at the base of the skull. It is understood that he never recovered from the effects of this accident, and that the catastrophe of his death was caused by his sufferings therefrom, the functions of the brain becoming implicated, leading to that degree of mental alienation which induced him to perpetrate suicide.

Pasqual Maria Benza was a native of Italy, and was in the British Medical Service under the Lord High Commissioner of the Ionian Islands, Sir Frederick Adam, whom he accompanied to his Government at Madras, having obtained a commission in the Medical Service of the East India Company. Former numbers of this journal afford the history of his movements in this country. In professional attendance on the Governor, he visited the Neilgherry Hills twice, and in the 12th number of this journal will be found a geological itinerary of his route thither on these two occasions. The 13th number contains his able and interesting *Memoir on the Geology of the Neilgherry and Koondah Mountains*, one of the most valuable contributions to Indian geology that has been given to the world. *Notes, chiefly geological, of a journey through the Northern Circars*, is the only other contribution to this journal. All these productions were transcripts from his note books, which contained more extended observations, particularly of his route from the Neilgherry Hills down the Cauvery to Permutty, where he observed the geognostic position of the rock containing corundum, a most interesting point, which was in need of elucidation, very valuable observations on which must have been found among the papers of the deceased. Dr. Benza took to Europe with him a very extensive collection of geological specimens, and it was his declared intention to publish a volume on Indian geology, when leisure and the facilities which a residence in Europe afforded, enabled him to do so. Such a work would have contained his mature views on the subject, and the opportunity of careful analysis, would have ensured exactitude

to his mineral nomenclature, which, however, we have no reason to think was not displayed in his published papers—and this leads us to the subject which has elicited the above notice.

First, with regard to the pillars of the mausoleum at Seringapatam: It is certainly singular that one so intimately acquainted with the physical characters of minerals should have pronounced the material to be a hornblende rock, for both Lieut. CAMPBELL's analysis, and specimens now before us presented to the Society by Lieut. NEWBOLD, taken from the mausoleum and from the quarry at Turivacary, would satisfy the merest tyro that it is a species of steatite. It is certain that Dr. BENZA never could have examined the pillars minutely, but that he must have taken BUCHANAN's account of them as correct, to which he might further have been led by the external aspect of the pillars, which in colour resemble hornblende. Dr. BENZA never visited the quarry at Turivacary. The only rock to which, in our opinion, Dr. BENZA stands pledged for mineralogical accuracy is the hornblende rock, or greenstone, of Seringapatam (No. 46 of his illustrative specimens), a fragment of which, with his own label, is now before us, and is clearly what he has designated it. In the ingredients assigned to the other rock by Lieutenant CAMPBELL, and in its infusibility, it exactly answers to the chemical characteristics of steatite or potstone. In a descriptive account of minerals presented to the Society by Lieut. NEWBOLD, written more than a year ago, that officer has pointed out the error into which BUCHANAN had fallen, whom BENZA followed, and he therein assigns its true denomination to this rock.

Secondly, respecting the *eurite* of Palicondah, Dr. BENZA appears, from Lieut. CAMPBELL's own showing, to be in no error—Eurite (an old term of WERNER's, we believe) is nothing but compact felspar; which is fusible, containing silica, alumina, an alkali, and iron—precisely the components of the rock of Palicondah, according to Lieut. CAMPBELL. We can further state that Dr. BENZA's own specimens of eurite in our possession, exhibit all the external characters of that rock.

Thirdly, as to the silicious schist—that rock being a slate composed principally of silex; and hornstone being of similar chemical composition, but wanting the slaty fracture; if the schistose character is observable in the mass (it clearly is in Dr. BENZA's specimens), the term he applies is likely to be the correct one.—*Editor.*

VII.—*Horary Meteorological Observations made agreeably with the suggestions of Sir* JOHN HERSCHEL.

1st.—*At the Madras Observatory.—By* T. G. TAYLOR, Esq. *H. E. I. C. Astronomer.*

Date.	Time.	Barometer.	Thermometer	Wet bulb.	Direction of wind.	Strength of wind.	REMARKS.
Sept.							
21	6 A. M.	29,908	76.9	72,6	W	1	Thick haze.
	7	29,936	77,1	73.0	W	1,2	Do.
	8	29,968	78,6	73,0	W	1,2	Do.
	9	29,978	80,5	73,0	W	2	Do.
	10	29,974	82,0	72,3	W N W	2	Do.
	11	29,960	82,9	72,5	W	2	Haze.
	12	29,934	85,2	73,5	N W	1,2	Haze.
	1 P. M.	29,917	86,8	74.5	W N W	2,3	Thick haze, strong wind.
	2	29,884	88,0	75,3	W N W	2,3	Do. do.
	3	29,861	88,0	74 0	N W	2,3	Do. do.
	4	29,854	88,0	73,2	N W	2,3	Do. do.
	5	29,874	87,0	73,8	N W	1	Haze. gentle wind.
	6	29,892	84,8	74,6	N W	1	Clear. do.
	7	29,900	82,8	75,5	N W	1	Do. do.
	8	29,912	79,6	75,1	N W	1	Do. do.
	9	29,936	78,1	75,1	S W	1	Do. do.
	10	29,930	79,3	75,1	S	1	Cloudy. do.
	11	29,936	80,4	74,5	S W	1	Flying clouds do.
	12	29,916	80,0	74,1	W	1	Clear. do.
	1 A. M.	29.906	78,4	74,5	S W	1,2	Do. moderate wind.
	2	29,902	78.0	74,5	S W	1,2	Do. do.
	3	29.902	77,8	74,3	S W	1,2	Do. do.
	4	29,900	77,4	74.0	S W	1,2	Do. do.
	5	29,906	76,8	73,9	W	1,2	Do. do.
22	6	29,942	77,3	71,9	W	1,2	Haze. do.
	7	29,952	76,5	71,5	S W	1,2	Do. do.
	8	29,964	78,9	72,4	S W	2	Do. strong wind.
	9	29,974	80,8	73,1	W	2	Do. do.
	10	29,971	83,0	73,5	W	2	Do. do.
	11	29,962	84,8	74,0	W	2	Thick haze—moderate wind.
	12	29.926	86,3	75,9	W	1,2	Do. do.
	1 P. M.	29,900	88,0	77,1	N N W	2	Do. gentle wind.
	2	29,876	88,3	76,6	N W	2	Do. strong wind.
	3	29,864	88,5	76,5	N W	1	Do. gentle wind.
	4	29,864	88,4	76,4	N W	1	Haze. do.
	5	29,872	88,0	76,0	N W	1	Do. do.
	6	29,890	85,4	78,2	S E	1	Cloudy. do.

2d.—*At the Trevandrum Observatory.—By the Rev.* G. SPERSCHNEIDER, *Superintendent.*

Date.	Hour.	Newman's Standard bar. corrected for temp. 32° and for capillarity.	Standard thermometer.	Depress. of wet bulb. thermometer.	Dew point.	Direction of wind.	Velocity of the wind.	Solar radiation.	Clouds, aspect of the sky and remarks
Dec.									
21	6 A.M.	29.703	73.0	2.6	69.12		,,		Sky very clear calm
	7	.730	74.0	2.9	69.70		,,	2.5	Do. cum. about the horizon do.
	8	.762	77.4	3.5	68.19		,,	0.5	Do. do. do.
	9	.768	80.5	5.2	73.14		,,	3.0	Do. do. do.
	10	.766	82.5	7.4	71.95		,,	cly.	Fly. clo. do.
	11	.757	84.0	8.4	72.07		,,	9.0	Zenith clear—light clouds about the horizon do.
	Noon.	.731	86.0	9.9	71.97	s	2	4.5	Do. do. light air
	1 P.M.	.692	87.6	10.8	72.38	s E	4	12.7	Do. cum. about the horizon—gentle wind
	2	.669	86.6	11.0	70.87	s	3	11.5	Do. do. do.
	3	.656	85.6	9.7	71.82	do	,,	cly.	Cloudy calm
	4	.653	84.8	9.1	71.81	do	,,	do	Very clo. at 4h 7m—drizzling—do.
	5	.660	84.5	8.7	72.16	do	,,	do	Clearing do.
	6	.674	83.0	8.0	71.57	do	,,		Zenith clear, rest becoming clo. do.
	7	.711	82.0	6.5	72.80	do	,,		Very cloudy do.
	8	.730	81.5	5.9	73.17	do	,,		Do. do.
	9	.749	80.0	4.9	73.06	do	,,		Do. do.
	10	.769	78.0	3.6	72.88	do	,,		Sky getting clear do.
	11	.735	76.2	2.7	72 33	w	1		Sky rather clo. wind just percept.
	Mid.	.739	75.5	2.8	71.48	do	,,		Do. calm
,, 22	1 A.M.	.713	74.7	2.1	71.66	do	,,		Quite clear do.
	2	.704	74.2	2.1	71.14	do	,,		Do. do.
	3	.678	74.0	1.9	71.23	do	,,		Do. do.
	4	.663	73.5	1.4	71.46	do	,,		Do. do.
	5	.665	73.0	1.4	70.95	do	,,		Do. do.
	6	.673	74.0	3.4	68.92	do	,,		Do. haze about the horizon do.
	7	.697	73.5	2.4	69.95	do	,,	0.5	Do. do. do.
	8	.727	77.5	2.9	73.39	do	,,	1.0	Zenith clo. cum. about the hor. do.
	9	.742	80.5	4.9	73.60	do	,,	4.5	Do. do. do.
	10	.740	83.8	8.1	72.32	do	,,	5.5	Do. do. do.
	11	.719	85.2	9.8	71.20	do	,,	1.8	Sky getting cloudy do.
	Noon.	.700	87.3	10.0	73.30	s E	6	8.5	Lt. fly. clo. in the zenith. do. plt. w.
	1 P.M.	.675	87.8	11.0	72.29	do	6	14.0	Do. do. do.
	2	.646	87.2	11.2	71.25	do	6	5.0	Do. do. do.
	3	.642	87.4	11.1	71.66	do	6	cly.	Threatg.—thun. at 3h 30m—rain—do
	4	.639	83.6	8.5	71.45	N	3	rg.	Rain continued gentle breeze
	5	.667	79.3	4.7	72.61	do	1	cly.	Overcast—wind just perceptible.
	6	.687	78.0	3.5	73.03	do	,,		Do. do.

December 21st fell rain from 6 A. M. to 6 P. M. None.

do. 6 P. M. to 6 A. M. do.

December 22d do. 6 A. M. to 6 P. M. ·1304

Total .1304

The Instruments are the same, and situated exactly as before.

METEOROLOGICAL REGISTER KEPT AT THE MADRAS OBSERVATORY FOR THE MONTH OF JULY 1839

Days.	Barometer at 9 A.M.	Thermometer at 9 A.M.	Wind at 9 A.M.	Rain	Barometer at Noon	Thermometer at Noon	Wind at Noon	Remarks
July 1	29.818	83.0	W.	0.005	29.780	90.0	W.	Lightning and thunder
2	.848	82.2	W.		.810	90.0	W.	do.
3	.782	83.0	W.		.740	91.0	W.	do.
4	.720	84.0	W.		.680	91.0	W.	do.
5	.747	84.0	W.		.710	91.0	W.	do.
6	.744	84.0	W.		.710	91.0	W.	do.
7	.716	84.0	W.		.680	91.0	W.	do.
8	.836	80.0	W.	1.000	.800	87.0	W.	Lightning and thunder & violent light
9	.774	82.0	W.		.740	90.0	W.	ning with rain
10	.760	84.0	W.		.720	90.0	W.	Do. lightning
11	.710	84.0	W.		.680	90.0	W.	do.
12	.716	84.0	W.		.680	90.0	W.	do.
13	.684	84.0	W.		.650	90.0	W.	do.
14	.684	84.0	W.		.650	90.0	W.	do.
15	.684	84.0	W.		.650	90.0	W.	do.
16	.716	84.0	W.		.680	90.0	W.	do.
17	.716	84.0	W.		.680	90.0	W.	do.
18	.716	84.0	W.		.680	90.0	W.	do.
19	.716	84.0	W.		.680	90.0	W.	do.
20	.716	84.0	W.		.680	90.0	W.	do.
21	.716	84.0	W.		.680	90.0	W.	do.
22	.716	84.0	W.		.680	90.0	W.	do.
23	.716	84.0	W.		.680	90.0	W.	do.
24	.716	84.0	W.		.680	90.0	W.	do.
25	.716	84.0	W.		.680	90.0	W.	do.
26	.716	84.0	W.		.680	90.0	W.	do.
27	.716	84.0	W.		.680	90.0	W.	do.
28	.716	84.0	W.		.680	90.0	W.	do.
29	.716	84.0	W.		.680	90.0	W.	do.
30	.716	84.0	W.		.680	90.0	W.	do.
31	.716	84.0	W.		.680	90.0	W.	do.
Means	29.744	83.8	W.	1.005	29.706	89.8	W.	

METEOROLOGICAL REGISTER KEPT AT THE MADRAS OBSERVATORY; FOR THE MONTH OF AUGUST, 1839.

Days.	Barometer at 10 A. M.	Barometer at 4 P. M.	Barometer at 10 P. M.	Ther. at 10 A. M.	Ther. at 4 P. M.	Ther. at 10 P. M.	Wet Bulb. 10 A. M.	Wet Bulb. 4 P. M.	Wet Bulb. 10 P. M.	Rain. Sun-rise.	Rain. Sun-set.	Evaporation.	Direction of Wind. 10 A. M.	Direction of Wind. 4 P. M.	Direction of Wind. 10 P. M.	Weather. 10 A. M.	Weather. 4 P. M.	Remarks. 10 P. M.
1839	Inch.	Inch.	Inch.	o	o	o	o	o	o									
Aug. 1	29,860	29,770	29,892	87,0	89,0	86,3	8,3	5,5	4,9	.....	.....	.....	N W	S. SE	W	Clear	Clear	Cloudy—lightning.
2	,868	,800	,868	87,8	89,0	86,1	9,4	8,5	5,1	.....	.....	.....	S W	SE. E	S	Clear	Fl. cl.	Fl. cl. do
3	,858	,770	,860	88,3	89,3	85,7	10,5	7,0	6,2	.....	.....	.....	N W	ES. S	W	Haze	Cloudy	Driz. rain thunder & vivid lightning.
4	,840	———	,850	85,7	——	85,2	6,0	—	6,6	1,204	.....	.....	W	———	S. SW	Cloudy	———	Do. do. lightning.
5	,844	,752	,842	85,0	82,0	86,3	7,6	13,0	6,8	.....	.....	.....	W	W	S W	Cloudy	Cloudy	Do. do. do.
6	,872	,766	,840	86,3	81,0	85,6	6,6	10,5	4,6	.....	.....	.....	W	E	S	Haze	Fl. cl.	Clear.
7	,872	,782	,844	88,3	89,0	85,2	11,6	9,0	10,3	.....	.....	3,158	N W	E	S W	Clear	Fl. cl.	Do. lightning.
8	———	,766	,836	——	89,5	87,5	—	9,0	5,9	.....	.....	.....	———	S. SE	S	———	Cloudy	Flying cl.—thunder and lightning.
9	,874	,772	,844	83,8	86,0	86,0	4,3	7,0	4,9	0,076	.....	.....	N E	NW. W	S	Dr. ra.	Cloudy	Do. do. do.
10	,862	,794	,874	81,8	84,4	83,4	6,1	5,4	3,3	1,651	.....	.....	W	S. SW	S W	Cloudy	Cloudy	Do lightning.
11	,906	———	,886	83,0	——	84,1	6,0	—	4,0	.....	.....	.....	SW. W	———	S W	Cloudy	———	Do. do.
12	,901	,822	,914	84,0	89,0	85,3	7,5	8,1	5,6	.....	.....	.....	N W	SE. E	W. SW	Cloudy	Cloudy	Do. do.
13	,912	,790	,882	84,5	87,4	84,6	6,7	7,0	3,6	0,101	.....	.....	W	SE. E	S	Clear	Fl. cl.	Do. do.
14	,894	,818	,910	82,3	86,0	84,9	4,8	5,5	3,9	0,042	.....	2,350	N W	S E	S W	Cloudy	Cloudy	Cloudy do.
15	,880	,794	,880	84,5	85,6	82,3	6,1	4,7	3,2	.....	.....	.....	W	S W	W	Cloudy	Cloudy	Drizzling rain, lightning and thunder.
16	,912	,820	,882	79,8	81,5	78,4	0,3	4,5	1,4	0,127	1,064	.....	N W	W	S W	Cloudy	Clear	Rain—clear do.
17	,876	,780	,825	82,1	82,5	81,8	5,1	3,5	2,4	.....	.....	.....	N W	E	S W	Cloudy	Cloudy	Flying clds— thunder and lightning.
18	,818	———	,818	82,2	——	81,7	3,8	—	2,6	.....	0,467	.....	N W	———	S W	Cloudy	———	Cloudy do. do.
19	,790	,722	,792	78,6	81,2	80,0	2,1	2,4	2,0	0,044	0,046	.....	N W	W	S W	Cloudy	Cloudy	Do. do. do.
20	,794	,728	,838	78,2	81,8	78,0	1,9	2,8	0,0	0,809	.....	.....	S W	S	S W	Cloudy	Cloudy	Do. ———
21	,882	,808	,894	79,4	82,6	81,0	1,9	6,4	1,5	0,707	.....	0,963	S W	W	S	Cloudy	Cloudy	Do. lightning
22	,906	,810	,884	80,9	85,6	85,5	3,4	6,6	5,1	.....	.....	.....	S W	S W	S E	Clear	Cloudy	Do. do.
23	,906	,804	,880	82,1	84,3	82,5	4,4	6,0	2,1	.....	.....	.....	W	W	S	Cloudy	Cloudy	Do. do.
24	,906	———	,906	81,9	——	82,8	2,2	—	2,4	.....	.....	.....	W	———	S	Cloudy	———	Do. do.
25	,922	———	,950	83,0	——	81,9	3,0	—	1,6	.....	.....	.....	N W	———	S W	Th. hz.	———	Do. do.
26	,946	,808	,880	82,0	86,5	83,9	5,0	8,8	5,9	.....	0,027	.....	S W	S W	N W	Cloudy	Fl. cl.	Fl. cl. do.
27	,872	,754	,820	82,9	86,4	84,0	6,9	9,4	3,2	.....	0,027	.....	S W	N E	S W	Cloudy	Cloudy	Cloudy—lightning.
28	,836	,724	,844	82,0	86,5	83,5	3,9	7,5	3,5	.....	.....	1,918	S W	W	W	Cloudy	Cloudy	Drizzling rain—lightning.
29	,836	,740	,844	83,8	87,0	84,6	5,0	7,5	3,8	0,097	.....	.....	W	W	S W	Cloudy	Cloudy	Rain, thunder and lightning.
30	,840	,758	,842	83,4	86,8	84,4	4,4	7,8	4,4	0,337	.....	.....	N W	N W	S	Th. hz.	Cloudy	Haze —lightning.
31	,896	,810	,904	84,0	88,0	86,1	4,7	8,0	4,1	.....	.....	.....	W	E	S	Clear	Fl. cl.	Do. do.
Mean	29,873	29,779	29,865	83,3	85,7	83,8	5,3	7,0	4,0									

METEOROLOGICAL REGISTER KEPT AT THE MADRAS OBSERVATORY; FOR THE MONTH OF SEPTEMBER, 1839.

Days.	Barometer at			Ther. at	Wet Bulb.	Rain.		Evaporation.	Direction of Wind.			Weather.		Remarks.
1839	10 A. M.	4 P. M.	10 P. M.	10 P. M.	10 P. M.	Sun-rise.	Sun-set.		10 A. M.	4 P. M.	10 P. M.	10 A. M.	4 P. M.	10 P. M.
Sep. 1	29,930	29,836	29,910	80,3	80,3	.....	.....	.....	N W	W	W	Clear	Fl. cl.	Flying clouds lightning
2	904	———	914	80,3	80,7	.....	.....	.....	N W	W	W	Clear	———	Clear do. do.
3	922	29,838	930	80,3	80,4	.....	.....	.....	N W	W	W	Clear	Cloudy	Cloudy do. and thunder
4	932	———	940	80,9	80,7	.....	.....	.....	N W	W	W	Haze	Fl. cl.	Clear do. and thunder
5	890	,773	882	79,0	80,3	.....	.....	3,062	N W	W	W	Haze	Cloudy	Cloudy thunder and lightning
6	865	,702	862	78,8	80,3	.....	.....	.....	N W	W	W	Clear	Fl. cl.	Fly. clouds lightning
7	896	,766	880	84,0	84,0	.....	.....	.....	N W	W	W	Clear	Clear	Fly. cl. lond th. & viv. lig. at night
8	896	———	896	84,0	84,0	.....	.....	.....	N W	W	W	Clear	Fl. cl.	Clo. thunder at day time, fl. at night
9	900	,755	884	82,0	83,5	0,037	.....	.....	N W	W	W	Cloudy	Cloudy	... thunder and fl. at day and night
10	900	———	———	82,0	80,0	.....	.....	.....	N W	W	W	Cloudy	Cloudy	Cloudy—lightning at night
11	883	,738	864	79,9	79,9	3,932	.....	.....	W. N W	W	W	Cloudy	Cloudy	Fly. clouds thunder and lightning
12	864	,764	862	80,6	81,3	0,070	0,07	2,965	N W	W	W	Cloudy	Fl. cl.	Cloudy—thunder and lightning
13	910	,800	902	82,1	84,1	0,138	.....	.....	N W	W	W	Haze	Cloudy	Clear do.
14	902	,846	940	80,2	82,6	4,800	0,187	.....	N W	W	W	Cloudy	Cloudy	Clo. lond thunder & vivid lightning
15	970	———	944	79,9	80,8	.....	.....	.....	N W	W	W	Cloudy	Cloudy	Flying clouds lightning
16	956	,832	978	78,7	82,3	.....	0,137	.....	N W	W	W	Cloudy	Cloudy	Flying clouds
17	892	,804	888	80,3	81,9	.....	.....	.....	N W	W	W	Cloudy	Cloudy	Cloudy do.
18	894	,809	874	80,3	81,4	.....	.....	1,450	N W	W	W	Cloudy	Cloudy	Do. do.
19	942	,843	944	80,8	81,0	.....	0,020	.....	W	W	W	Cloudy	Cloudy	Do. do.
20	970	,846	922	81,3	84,6	.....	.....	.....	W	W	W	Cloudy	Cloudy	Do. do.
21	974	,854	930	82,0	85,0	.....	.....	.....	W. N W	W	W	Th. lte.	Th. lte.	Thick haze do.
22	964	,864	932	83,0	85,9	.....	.....	.....	N W	W	W	Haze	Haze	Haze do.
23	972	,876	936	83,0	84,4	.....	.....	.....	N W	W	W	Clear	Fl. cl.	Clear do.
24	976	,876	954	84,0	84,0	.....	.....	.....	N W	W	W	Haze	Cloudy	Haze lightning
25	970	,878	968	86,0	87,0	.....	.....	.....	N W	W	W	Clear	Fl. cl.	Clear dew
26	960	,874	962	84,7	87,4	.....	.....	2,600	N W	W	W	Cloudy	Fl. cl.	Cloudy do.
27	946	,846	918	83,0	84,9	.....	.....	.....	N W	W	W	Cloudy	Fl. cl.	Do. do.
28	976	,866	966	85,0	85,5	.....	.....	.....	N W	W	W	Clear	Fl. cl.	Do. do.
29	960	———	950	85,0	85,0	.....	0,064	.....	N W	W	W	Clear	Clear	Flying clouds
30	966	,840	936	85,0	85,0	.....	.....	.....	N W	W	W	Clear	Clear	Flying clouds
Mean	29,930	29,839	29,919	82,0	82,8	0,579	0,048	2,444	N W	W	W	Clear	Cloudy	Flying clouds
	10 A. M.	4 P. M.	10 P. M.	10 P. M.	10 P. M.				10 A. M.	4 P. M.	10 P. M.			
	Inch.	Inch.	Inch.											
	29,930	29,839	29,919	82,0	82,8	0,579	0,048	2,444						

The Instruments with which the foregoing observations are made, ar placed in the Western Verandah of the Honourable Company's Obser vatory; at about 5 feet above the surface of the ground, and 27 fee above the level of the Sea; the thermometer was made on purpose fo the Observatory, and at 75° (the only point at which a comparison ha been made) it was found to differ insensibly fr m the Royal Society' Standard; the barometer is one of two Standards which I have lately constructed, and may be depended upon to 0,0100 an inch.

T. G. TAYLOR,
H. C. Astronomer.

ERRATA.

Page	*line*		
287	2d	from bottom	For sulphureous, read sulphurous.
289	7th	do	Erase the word "*Chloric.*"
308	14th	do.....	Erase "it is," and read,—The lunar caustic of the apothecary, which is soluble in water, is a proper test for muriatic acid.
323	14th	do.....	For substance, read substances.

ORIGINALS of the passages translated from TELUGU POEMS *in the Essay on Telugu Literature in* No. 25 *of the* MADRAS JOURNAL, 1839.

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1840.

Originals of the Extracts from Telugu Poems translated in Essay on Telugu Literature by C. P. Brown.

Extract from Dwipada Ramayan, Aranya Canda :— *Tale of the Golden Deer.*

బెనగొని యందంద బేర్చి శోభిల్ల
కపట సారంగమై గదియ నే'తెంచి
యుపమింప న'రుదై'న మొప్పుల నె'ప్పు
సెమరుచు బులు మేయ నిజ వాల రుచుల
రమణమై వన మయూరముల నా'డించు
తరిగొని యొకమూటు తన కుహీ రుచుల
పరపై'న వన మె'ల్ల పసిడి గావించు
ధరణి పై నె'కమూటు తన పార్శ్వ రుచుల
నెరి చంద్రకాంతముల్ నీరు గావించు
కుదియించి యొకమూటు కుప్పించి చాటి
త్రిదశే'ంద్రు చాపంబు తెరగు గావించు
నె'కమూటు చంగున ను'ప్పరం బె'గసి
ప్రకటించు న'తుల శంపాలతా తతుల
మృగ యూథముల గూడి మెలగుచు ను'ండు
మృగముల బెదరించు మెల్లనె డాగు
న'ంతంత బొడ జూపు న'ట చేర వచ్చు
న'ంతలో బెదరి బిట్ట'దరి కుప్పించు
తరుల నీడల కే'గు తగ పర్ణశాల
చొరబారు న'ంతనే సృక్కి కేళ్లరుకు
వసుధ మూర్ఛొని జూచు వాలమ'ల్లార్చు

దెవలకు చెవి జేర్చు దెలియ వా'లించు
కంచుమించై పారు క్రమ్మర జేరు
తుంచితా'కృతి చెవి కొన గదలించు
పచ్చిక పట్టున పఱపించు లేచు
మచ్చిక న'చ్చోటి మాపుల జేయ
ఖురముల జేవి గ్రోకు కొమ్మల తుదల
విరుల లేగె గదల్చు విరులె'ల్ల రాల్చు
న'ందంద యందమై యా పర్ణశాల
ముందర వ్యగమి'ట్లు మోదింపు చు'ండ
నా'వేళ సీతయు యలరుల జిదుపు
లావణ్య సీమ యల్లన పర్ణశాల
తుంజాల సింజినీ ముంజీర రవము
రంజిల్ల దెడలి సారభముల బూదలు
పొదలు డాయుచు ఓరుల్ పొనగ గోయుచుసూ
మదికి విస్మయమై'న మాయంపు లేడి
కనుగొని సైదేహి కడు చోద్యము'ంది
యినకులా'ధిపు బిల్చి యిట్లని బలికె
సీ'పొంత వింతయై యిది యొక్క వ్యగము
చూపుల కిం'పార సొంపు గల్పించ
నే'పార ను'న్నది యేమి సోద్యంబొ
భూపాల జూచితే పొదలుచు'న్నదియు
యెన్నడు పొడగాన మి'న్ని చందముల
వన్నెల వ్యగముల వనభూము ల'ందు
జగతీ'శ యీ వ్యగ చర్మంబు నందు
దగిలి సుఖింప నే'ంతయు వేడ్క బుట్టె
దిననాథ కులనాథ దీని వెఱ్ దగిలి
చని యేసి వెన దీని చర్మంబు దెమ్ము
యది యేల నీ యుపాయంబున దీని
జేదరక పట్టి తెచ్చితి వే'ని మిగుల

మంచిది బ్రాణేశ మన వన వాస
మెం'చంగ నీ'డేరె నీ'వైడి మృగము
బురికి వేగమె గొని పోయి యత్తలకు
భరతా'దులకు వేడ్క బరపగ వచ్చు
న'ని సీత బ్రీతివై నా'డు వాక్యములు
విని లక్ష్మణుడు రాయనిభు జూచి పలికె
మృగమున కి'టువంటి మేము'ర్వి గలదె
మృగ మాత్రమున కి'ట్టి మెరుకువ గలదె
మాయా మృగము దీని మది నక్ష్మ వలదు
మాయావు ల'సురుల మాయగా నెరా'పు
న'దియు గాకి'చటి నంయములు మారీచు
డ'దయుడై మాయావియై యిందు మెలగు
న'ని బల్క వినమె యీ యసుర గాబోలు
మనల భ్రమింప నీ'మాడ్కి నే'తెంచె
చిత్తంబు దీని పై జేరిచి మీరు
ను'త్తల పడి పట్ట నూ'హింప వలదు
ఆరయ నీ'వైదేహి యతి ముగ్ధ గాక
మీరును ముగ్ధలే మేదినీ నాథ
యనిన రాముడు సీత యానవా'ంబుజము
గనుగొని నవ్వి లక్ష్మణు జూచి పలికె
చలియింప నే'టికి సౌమిత్రి యింత
యిల రాత్రుసుల మాయ లె'దురునే నమ్మ
మృగమై'న గొనివత్తు మేటి రక్కసుల
తెగ నే'సి పారిబుత్తు దెలసి యీ రెంటి
తెంపుమై లక్ష్మణ దీని వెడ్డగిలి
చంపి చర్మము దెచ్చి జానకి కి'త్తు
ని'న్నిన్నాళ్లకు శలభీ'కోర్కె వేడె
చిన్నబుత్తునె సీత జెప్పిన మాట

హిత మతివై పూని యా పర్ణశాల
వ'లెవ నే'మరకు మీ'వలి యప్పగించి
యల్లిన రఘురాము డ'మజా జే మ'న్న
ల్లి'ంది మో'వెట్టి వెరవొ'ప్ప వెడలి
యా గ మృగంబు మున్న'ధి వెన్నొంటి
యా గజా'సుర వైరి యన జేమ్ము మీఱి
కొంకుచు పొద మరుంగున పొంచి పొంచి
గ్రుంకుచు వ'ంతంత గూడ బారుచును
మగుడి జూచుటయును మరుగున నిలిచి
తగులుచు దప్పంగ తమక్ మ'ందుచును
ఒల్లువ'మ్ములు వెన్క వేర్చి జే పట్టి
యల్లన చరణంబు ల'వని పై నీ'దుచు
చప్పుడు గాకు'ండ జాడ గన్గొనుచు
చొప్పున మె'య్యున జూచి డాగుచును
వడి చేరి బట్టెద వ'ది చేర వచ్చె
న'దియె లో బడియె వాకొ'ని చెలంగుచును
యిద్విధంబున భోవ నే'చి యా మృగము
దప్పుల బాడమాపు దమ జేర వచ్చు
పట్ట బోయిన మిట్టిపడి పారి పోవ
కట్ట'ర్క రాముని గన్న'ంత నిలుచు
లలి దివంకు బారు లాంతో గూడ
శలపుల చులు రాల్చి శేష్టలు మురుచు
వె'వగి వీక్షించి వెల్లె'గసి కేళ్లరుకు
పవ మించ మిన్నుల పై బారు చు'ండు
కుప్పించి డాటి చంగున తీగె మెరుపు
ద్రిప్పిన గతి జివ్వ ద్రిప్పు వ'ండాడ
కొరవి ద్రిప్పిన రీతి కుమ్మర సారె
తెరగున భ్రమరిగా దిర్గిరం దియ్యు
ఒడలిన గతి క్రుస్గ వజ్ర కే'ఁదర

వడి సాళువమ్ము కైవడి మింట బారు
నలసి రాముడు వెరగంది నిల్చుటయు
గెలకుల బొడమూపు కికురించి తోలగు
తెగ వేయ దలప నదృశ్యమై పోవు
మగుడి రా దలచిన మరి ప్రోల నిలుచు
కలగొన నిభృంగి కాకుత్థ రాము
నలయించి యలయించి యవలకు నవల
గొనిపోయి పోయి యా ఘోర దుశ్శకాముల
కనుభ్రామి యట బోవ గడగిన జూచి
మాయా మృగం బని మది రాము డెరిగి
చాయ నీవె క్కడ దప్పి పోయెదవు
యగుపడి తంచు బ్రహ్మాస్త్రంబు దొడిగి
నగములు ఫణక నర్ణవములు గలగ
జగములు బెదర దిక్చక్రంబు లదర
తెగగొని దృష్టి నంధించి వేయుటయు
నాలోన నెరలుచు నారూప మణిగి
హా లక్ష్మ్మ యన్చు హా సీత యనుచు
దెన లద్భవగ మహా దీఘ్ర దేహమున
యసువుల నెడబాసి యసురయై పుడమి
కూలె రాతున లక్ష్మీ కూలె రావణుడు
గూలె లంకాపురి గూలె నన్నట్లు
యంత మాయా మృగం బవని ద్రెళ్లుటయు
నంతోషమున వాని జానకీ విభుడు
కనుగొని మారీచుగా నిశ్చయించి
తన తమ్ము మాటలు వలచి పెచ్చుచును
సౌమిత్రి సీత యీ చపల రాతునుని
యీ మహా రవమున కెంత వేగెదరో
నా యెలుంగుగ నార్త వాదంబు జేసె

యే యెడ నే'మై'రొ యెల్లు'వ్వనారొ
యవి దంకుచు మ'వ్వ వా'యార్త రవము
ఒవి సీత ఫీతిల్లి వెనమ'ర్వి క్రొత్తి
దెలసి దిక్కుల జూచి ధృతి తల్లడిల్లి
లలి దూలి యెలుగె'త్తి అత్మ్మ జూచి
సామిత్రి యిది యేమి చంతమో నేతు
రాముడు విన్నా'ర్త రవముగ జీరె
వ'వసు నీవా'పలు కాలించి వినవై
ఒన నె'ల్లపై గాక ఒవ రారొ వీకు
మ'లుకవు ఫీతిల్లి వ్రా'క యింత ఎంగ
వ'లయపు శోకింప వ'ది యేమి సీవు
వానా విధంబుల వా యంతరంగ
మూ'నిన వగం బెల్లు'లుకు చు'న్నదియు
యడవుల కొ'ంటివై యట పో'యివాడు
తడవా'యె రాదు యుద్ధంబున నేడు
కడిది రక్కసుల కె'క్కడ బిక్కివాడొ
తడయక పో'వయ్య ధరణీశ కడకు
న'న యక్రొ వూరంబు ల'ంతంత దొరగ
జనక నందనకు అత్మ్మ డిట్టు ల'వియె
తల్లి నీవే'టికి దలకెడు రాము
వల్లభునకు నెం'దు వచ్చునే కీడు
యెరుగవే నీ కూర్మి హృదయే'శ మహిమ
లె'రిగియు వెడమాట లా'డ్లాడ దగునె
నిన్నటిల్లెడు వగ విన్ని'ంత గంత
నె'వ్వడో యొక దైత్యు డిటు జీరె గాక
యినకులా'ధిపు డే'డ నీ దైన్య మే'డ
జనకజ నీవే'ల చంచలిం చెదవు
తలపొరి రఘురాము ధరణీశ దొడరి

బొలియక నిలుకురే పోర రాక్షసులు
మిడుతలు గార్చిచ్చు మీద గర్వించి
పడి నిల్వ నేర్చునే భస్మమౌ'గాక
గరుడని పై కుహూ'ప్రళ మీర గదసి
యురగముల్ జచ్చు గాకో'పునే గెలువ
ధృత కోపమున గేనరిం జేరి కరులు
మృతి బొందు గాకె'ట్లు మెరయంగ నెూ'పు
కాపున రామా'జ్ఞ గడచి నిర్ణయించి
పోవ జూచుట నాకు బుద్ధి గాదు'ంక
నీ'కాన లోన నిన్నె'ట డించి పోవ
నే'కీడు వచ్చునెూ నే బోవ వెరతు
న'లయక నా మాట లా'త్మలో నమ్ము
తలకకు మ'నవుడు భాత్రీ తనూజ
యొలసిన రోషా'గ్ను లా'గి యుండు చు'ండ
న'లయుచు సౌమిత్రి న'టు జూచి పలికె
నీవు రాముని దెన నెర్రయ భక్తుడవు
నీవే'ల నేడి'ంత నీచుండ వైతి
శ్రీరాము డి'ట నిన్ను జీరుట వినియు
దారుణ మతి వగ దాయ చందమున
నెమ్మది మ'న్నాపు నీకి'ది తగునె
తమ్ముడు ప్రాజ్ఞు డు'త్తము డీ'త డ'ంచు
భూపతి విను నమ్మి పోయిన పిదప
నీ'పాప వర్తన మే'ల గైకొంటి
వ'గు నెే'రింగితి రాము డ'నురుల చేత
దెగుట నిక్కము గాగ దెలిసి నీవ'కట
న'నుచిత మతి బూని యాలస్యము'డిగి
నను బొంద దలచెదో నాన భో వీడిచి
కాదే'ని కొని పోయి కైకేయి సుతున

కాదట పెొమ్మంతు వని తనుంజెక్కి
యేమ వా డగు జీవ మిూశేరీరముక
బాహుంగ డంచుట బద్ధి గాడింక
దడయక పోయి గోదావరి లోన
బడి ప్రాణములు పిత్తు వచ్చి లేమిటికి
నని చెప్పిదపు మూట లంతనిజ బలుక
ని లక్ష్మణుడు చాల వేదన చొంది
రాము చ్యోని కవ్వ రంద్రములో మూసి
టీయుపంబున వార్లు దిక్కులు జూచి
ఒలు పాపమును సీత బచ్చి మున్నదియు
కెలియ బంటిరె తన జేవతలార
మిూరిందడుము పాటీ మేదిని తనయు
ఘోర భాషల వమ్మ క్రూరత బలికె
నని కాష్ప లోచనుండై లక్ష్మణుండు
తన మది దిక్కు దిల్వ తరము గాదాతచు
తల్లి యేనిలె బోయి తడయక పీదు
వల్లభు గొని వత్తు వగతకు మనుచు
పర్ణశాంకు జొట్టు బరుచేదు ప్రాసి
వబ్బించి యీ బరుల్ వడి కాటక్ష్మ
యెవ్వడే నీబరుల్ యిటు కాటి వచ్చు
నష్వీరు వర తం లియు కాక్షణమె
యని చని యనలిని యర్థము ప్రార్థించి
తనిత నేవరకు సీవని యడప్పగించి
జగతీ తనూజకు వర్ష్టి క్రొక్కి
పాగలుచు రాము చొప్పన ప్రాయె నంత
నా పావకుడు సీత నప్పుడు దాచి
యా శుద్ధి డొక సీత నప్పుడ గల్పించె
దీపించు ఘన దివ్య తేజంబు తెలుగ

నా'పణతియు నుం'డె న'ట్ల జింతిలుచు
న'త్తరి రావణుం డ'దరి చా లేచి
యుత్తలంబున చిత్త ము'లుకుచు నుం'డ
కరమున దండంబు ఘన కమండలము
ను'రు లలాటంబున నూ'ర్ధ్వ పుండ్రంబు
గొలదులై వ్రేల్లను కుశ పవిత్రములు
బొలుపొం'ద వేరు'రంబున జన్నిదములు
న'రుదుగా వల చేత న'ఖ మూలికెయు
నరి బూని యున్న కాషాయ వస్త్రములు
తులసి పూనల పేర్ల దోడ ముందరికి
వలసె'ప్ప సె'క కొంత వ్రాలిన మెడయు
బడుగు దేహంబును పావలు జింపి
గొడుగును వెడ ముడి గొన్న'ట్టి సిఖయు
న'లవడ గపట నవ్యాసి వేషంబు
వెలసిల్ల వెడవెడ వ్రేల్లె'న్నిగొనుచు
కొన్ని మంత్రంబులు గొణుగుచు ముసులు
ధన్నె'రింగెద ర'ంచు హస్తరింపుచును
దలకొన్న ముదిమిచే తల వడకంగ
న'లయుచు సొలయుచు న'రసి జూచుచును
యంత'ంత నిలుచుచు మరి మరి యనుచు
శాంతి బొందుచు పర్ణశాలా'ంతరమున
కే'తెంచి నిలచిన న'ంత లోపలనె
సీత నె'త్తుక పోవ జేర వీడ'నుచు
తను జూచి వన దేవతలు జగ ద్రోహి
చనుదెంచె వీడ'ని సభయులై యొదుగ
విక్ర'ంబ మును తోలి నిలిచిన జూచి
గ్రక్కున నై దేహి కడు భక్తి లేచి
యక్ష పటా'త్మ నవ్యాసిగా డలచి

మ్రొక్కి హస్తాంబుజంబులు ముకుళించి
పామిత్రి వ్రాసిన చక్కని బరులు
నామరంగ గడచియు నతి భక్తి తోడ
పాంతి యభ్యాగత పూజ గాఁపం
గలగుచు నైకావి కళ్యాణి మాచి
దెూ ఛాము నీఁట్టి యుగ్ర దుర్గములు
నేఁభంగి జరియించె దిట్టాంటి నిలిచి
రతిపై శ్రీపతిపై భారతిపై గాతు'న్న
ఖీతి మూర్త్య నతుల కీ'పెలువంబు గలఁడె
నీ మోము విఁడు వెన్నెల పిండు దెగడు
నీ మోవి కెంపు రా విగ్గులై నెగడు
నీ మేను పొడామినీ లత గేరు
నీ మాట సుధ తేట నీటుల మీరు
నీ వేడి జలద వేణికల బో దరుము
నీ విలాపంబు హర్షింప నా దరమె
తరుణి నీ కౌంగిట దగిలి సుఖించు
పురుషుండు దలపోయ పురుషో'త్తముండు
కామిని నీ పొందు గల వాఁడె పూణ్య
కాముండు శ్రీ నిత్య కళ్యాణ డ'రయ
ని'చ్చట నీ యన్ని కెం'తయు వగపు
వ'చ్చెరు వ'య్యెడు వ'చ్చాఁ మూకు
నెలత నీవె'వ్వరు నీవే'ల యింత
వలిగెద వీ'కాననము లోన విలచి
యంతయు నెరుగింపు మ'నిన యా సీత
యెంతయు భక్తితో వి'ట్లని పలికె
భావభూత్మ రఘురాము వ'రివ మా తండ్రి
జనపుండు దశరథే'శ్వరుడు మా మూమ
నా కేఁడు సీత యన్నత కీర్తి రాము

భూపతి తను తండ్రి భాష్మ'న్న వెడలి
కాననంబున నం'డ కడగి వచ్చుటయు
యేను లక్ష్మణుడు వో'నే'గుదెంచితిమి
యీ యాశ్రమంబున నే'ము ముహ్వరము
బాయని నియతి చాపసులై యుండ
నె'లసి నా ముందర నె'క పైడి మృగము
పొలచుటయును జూచి భూనాథు తోడ
దాని చర్మము నాకు దగిలి దెమ్మ'నిన
బూని రాముడు బోయె బోయిన పిదప
హా లక్ష్మణా యను వాగ్ర రవంబు
శూలమై నా చెవి సోకి కాడుటయు
క్రొగిలి లక్ష్మణు డిట్టి భాష్మ'న్న బోయె
మగుడి రా'ది యేమి మూగతో దలప
న'ని జెప్పి ముని జూచి యనఘు నీ పేరు
వినుపింపు మి'ందే'ల విచ్చేసి త'నిన
కొంకక తన పై'న కుహకత్వ ము'డిగి
లంకా'ధినాథు డా'లలన కి'ట్లనియె
వనజాక్షీ వినుమే'ను వనధి మధ్యమున
సే'నయు లంకా పురం బే'లెడు వాడ
రాక్షసా'ధిపుడ శ్రవసు నందనుడ
యతే'శు ననుజుండ యఖిల దిగ్జయుడ
రావణుం డ'ను వాడ రణము లో'నే'దిరి
దేవా'సురుల నై'న దెగటార్చు వాడ
వనిత నీ రూప లావణ్య సంపదలు
వని చూడ వచ్చితి వేడ్కలు నూని
నవయుచు పేడ మూనుము తోడ గూడి
యువిద యీ యడవుల నుం'డ నే'మిటికి
నా రాజ్య ముంతయు నలివాయతాక్షీ

కోరి యేలుచు నీళు కొఱుకు దీపింప
పొగడొం౦ద బెంపొం౦దు భుజ్వకం బా'ది
యగు విభూనంబుల హర్మ్యంబు ల'ందు
సుర గరుడోరగా'సుర సిద్ధ సాధ్య
వర కన్య ల'టు గొల్వ వర్తింతు గాక
నీ యంఘ్రి రుచులు నా నిలయ భూములకు
మాయని మణి కుట్టిమము ల'గు గాక
చెలువ నీ మాపుల సిరులు నా మేడ
కలువ తోరణముతో గలకింపు గాక
నీ మందహానంబు నిత్యంబు నాదు
ప్రేమా'ంబునిధికి చంద్రిక ల'గు గాక
రమ్మ నా లంకాపురమ్మున కం'నిన
యమ్మాట విని సీత యతి భీత యగుచు
ధీర గాపున వాని తృణముగా జూచు
తీరున రన కేల తృణము జూచుచును
యా నాతి శ్రీరాము నా'త్మలో దలచి
దానవు జూడక తరుణి యిట్లనియె
సార పతివ్రతా'చారగా యనక
పొరి నన్ని'ట్లాడ ను'చితమే నీకు
న'నిమిష యోగ్య పూర్ణా'వుతి యనక
మునకు దుల్ల భ మై'న పోల్కి భావింప
శ్రీరాను చంద్రుని జెందిన నన్ను
కోరి కామింప నీకును నెన్ని దలలు
పొమ్ము గుట్టున నీదు పురవరంబునకు
నెమ్మది బోక దుర్నీతి యేమే'ని
దలచితి నే'ని నా ధవుడు రాఘవుడు
విలసిత శస్త్రా'స్త్ర విదిత లాఘవుడు
హర చండ కోదండ హరణ వినోది

ఖర దూషణా'ది రాతున శిర శ్ఛేది
నిన్ను నీ వంశంబు నీరు గావించు
నె'న్నంగ నీకు నా'యినకులా'గ్రణికి
నక్క కు సింహంబునకును బోమకును
దిక్కరికిని పయోధికి గాలువకును
వాయనంబునకును నైనతేయునకు
నే'యంతరము పెద్ద లే'ర్పరింపుదురు
యా యంతరము గల్గు న'ట్లుగాన నీవు
ధీయుక్తి లంకకు తిరిగి పొమ్మి'ంక
న'న వి ని రావణుం డా'గ్రహిం'చి'దగ్ర
జనితో'గ్ర దృష్టియై జానకి జూచి
యనుపమా'టోపుడై యా రూప ము'డిగి
తన మనో వీధి గంధర్వుడు నిలువ
పది యవస్థలు దోచి భాసిల్లు పగిది
పది తలల్ మణి దీప్తి పంజుల నె'ప్పె
నా' యవస్థల కోర్కు ల'వి యిమ్మడించి
పాయని గతి నె'ప్పె బాహు ల'ర్వదియు
గొన ఇ'మ్మడించి కోర్కులు పల్లవించె
న'న పన్న రుచు లై'న హస్తంబు లా'ప్పె
లలి దోచు కోర్కి పల్లవముల పుష్ప
ములు బోలె నా'యుధంబులు పొల్పు మీర
బరగు దివ్యా'ంబరా భరణై'క కాంతు
ల'రుదార మదనా'గ్నుడై మండు చు'ండ
న'తి భీషణా'కారుడై నిల్చుటయును
భృతి దూలి సీత భీతిల్లి యేతెంచి
బిరుల కి'వ్వల పచ్చి బడియె మూర్ఛిల్లి
యరదంబు డిగి యప్పుడ'మరారి శౌరి
ధరణీ తనయ జూచి త్వర్గిగా దలచి

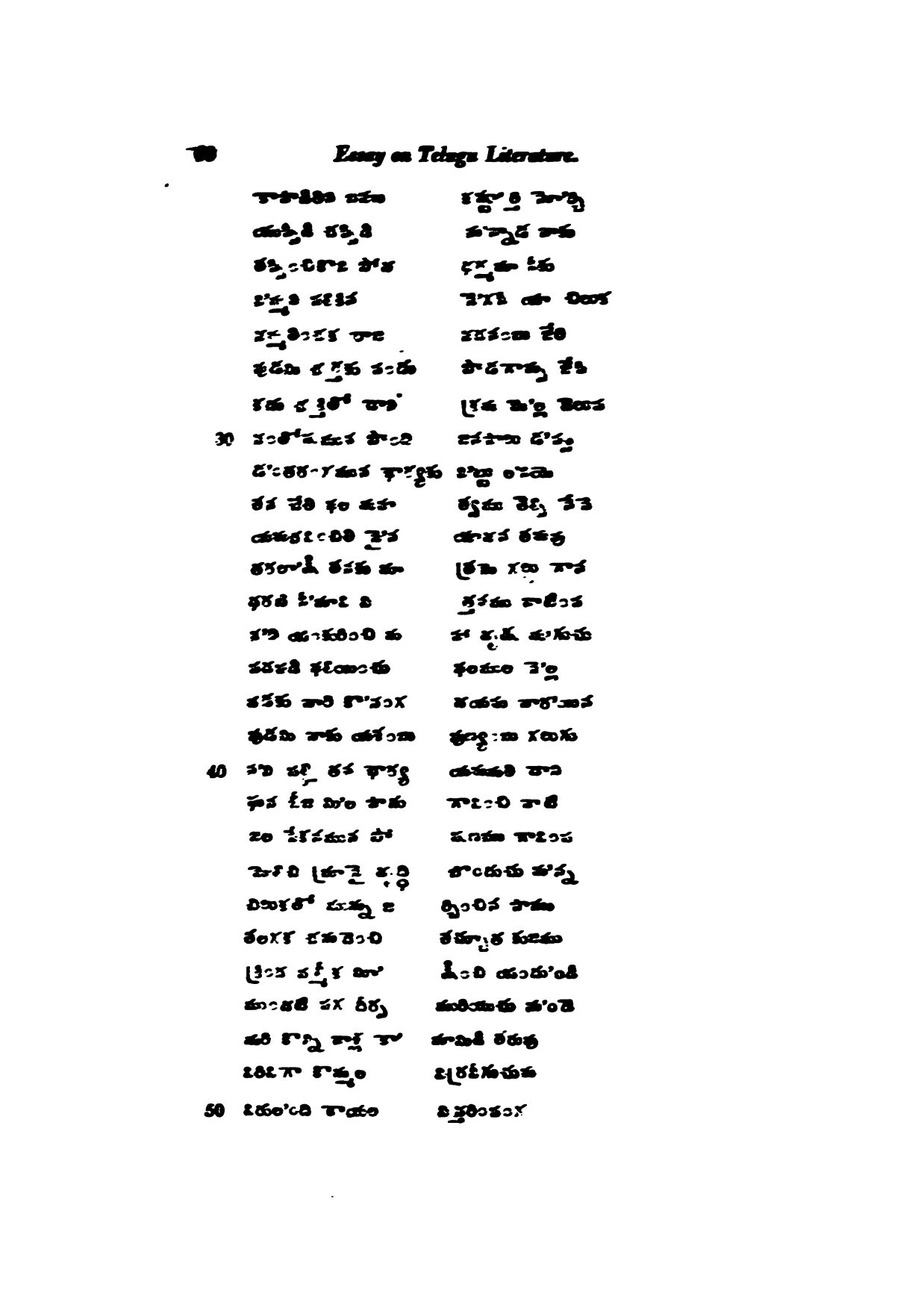
యరుదైన వైకుంఠ మంతిని వసుచు
పరతత్వ చిత్తంబు పరులకు నీక
పొరి బొరి వజ్ఞాన బుద్ధి మూర్ఖమున
వడి గాలి బడి వాలు భవ లత పెూలె
బడి యున్న కనుగొని పంక్తి కంధరుడు
గ్రమ్మి యశ్రువు లార్ల గొదీగె మలియ
గ్రుమ్ము డి వీడగా గుచము ల'ల్లాడ
న'ందంద దెగి రాల హార రత్నములు
పొందిన భయ శోకముల మేను వణక
నచ్చారు లోచన నదయుడై యెత్తి
కెచ్చి రథంబు పై కెరగొ'ప్ప వెట్టె
డైవంబు ప్రేరేప తన పాలి మృత్యు
దేవత గొనిపోవు కెరగున బేర్చి
యమరా'రి గొని పోవ నా'కాశ వీధి
కమల లోచను దేవి కను వెచ్చి జూచి
వెదచులు దడుపుచు బిగి చన్ను దోయి
ప్రిదలిన పయ్యెద బిగియ నేర్చుచును
వేర్చ్ఛ చకోరముల్ వెన్నెల ప్రక్కు
మూర్ఛి తమ్ముల జారు మకరంద మనగ
నానన శశి దోచు నమృత బిందువుల
భూనికె గన్నీరు పాట పాట దారుగ
డెలుగె'త్తి కొదమ కోయిల గూసి నట్లు
పలుమారు వీధి దూరి ప్రాణేశు జీరి
యలతయు కోపంబు న'తి విషాదంబు
వెలవెల పాటుపై వీలపింప దొణగె
నో'రాఘవేశ్వర యో రామచంద్ర
నీరజ హిత వంశ నీ దేవి వన్న

ఇత్యాది - ఇత్యాది - ఇత్యాది.

Extracts form the *Tale of Saranga Dhara.*—Episode of the Fairy Fruit.

In these pages the lines of verse are divided at the rhyme. This rhyme is called yati. The second syllable of each line has a rhyme called Prasa.

కాడ'న తగు తొల్లి కాలంబు న'ందు
వైదభూ-డ'ను నొక వసుధీ'శ్వరుండు
ధాత్రి పాలింపుచు తనయులు లేక
చిత్ర కాంతుల రాము చిలుకను బెంచి
గారవింపుచు ప్రౌఢ్డు గడపుచు సుతుని
హారు గా తగు ముద్దు మాటల గరపి
పేరి'త్తి యందరి పిలిచి భాషించు
నీ'రీతి దినదిన వృద్ధిచే బాదలు
కారణంబున కొంత కాలంబు జనిన
వారినిధి ద్వీప వనముల హు'ండి
చిలకలు గుంపులై శీఘ్రు మూ'సీము
వల నె'ప్ప శృంగార వనమున జేర
భూపతి న'డిగి యా భులుగుల గలసి
దీపించు శాల్మలి ద్వీప వనా'లి
విహరింప న'ందొ'క్క వింత ఫ్రతుంబు
మహి నో'ప్ప న'ప్రతంపు మూమిడి యనగ
నా'పండు గొని వృద్ధు లా'రగించుటను
ప్రాపించు యౌవన ప్రాయ మూ'ఢుణమై
యది జూచి మా రాజా కా'ఫలం బి'చ్చి
ముదిమి బా వెడ న'ంచు మూతిని గరచి
యారూఢ గతి బోధ న'ందొ'క్క పాము
కీరంబు గనుగొని కిసుక ని'ట్లనియె
నీ'పండు నై వచ్చి. తోడాది హు'ండి



పరిపక్వమై యూడి కడకె మొక్క మంతం
కన్న నైరము దీర్ప గా గాచి యున్న
పన్నగం బ'ప్పు డా' ఫలమును గరచి
గరళంబు నించి భృ త్యులు భాసి పరిగ
పరగ విజాంత రీ పమునకు జనియె
వనములో కాపరి వార లా'పండు
కని కానిపోయి భూ కాంతున కొ'నగ
నదయుమై యూ రాజు నచిభలు చాపు.
ముద మొం'ది మన కి'ది మొదటి లాభంబు
60 డారికె విప్రునకు ముం దుగ నమర్పించి
తరువాత నైకొన దగు మన క'నుచు
రాజు పురోహితు రప్పించి మ్రొక్కి
పూజించి యా'పండు బుచ్చుకొమ్మ'వన
ఫలము నిండిన ప డు విప్రుడు గుడిచి
ఓపు మొ'క్కి మూడ్కొల్లి ఓడిచె ప్రాణముల
బహు జనం బ'ది దోమి పాప మీ యనగ
మహనియ్యు డ'గు విప్రు మరణంబు జూచి
యధిపతి యూ బ్రహ్మ హత్యకు వెరచి
విధిని మారుచు ఘోర విపినమున చిలుక
70 తను జంప మూ'హించె ద్రైప దొగముప
తన చాపు తప్పి హా తకము సిద్ధించె
వి'ది కీర మ'వగ రా ది'ప్పడే దీని
కదలంగ నీ'క నే ఖండింతు న'నుచు
చలమున రత్న పం జరము దెప్పించి
బలు తామనంబున పంక్లి'ల్ల గీటి
యెరుకు పత్తుల పధి యించు చందమున
కరకరి తన చామ కరమున బట్టి
పావ పుణ్యంబుల పరికింప లేక

కాపోవగా జంపె వసుధీశ్వరుండు
పిసుమ'ంత తత్పురి వేశ్యా వధూటి
జనములో మిన్నయై నంగీత కాట్య
చాతుర్యముల తయ ప్పనుయంబు నందు
ఖ్యాతిశే నకల భో గములు ని'ంపొ'ంది
ముదిసి వేశ్యా జూత ముగ్ధల తోడ
న'దయత కలహింప న'ందరు మాద
బడి వెక్కసము లా'డి ప్రహరించి యిల్లు
వెడలింప పొరిగి'ంట పిలపింప దొరగె
నుడుపులనే నేను నూట పదా'రు
గడియించు యూవన కాలంబు నందు
బోదుగా జనములు పొగడిన సెల్లా
కాదు కాద'నిపించె గా ద్రైవ మాయ
పొంగుచు నురి పుల్లె పూ ల'మ్మి న'ట్టి
యుంగటనే కొట్టె ల'మ్మిన యట్లు
వగ మూలి బ్రతికి యూ వరి సు'ద్ధరింతు
తగడి'ంక జీవింప తనక'వి మతివి
భావింప విష మూత భలము భక్షించి
వేవేగ ప్రాణంబు విడిచెద న'ంచు
న'రసి సెప్పుది సె'ంచి యధక రాత్రమున
గరళ మూతము. నేర గా నే'గి క్రింద

రాలిన భలముల రాసుల లోన
మేలై'న దొ'క పండు మెనవిన యప్పుడె
వనిత పండ్రెండే'ండ్లు వయసు ప్రాపింప
తన యది మ'ప్పాంగి తవ సొ'దయమున
నా'డుచు పాడుచు న'చ్చోటు బాసి
వేడుకతో పుర వీధి లో'నేర
జను లె'ల్ల జూచి యా శ్చర్యంబు సె'ంది

జనపతి వొరుగింట సంశయం బ'నుచు
రావించి యూహన ప్రాయంబు గనిన
యా వేశ్య నీ'యించి యద్భుతం బ'నుచు
100 బసుల వారల చేత బండ్లు దెప్పించి
జనులు చూడగ తన సచివుల కి'చ్చె
న'వి బుచ్చుకొని వార లం'ద ర'చ్చోట
నవ మోహ నా'ంగులై నటియించి ర'భుడు
శత వృద్ధు ల'గువారు సతి పతుల్ వొనవి
యతి పిన్నయత యూవ నా'ంగులై యలత
చిలుక జేసిన మేలు యీతిపతి యుదివి
దలపోసి తన జాడ్య తకు రోసి కన్న
కొడుకు మూరుగ వెంచి కుడిచి కూర్చుండి
తడయక ధర్మంబు తప్పి కీరంబు
110 కనరి జంపితి న'ంచు కంధరం బ'ప్పు
డ'సిధార దెగ నైవి ప్రాణముల్ విడిచె
తన భర్త యీ రీతి తనుభు వీడుటయు
గని రాజ సతి యనా గమనంబు జేసె
చిలుక సామ్యంబుగా జేయకు మి'భుడు
పలదు నీ పుత్రుని వధ్యుని జేయ

ఇత్యాది - ఇత్యాది - ఇత్యాది.

Extracts from the Lila, Canto III. The Birth and youth of Maia.

శ్రీ సిద్ధవీర దేశిక చక్రవర్తి
భాసుర పద పద్మ భజకా'ధిరతులు
సత్య శౌచ దయా'ది సద్గుణా'న్వితులు
నిత్య నిర్మల కృత్య నియమా'ధిరతులు
ముక్తి గోరెడు భవ మోహ వర్జితులు
భక్తులా'లింపు డీ' ప్రభులింగలీల
హరు డి'ట్ల'మగమింప న'మరోర గములు
పరిణామ వార్తలు బచరింపు చు'ండ
తగిన శైలమునకు దక్షిణం బ'ందు
తగు బెడవళి సీమ తనరారు న'ందు
సకల జనంబులు సత్య భాషణులు
సకలే'శు భక్తులు సకల మానవులు
ధర్మ మార్గస్థులు ధరజీ'శు లె'ల్ల
నిర్మల చిత్తులు విభులా'ర్య లె'ల్ల
ధర్మంబు సార్చు పా దంబుల నడుచు
దుర్మార్గ ల'చ్చట ద్రొక్క రె'న్నడును
యా దేశ మధ్యంబు న'ందు చందురుని
మేదుర కళ లె'ల్ల మిళితమై యుండు
నదనమో కాక వి శ్వంభరా రమణి
పదనమో యన బణవని యను పురము
చాల సె'ప్పార న'చ్చటి విశేషములు
వాళీకభవుడు వ ర్ణన సేయ లేడు
పూచిన మాఘులు పోక మాపులును

కాచిన విప్పలు కదళీకా తరులు
చండిన పనసలు ఫల పూరములును
మండితా'శోకముల్ మూలూరములును
నర్జ ఖర్జూరముల్ చంపక బకుళ
ఘూర్జా'చి తరుల తో పుల నే'పు మిగిలి
కలకంఠ శుక శారి కా కదంబములు
30 కలకల ధ్వనులతో గడిసి క్రీడించు
కన్నె వేదంగులు కరవీరములును
పొన్నలు పొగడలు బొండుమల్లెలును
గుండజర్ధనములు కొండగోగులును
బండిగుర్విందముల్ పారిజాతములు
వానంతెకలు ఓర వాదులు జాజు
లా'నన్న జాజులు న'ట్టి చామంతు
లే'కాలమున గల్గి ఈశు భక్తులకు
నా'కాంతు బొడమించు న'భపు బూజింప
వరుపు నప్పక పూచి పరిమళింపుచును
40 పురము చుట్టును మండు పుష్ప వాటికలు
కస్తూరి న'లికిన ఘన ఓతడికలు
విస్తారములు గల వివిధ వీధులును
మకర తోరణములు మణి తోరణములు
నె'కనాడు విడువక నుం'డు న'ప్పరిని
కలయంపి చల్లిన గంధంబు నీటి
చలువ నెత్తావు ల' చ్చట నోచ్చి యుండు
మలయజా'మోదంబు మచ్చిక దాల్చి
యలరుల నెత్తావు ల'ంగీకరించి
చల్లగా గొలకుల జాడలు వట్టి
50 మెల్ల మెల్లనే వచ్చి మీనలోచనల
యుల్లంబు ఝల్లన నో'రసుక పైట

ల'ల్లన దొలగించి యలక ల'ల్లార్చి
యొల్ల తాపులు ముట్టి యింపు పుట్టించి
పల్లపు లీలనా' పట్టణం బ'ందు
నల్లనితో'శ్వాహా నంపడ పెరసి
ముల్లడి గొనుచు'ండు ముదయ మూరుతమూ
వేద శాస్త్రో'గము విద్వల యందు
బాదరాయణు క్రిందు బరచు ప్రపులును
ప్రజల బాధించక బరుల సాధించి
60 విజయంబు చేకొను విపులా'ధి పతులు
లెక్క తో బ్రతుకు మో' లెక్క'ని ధనదు
పెక్కుప పెచ్చని బేహారి కులును
విక్రమార్కుని మీద విడిచిన సై'న
నా'క్రమింపగ మాన ర'ందు'న్న భటులు
సె'రశిన మరు సై'న సె'క పూట లోన
సె'రపుగా బలపింప సేర్చు ర'ంగనలు
యిభ హయంబుల వేగ మె'న్నిక దేవ
విభు గజా'శ్వము లై'న వెలవెల బారు
అనువా'డ సేరని యర్థి లేడ'ందు
70 విని యూరకు'ండెడి ఇతరణి లేడు
పతి భక్తి నడపని ఖాము లే'ద'ందు
నతుల రక్షింపని జాల్ములు లేరు
ఆ కోట పాడుపును నగడిత లోతు
నాకులుం కూగ్మ ప న్నగులును గాని
యెరు లె'రుంగ ర'నంగ సు'రతర సౌధ
నతజి యుచ్చైధంబు జర్చింప దరమె
కరి బృంహితంబులు ఘు టా'రవముల
వర వంది మాగధ వాగ్విలాసముల
హేషిత స్వనములు సై'ల్ల వాద్యముల

0 ఘోషణంబుల ప్రజా కోలాహలములు
రమణేయ్య మగు నా ప్పతీం బేలు చు'ండు
మముకారు డ'నిమెడు నుండలే'శ్వరుడొ
యతని సౌభాగ్య మే' మ'ని జెప్ప శక్యు
రతిరాజు రూపున రమ్య భోగమున
సురరాజు కీర్తి భా సుర రాజరాజా
కురురాజు మాన శ ద్గుణమున నీ'గి
ధర న'ంగరాజ'ని దను బ్రస్తుతింప
గరిమెతో నా'రాజ కంఠీరవుండు
శాత హేతి నిక్వంత శత్రు రాజన్య
) జాత నిర్భిన్న భా న్వన్మండలుండు
మనుచు'ండి తన మేన మూను నత్పత్ని
న'నుప మూ'ంబుజ నేత్రి యంచిత గాత్రి
మోహిని యను జగ న్మోహిని దగ వి
వాహమై యత్యంత వైభవంబులను
శచియు ని'ంద్రుడొ రతీ శాబు లా'శత
రువియు రోహిణియొ మరుండును రతియొ
యన దగి కవ గూడి యనగి పెనంగి
మనసులు సరిపోయి మమతలం బిక్కి
వామ తంత్రంబులు గడువుచు ను'ండు
రా'మమతాతున రా'మోహినిని
నంతాన లాభంబు నమకూర కు'న్న
ని'ంతియు ఒభుడును నెంతయు వగచి
యీ రాజ్య సుఖ మే'ల యీ రాజ్య మే'ల
గారాపు నంతతి గలుగమి మనకు
స్థిర న'పుత్రన్య గ తిర్మా స్తి యనుచు
వర వేద వాక్యముల్ వాక్రుచ్చు చు'ండ.
వ'ని శకునజ్ఞుల న'డుగుటు రొట్ల

సె'శరంగ పోచిన్ల తోతురు తుటియు
గడ్డె చూపింతురు గొరి సోముంతురు
పెద్దలు తమకు వె ప్పిన ప్రకారమున
గల సోము ల'న్నియు గలయ సోముతురు
చలు దెరంగుల పొమ్ము భార జల్లుదురు
శూద్ర శక్తుల సె'ల్ల గొలుతురు గాని
రుద్రు గొల్వంగ సె' రుగ ర'జ్ఞు ల'గుచు
అటు గొన్ని దినముల కా'పంబతులకు
కుటిల కుంతలి పూయ కూతురై పుట్టె
పుట్టిన దినమున భూరి వాద్యములు
సెట్టణ క్రమోశ సె' స్వీని విధములను
భూరి వెట్టించిరి భూసురులకును
ధార పొయించిరి ధరణీ స్థలములు
అధిక నంఘముల కి' ష్టార్థ సిద్ధులను
అధిక ని'చ్చిరి జాన ల'చ్చెరు చె'ంద
నూ'రును యిల్లును సొల్లక బడిచి
ఘోర కాననముల కును జని యచట
గంగా తటంబుల భూన గిరి గుహాల
శృంగార వనముల సిద్ధ స్థలమున
పంచా'గ్ని మధ్యమ కా'గబు ల'ందు
మంచు లోపల జల మధ్యంబు ల'ందు
ఫలముల జలముల బండుటా'కులను
పులయ నా'కటి చిచ్చు మానుపు కొఱకు
పాయక నిష్ఠత జంబు లే'ప్రొద్దు
జేయు తపస్వుల చిత్తముల్ వెదరి
తలలు వణకెడు ముది కాశసో'త్తముల
తలపు సె'ంతయుమ ఖ త్తర శిత్తర'మ్మో
మృగ పక్షి పశుభూతు మోతలు వడిని

పగలు రేయును బెంటి ఐకీ చాయ క'మ్మెన్
పుట్టలు తల మీద బుట్టి న'ప్పడును
నెట్టన విష్ఠలు నిలిపెడు బుమల
గుట్టు ల'న్నియును గూం కువు పత్తు ల'మ్మెన్
0 వి'ట్టి దుర్దశ రాక కే'మి కారణమొ
యనుచు చింతా'క్రాంతు లగుచు న'ండరుపొ
మునసుల దలపోసి మరుగుచు నుం'డ
దుర్వార దుశ్చర్య దుశ్శీ'ద్రి వజ్రి
దూర్వాసు డా'మహా త్ముడు శైవ మూని
వచ్చె న'చ్చటికి ద్రై వ వశంబు కతన
వచ్చిన గని ముని క్రాంత మా'తనికి
న'ర్చన లి'చ్చి ము షో'హా పీఠమున్
గూర్చుం డ జేసిమ క్ష్మ జేరి మ్రొక్కి
కరములు శిరమున గడియించి దేవ
) హర కృపా'యత్త కా లా'ర్ధా'సుభావ
యేమి కారణమునే వీ'చిత్త చలన
మీ'మాడ్కి మూక'మ్మె నేరుగింపు డ'నిన
ధాత్రి పై మునికార ధరణీ'శ్వరునకు
పుత్రియై మాయ య మృతముగా బుట్టె
నెక్కడి దోగంబు పెక్కడి తపము
లెక్కడి భక్తి ము లెక్కడి ముక్తి
యన విని దూర్వాసు న'డిగిరి మరియు
మునములు చలియింప మోము ల'ంజలిను
మాయ యెట్టిది యది మమీ నే'ఁ పుట్టె
0 నీ'యద్భమును మాకు నేరుగింపు డ'నిన
దంత కాంతుబు బిశా మంది దంతేమ
కాంతులు కడకొ'త్త గా బల్లి మరియు
హరుని కొల్వున గొని యుంబరు పెరుగ

ల'ల్లన దొలగించి యలక ల'ల్లార్చి
యొల్ల తాపులు ముట్టి యింపు పుట్టించి
పల్లపు లీలనా' పట్టణం బ'ందు
నల్లితో'శ్వాహా నంపద పెరసి
ముల్లడి గొనుచు'ండు ముల్లోక మూరుతమ
వేద శాస్త్రా'గమ విద్వాల యందు
బాదరాయణు క్రిందు బరమ ఋషులను
ప్రజల బాధించక బరుల సాధించి
60 విజయంబు చేకొను విపులా'ధి పతులు
లెక్క తో బ్రతుకు టే' లెక్క'ని ధనదు
పెక్కుప పెచ్చని బేహారి కులమ
విక్రమార్కుని మీద విడిచిన నైన
నా'క్రమింపగ మాన ర'ందు'న్న భటులు
సె'రసిన మరు నైన సె'క పూట లోన
సె'రపుగా బలపించ సేర్చు ర'ంగనలు
యిభ హయంబుల వేగ పె'న్నిక దేవ
విభు గజా'శ్వము లై'న వెలవెల బారు
అనువా'డ సేరని యర్థి లేడ'ందు
70 విని యూరకు'ండెడి ఇతరణి లేడు
పతి భక్తి నడపని భామ లే'ద'ందు
నతుల రక్షించని జాల్ములు లేరు
ఆ కోట పాడుబ్రమ నగడిత లోకు
నాకులుం కూర్మ ఫ న్నగులును గాని
యెరు లె'రుంగ ర'నంగ ను'ర్వరల పొధ
నరణి యుచ్ఛేధంబు జర్చింప దరమె
కరి బృంహితంబులు ఘు టా'రవములి
వర వంది మాగధ వాగ్విలాసములి
హేషిత స్వనములు సై'ల్ల వాద్యముల

ఘోషణంబుల ప్రజా కోలాహలములు
రమణియ్య మగు నా ప్పతిం బేలు చుం'డు
మమకారు డ'నితెడు నుండలే'శ్వరుడు
యతని సౌభాగ్య మే' మని జెప్ప వచ్చు
రతిరాజు రూపున రమ్య భోగమున
సురరాజు కీర్తి భా సుర రాజరాజు
కురురాజు మాన వ ద్గుణమున నీ'గి
ధర న'ంగరాజ'ని దను బ్రస్తుతింప
గరితెతో వా'రాజ కంఠీరవుండు
శాత హేతి నిక్కంత శత్రు రాజన్య
జాత నిర్భిన్న భా న్వన్నండలుండు
మనుచు'ండి తన మేన మామ వత్సత్రి
న'నుప మూ'ంబుజ నేత్రి యంచిత గాత్రి
మోహిని యను జగ న్మోహిని దగ వి
వాహమై యత్యంత వైభవంబులను
శచియు ని'ంద్రుడొ రతి కాబుతాలా'శత
రుచియు రోహిణియొ మరుండును రతియొ
యన దగి కవ గూడి యనగి పెనంగి
మనసులు సరిభోయి మమతలం జిక్కి
ధామ తంత్రంబులు గడుపుచు నుం'దు
రా'మనుతాత్మున శా'మోహినికిని
నంతాన లాభంబు నమకూర కున్న
వి'ంతయు ఖిభుడును నెంతయు వగచి
యీ రాజ్య సుఖ మే'ల యీ రాజ్య మే'ల
గారాపు నంతతి గలుగమి మనకు
స్థిర న'పుత్రస్య గ తిర్నా స్తి యనుచు
తర వేద వాక్యముల్ వాక్రువ్వ చుం'డ
వే'ని శకునజ్ఞాల న'డుగుటు రొట్ల

సె'శరంగ పోచిన్ల తోతురు తురియు
గడ్డె చూశింతురు గొరి సొకుంతురు
110 పెద్దలు తమకం బె స్పిన వ్రకారమున
గల సొము ల'న్నియ కలయ సొముమతు
చలు దెరంగుం పొమ్మ భార బల్లిదురు
శూద్ర శక్తుల సె'ల్ల గొలుతురు గాని
రుద్రు గొల్వంగ సె' రుగ ర'జ్ఞా ల'గుచు
ఆటు గొన్ని దినముల శాశ్వతులమ
కుటిల కుంతలి హాయ కూతురై పుట్టె
పుట్టిన దివమున భూతి వాద్యములు
సెట్టణ ప్రమోశె సె' స్పేని విధములమ
భూతి వెట్టించిరి భూసురులకును
120 థార పొయించిరి ధరణీ స్థలములు
అధిక వంశముల కీ' ష్టార్థ సిద్ధులను
అధిక ని'చ్చిరి జన ల'చ్చెరు పె'ంద
నూ'రుమ యిల్లను మెల్లక ఒడిచి
ఘోర కానవమున కుమ జని యచట
గంగా తటంబుల భువ గిరి గుహల
శృంగార వనముల సిద్ధ స్థలమున
కంచా'న్ని మధ్యమ శాగంబు ల'ందు
మంచు లోపల జల మధ్యాంబు వ'ందు
ఫలముల జలముల బందుటా'కులమ
130 మలయ వా'కటి చిచ్చు భూమపు కొమ్ము
పాయక నిష్ఠర పంబు లే'ప్రొద్దు
జేయు తపస్వుల చిత్తముల్ జెదరి
తలలు వణకెను ముది శాశపో'త్తములి
తంపు సె'ంతయమున త్తర కిత్తర'మ్మో
మృగ పక్షి వనమృగ మోతలు వడిలి

పగలు రేయును బెంటి ఐశీ చాయ శ'ఙ్యొ
పుట్టలు తల మీద బుట్టి న'ప్పడును
నెట్టన విష్ఠలు నిలిపెడు బుమల
గుట్టు ల'న్నియును గూం కువు పత్తు ల'ఙ్యొ
పిట్టి దుర్దశ రాక కేమి కారణమొ
యనుచు చింతా'క్రాంతు లగుచు న'ండరును
మనసుల దలపోసి మరుగుచు నుండ
దుర్వార దుశ్శక్త దుఃఖా'ద్రి వజ్ర
దూర్వాసు డా'మహా త్ముడు శైశ మూని
వచ్చె న'చ్చటికి వై ఖ వశంబు కతన
వచ్చిన గని ముని క్రాంత మా'తనికి
న'ర్చన లి'చ్చి మ హా'ర్హ పీఠమున
గూర్చుండ జేసిమ క్ష్మీత జేరి క్రొక్కి
కరములు శిరమున గడియించి దేవ
హర కృపా'యత్త కా లా'ర్ధా'నుభావ
యేమి కారణమున నీ'చిత్త చలన
మీ'మాడ్కి మూక'మ్యె నేరుగింపు డ'ధిన
ధాత్రి పై మమకార ధరణీ'శ్వరునకు
పుత్రియై మాయ య మృతముగా బుట్టె
నెక్కడి దొంగంబు నెక్కడి తనయు
లెక్కడి భక్తి మ రెక్కడి ముక్తి
యన విని దూర్వాసు శ'డిగిరి మరియు
మనములు చలియింప మోసు ల'ణచుకొను
మాయ మెట్టిది యది మహి నే'ఁ బుట్టె
నీ'యగ్గమును మూక నెరుగింపు డ'ధిన
దంత కాంతుబు దికా ఖంతి దంతేయుఁ
కాంతులు కడకొ'త్త గా బల్గి మరియు
హరుని కొల్వుకొ'ల్వి యుండెరు కొడుగ

మెల్లనే జని తండ్రి మొడ గొంగలించి
గద్దరి తనమున కదు వేడ్క తోడ
ముద్దులు చెల్లుచు మురియుచు వాడు
అందెలు మువ్వలు నందంద్రఘుల మొరయ
నందంద గదలి దట్టడుగులు చెల్లు
మంగరంబులు బయి తొత్తులు నుద్ధుట
రంగైన బంగారు రాటిరేకయుమ
యందంబుగా గన్నె రాకు దండలుమ
కుందనంబున నైన గుండ్ల పేరులును
మేన నొప్పారంగ మిక్కిలి వేడ్క
తో వాడుబడుచుల తో గూడి యాడు
తన తల్లి తండ్రులు దాదులు చెలుబు
మనసు రంజిల్ల యా మాయ బాల్యంబు
గడుపుచు నుండె నక్కజ మొందె జనులు
వేడుక వెయి నోళ్ల నితింపు చుండ
నా మోద మాయ శి ఖోచార్య నట్ల
సామజంబులకు హం సలకుమ నడలు
కలకంఠ తతులకు కలకల ధ్వనుబు
చిలకలకుమ ముద్దు జిలుక పల్లులును
దానేర్పు చుండున తట యావనంబు
గానంగ నయ్యె నా కందువ మాయ
మనసు లో భావంబు మాటలో లేటి
తను పన్న మగ్నంబు కర పొంజ్ఞ కీలు
బొమముడి కోపంబు బుద్ధి బింకంబు
భ్రమకు గారణ మైన భావంబు జూచి
మూఢు లైనను జూచి మోహింపు చుండ
ప్రౌఢ తనంబున బరగుచు నుండె
నానటనంబులు నా విలాసములు

	నా'నడలా'ఓక్క	లా'నును దొడలు
	నా'నితంబము గొమ	నా'గబ్బిగుబ్బ
250	లా'నాసికము సోగ	లై'న'ట్టి కన్ను
	లా'నయం బ'గు చేతు	లా'నగు మోము
	నా'నెరి వేణియు	నా'మూయ మగువ
	కే కాని దెవ్వరి	కిని లేవు పిదప
	లోక త్రయంబును	లోగొన్న యట్టి
	యా మూయ కు'డంగ	నా'నృపాలుండు
	హేమ రత్నములతో	నే'పు దీపింప
	గొడలు పెట్టించి	కొలుపు కూటములు
	మేడలు వాడలు	మేలు మూగిగెలు
	కట్టించి యందు న	కల నియోగముల
260	పెట్టించి విద్యల	పెద్ద లై'న'ట్టి
	ఘనులచే జెప్పించె	కావ్య నాటకము
	ల'నుపమంబుగ బాల	న'ట్లు రప్పించె
	న'ట మీడ మనుకారు	డా'స్థ నంభవకు
	పటు నైభవంబున	పరిణయంబునకు
	కరహాట మరహాట	కర్నాట లాట
	కురు భోజ బబ్బార	భూజ్జర ద్రవిళ
	నేపాళ మాళవ	నిషధ పాంచ్వీర
	భూపాల సుతుల నా	పుత్రి మాయకును
	గరిగరికల విద్య	కౌశలంబునను
270	దొరసిన దొర యాడ	దొరుకు నో యనుచు

Extract from Canto VIII. describing the death of Maia.

యా రీతి న'ల్లము	డ'ంతర్ధి నొం'ద
భూరి శోకంబున	బొగలుచు మాయ
విమల నా'లోకించి	విన్నై యికను

హిమశైల సుత కడ కేసెట్లు వత్తు
నామేన కాత్మజు హరు గొల్వనకును
నేమూడ్క బోపు నే వీట్లయ్యకొంటి
యింత కార్యమునకు యిందరి లోన
పంతవాడితి గదా చాపురే విధియు
అని యాత్మ లోపల నడలుచుండంగ
మనుజ నాయకుడు కు మూర్తి జూడంగ
వనమున కేలెంచి వనమెల్ల దిరిగి
కనియెను నొక్కెడ చెలి కత్తెల గూడి
అరుల చింతాక్రాంత మై యున్న సుతను
నతియునుం బతియును నయ్యన జేరు
లే త్తి కౌంగిట జేర్చి యింతి నీకింత
చిత్త విభ్రమణంబు జేసెగా శివుడు
మన్నెరాయ కుమార మండలేశ్వరుడు
నిన్న డిగించంగ నీవు నేడొక్క
మద్దెలకాని వెం బడి చారి వచ్చి
యిద్దుర వస్థకు నెట్లు లోనైతె
వద్దను రేయి మీ యమ్మ నీకెన్ని
బుద్ధులు జెప్పిన' ప్పుడూ విన వైతి
మన్నె రాజుల కెల్ల మగడ నయ్యుంతు
నన్నైన దలచక నా ముద్దు కూన
దిప్పకాయలు వలె తిరిగి యిల్ వరన
తప్పంగ నడుతురా తల్లియు దండ్రి
జెప్పిన మాటలు నేయకుండుదురె
తప్పె కార్యము గతో' దక బంధమునకు
పని యేమి వున్నది పల్లకి యెక్కి
చనుదెమ్ము లెమ్మన్న జననాథు జూచి
విమల వాక్ప్రౌఢిని విన్నప్తముగను

హిమశైల తనయ నే నీతుణంబ నన్నె
భ్రమయించి వలపించి పట్టుక పత్తు
న'ని శివు ముందర న'గజతో నా'డి
చనుదెంచె యా ప్రతి జ్ఞయు చెల్లా'యె
కైలాసమున కే'ము గడలి పోయెదము
చాలింపు డీక మీ వి మాదము్ మీరు
ప్రొలికి జని సుఖం బున నుం'డు మ'నుచు
పిమలయు మాయయు పినుఓధి జనిరి
40 బ్రమదయు బలియును బహుళ దుఃఖముల
న'డలుచు బడలుచు మా భ్రత్రి యనుచు
భుడమి ధరాళి సె'డెళ్లు బ్రుంగుడు గాగ
బోరలుచు సె'రలుచు బో యిలే యనుచు
కరుగుచు మరుగుచు కటకటా యనుచు
కందుచు గుందుచు కళివింపుచును
వందుచు వెనరుచు వడి గొట్టుకొనుచు
వా'యంద మూ'చంద మూ'ఓలానములు
నా యక్ర మేమె'న్ని వాల్లకు మరుతు
మ'నుచు ప్రలాపించు న'వనరంబునను
50 ఘనుడ'హంకారుడ' క్ర్డిశే'గుదెంచి
కడ చన్న పనికి దుఃఖ పడంగ నే'ల
మృదు నా'జ్ఞ జనులకు మీరంగ దరమె
మాయ కారణమున మన యింట నిలిచి
పోయె ని'ంకేకాక భ్రత్రిదే మీకు
పిమల చెప్పిన మాట పినియను విట్లు
క్రమము దప్పంగ దుఃఖ పడంగ దగునె
మన రాజధానికి వగుడి పోకు'న్న
వ'నుభూనములు భట్టు నరుల డెందముల
మన వార ల'ందరు మన శాప పిడిచి

60 చన జూతు రన్య రా జన్యుల కడకు
యని నొడబడ జెప్పి యా మమకార
జనపతి దెచ్చి యా స్థానంబు నం'దు
నిబుప నా'మమకార నృప కుంజరుండు
సలలిత లీల రా జ్యము సేయు చు'ండె
ఆక్కడ నా'తాయ యా పితరియును
క్రొత్తి శంకరు రాజ ముందర నిలిచి
తల క్రేల వేసుక ధరణి క్రాయుచును
నిలుచు'ండ గని భవా నియును నవ్వాయ
క'ల్లను చిక్కక యరుగుట మెరిగి
70 భల్లానము'డిగి ని ట్టూర్పు వించుచును
వాయని వద్దికి బోక యద్రిజ యంచె
బారుకు వా'వ క్రాంత హు'తయు వెరిగి
శిరాజ సుత యుంటి కిం చాన్నె పోయి
కయణా రసంబు దొసి కంగ మా'రార్చి
యంతట జాలిత కొంతకాంతరమున
కాంతకి'ల్లడియె వ్యా గ్యము గావ చక్ర
పితుకు తండ్రముడమ పిట్టల చేసి
లుచెక చెట్ల వమ్మ మ్రోగుకమాంస
కొమరుండ వమ్మ చ్చ మ్మన వాని కోక
80 లాకీని కీకర వమ్మ మొచ్చెపోవుమమ
నిలింప చాలెట్టి భుజంబు చ్చెన
తమవే యంచే చాన చ్చెన్న మ'రొంక
అయిన కాన్యాదమ్మె యద్రిజ కీయ
చానుబుజే కింతి మాటలాడిరా యొక
మాయ రా మాయరా మనకి నిటిమ
ఆ యక్షయుకు ప్రతి చ్చెన కీవ లోయు
ఆకిన నిలిచిన కాంక్షి

చొడిరి నిక్కనైన నూరక యుండు
మన విని పార్వతి యధిక గర్వమున
తనిచొనిని నీ లోని కామనం బెల్ల
వనితగా జేసి య వ్వసుధకు ఐంపి
నిమ నీవె జేసుకొం టివి నగుఖాటు
ఘన సహజానంద కలితుని నతని
మనుజ మాత్రునిగాను మది తలపోసి
మాయయు గీయయు మాటాడ గలకె
కాయ గుణంబులు గలవె యాతనికి
యని సారె సారెకు హరు డిట్లు వలుక
ఏని విని వేసారి విభున కిట్లనియె
ఆక్కటా పలుమారు నామాట లేల
ముక్కు గోయుట గాక ముకరమిానే ల
నేరమి యొచంగ నేనెంత దాన
కారుణ్య నిధి నీవు గావున వమ్ము
మన్నింపు మనిన న మ్మావిని జూచి
వమ్మగా నిట్లని పలికె నీశ్వరుడు
యేవిధంబున నైన యీసారి కోర్వ
నీ వగ పెల్లను నేనె దీర్చెదను
నా విని దండ ప్ర కాశంబు జేసి
కేవల భక్తితో గిరిజ కేల్మొగిచి
యే వగ మాస్వేద మీవగ పనిన
దేవికిట్లనియె నా దేవ దేవుండు
నీ లోని సాత్విక నిర్మల కళను
భూలోకమున కీమ ఫుము కర్మ రహిత
భక్తి వైరాగ్య నం పన్నగా జేసి
భక్తి యొచ్చట మం'దు ప్రభువుండు నచట
గాన నీ సాత్విక కళ యున్న కడకు

తా నె డా యగ వచ్చి తనదు నిజ న్వ
రూపంబు జూపి తా రుణ్యంబు తోడ
నా'కైదటికి వభూ' ల్లోద మొ'నంగు
న'విన నా'వేటి వు వా ప్రసాద మ'ని
120 తనదు సాత్విక కళ శరణికి న'నిచి
అనుపమూ'నందంబు నం'ది నా'వేళ

ఇత్యాది - ఇత్యాది - ఇత్యాది.

These pages, 45 to 78 are to be placed at the end of No. 26 of the Madras Journal.

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