THE
JOURNAL
OF
THE ASIATIC SOCIETY
OF
BENGAL.

EDITED BY

JAMES PRINSEP, F. R. S.

SECRETARY OF THE PHYSICAL CLASS, ASIATIC SOCIETY.

VOL. I.

JANUARY TO DECEMBER,

1832.

> "It will flourish, if naturalists, chemists, antiquaries, philologers, and men of science, in different parts of *Asia*, will commit their observations to writing, and send them to the Asiatic Society at Calcutta; it will languish, if such communications shall be long intermitted; and it will die away, if they shall entirely cease."
>
> SIR WM. JONES.

Calcutta:

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1832.

TO

CAPTAIN JAMES D. HERBERT,

Bengal Infantry,

LATE

DEPUTY SURVEYOR GENERAL OF BENGAL, AND SUPERINTENDENT
OF REVENUE SURVEYS;

AT PRESENT HOLDING THE APPOINTMENT OF

ASTRONOMER TO HIS MAJESTY

The King of Oude:

WHOSE JUDGMENT ORIGINATED; WHOSE PERSEVERANCE AND EXERTIONS SUCCESSFULLY
ESTABLISHED; AND WHOSE SUPERIOR ABILITIES SUPPORTED FOR 3 YEARS,

THE FIRST JOURNAL

IN INDIA

DEVOTED TO THE EXCLUSIVE PUBLICATION

OF

GLEANINGS IN SCIENCE;

THIS VOLUME,

IN ALL RESPECTS, BUT TITLE, A CONTINUATION OF HIS OWN WORK,

IS

Inscribed,

BY HIS ATTACHED FRIEND,

THE EDITOR.

Calcutta,
January 1, 1833.

PREFACE.

The Asiatic Society, on the 7th March, 1832*, passed a resolution, that the monthly journal hitherto published under the name of "Gleanings in Science," should be permitted to assume that of Journal of the Asiatic Society, and to continue it as long as the publication remains under the charge of one or both of the Secretaries of the Society. This privilege has, as it was anticipated, been the means of extending very considerably its circulation, while it has given a character and authenticity to the work, by its connection with an institution of established literary reputation, which no anonymous magazine, however well conducted, could hope to command.

The advantages of extended circulation have reacted to the benefit of subscribers, by enabling the Editor to increase the quantity of letter press from 400 to nearly 600 pages; and yet so constant has been the growing support of its contributors, that the pages of the Journal have been devoted, with few exceptions, to the insertion of original communications.

To many readers it would doubtless have been preferable that the Journal should contain more copious extracts from English scientific periodicals, which are not procurable in the interior of India; but conceding that, as an organ of Indian scientific intelligence, it must obviously derive its only merit among the many similar periodicals of the present day, from its stores of *oriental* literary and physical research, it will be generally acknowledged, that the first object of the work should be to give publicity to such oriental matter as the antiquarian, the linguist, the traveller, and the naturalist may glean, in the ample field open to their industry in this part of the world. While acting

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* The January number was not published until the middle of March.—Since then exertions have been made to bring up arrears, and in future each monthly number will appear with regularity on the 10th of the following month; the insertion of the meteorological register rendering an earlier issue impossible.

on this principle, however, the Editor has not lost sight of the great utility of following, as far as means would permit, the progress of the various sciences at home, especially such as are connected in any way with Asia; the only limits thereto being want of space, and want of time to peruse and extract from the vast number of publications of the present day. Want of room also precluded the possibility of republishing the proceedings of the Medical and of the Horticultural Societies; but this had become less urgent since both of those useful bodies adopted the excellent rule of giving early publicity to their own proceedings and records.

To the Asiatic Society THE JOURNAL has naturally looked for its most frequent and interesting communications; and in consequence of its more intimate connection with that Institution, the proceedings of that body have been given in greater detail than heretofore, so that absent members may learn exactly what passes at its meetings, and what accessions are made from time to time to its library and its museum. Many absent members have complained of the quarterly subscriptions they were heretofore called upon to pay, while they remained in ignorance of what was going forward; this source of objection is now obviated, and perhaps a still greater amendment may yet be effected for their benefit, by an arrangement that all members of the Society shall receive a copy of the Journal gratis, which will reduce their annual payments nearly one fourth.

It is unnecessary to recapitulate the contents of the present volume, or to allude in anonymous praise to those who have favored its pages with their assistance; since the authors have, in most cases, on suggestion, permitted their writings to be authenticated by the insertion of their names, as should always be the case in matters of fact, observation, and research. One illustrious name however must not be passed over without a tribute of gratitude for its valued and frequent contributions, a tribute more sincerely paid, since India has now lost the power and the claim to their continuance; she has resigned her most eminent oriental scholar to climes where his talents may find more genial appreciation, but where they cannot excite more respect or admiration, than they will ever command in the land which called forth their energies and directed their application.

The learned Societies at home will be proud to publish the continuation of the *Analyses of the Puránas*, of which the four first have appeared in these pages. Abstracts of four only were ready for the press, but translations of the remainder of the eighteen *Puránas* themselves had been completed under the superintendence of Professor Wilson before he quitted India.

Mr. Alexander Csoma's indefatigable labour, in opening to us a first acquaintance with the literature of Tibet, will be estimated as it deserves by literary men—a contracted circle perhaps, because deep erudition and study are requisite to form critics capable of appreciating the nature and bearing of his peculiar researches upon the history, languages, and religions of other nations, both ancient and modern. All may however feel sensible of the devotion, zeal, and perseverance which are necessary to lead a man, alone and unpaid, into a distant and wild country, to learn its language and study its people at the fountain head. The volumes of notes which Mr. Csoma has presented to the Asiatic Society, will, it is hoped, be published in their Researches at length.

In furtherance of the desire of the Government, the greater part of Dr. Buchanan's Statistics of Dinajpúr has been printed in a detached form, as commenced by the Editor of the GLEANINGS; and to complete the work more speedily, two extra numbers have been issued in the course of the year. It will be remarked, that there are many plates referred to in the text: the drawings alluded to are in possession of the Honorable Court of Directors, along with the original manuscripts; it was thought better to preserve the references, in case the Hon'ble Court might hereafter be persuaded to publish them, either in a separate form or of a size adapted to the present edition. It must not be forgotten that it is this undertaking which gained to the GLEANINGS, the valuable privilege of free postage through the Bengal Presidency. The Editor is happy to announce that the same boon has, in the most liberal manner, and without any solicitation, been extended to the Presidency of Bombay and to the Government of Ceylon, by their enlightened Governors, His Excellency Viscount CLARE, and His Excellency Sir R. W. HORTON, to whom his thanks are thus publicly and respectfully addressed.

To his numerous correspondents the Editor can but proffer thanks for past, and solicitations for future, support, bidding them remember that, the scope and object of this publication embraces the literature, the manners, the geography, physical and mineral, the arts, the natural productions of Asia, the phenomena of its climate, and observations of the heavens. In the words of the illustrious founder of the Asiatic Society, " the bounds of its investigation will be the geographical limits of Asia; and within these limits its inquiries will be extended to whatever is performed by man or produced by nature."

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DIRECTIONS TO THE BINDER.

The sheets of Buchanan's Statistics are to be separated from the monthly numbers. The Plates may either be bound up at the end of the volume, or in the following order :

ERRATA.

Page 10 line 9 *for* "wool," *read* "wood."
—— 11 — 7 *from bottom, for* "plate 1, fig. 2," *read* "plate 2, fig. 1."
—— 14 *last line, for* "delomite," *read* "dolomite."
—— 19 — 16 *from bottom, for* "3, 4, 5," *read* "1, 2, 3, 4."
—— 20 — 8 *from top, for* "plate 1," *read* "plate 2."
—— 20 — 9 *for* "he protracted," *read* "the protracted."
—— — — 11 *for* "BB″ B′," *read* "B″ B′."
—— — — 16 *for* "intercepts," *rsad* "intersects."

AND

In Fig 2, *plate II.* continue the dotted arc 1′ 1 *a″* to *a′*.
The line A *c′* continue to *c*.
—— 28 — 7 *from top, for* "manima," *read* "minima."
—— — *at bottom, for* "Artesien," *read* "Artesian."
—— 33 — 7 *for* "January," *read* "February."
—— 410 — — *in last column* of Table II. *for* "2m. 58s. 8," *read* "0m. 58s. 8."
—— 46 — 18 *from top, after* "which" *insert* "comma."
—— — — — ———————— "either" ditto.
—— 47 — 2 *from top, for* "have," *read* "has."
—— 57 — 12 *for* "$99\frac{1}{4}$ $99\frac{1}{2}$ $99\frac{3}{4}$," *read* "99^1 99^2 99^3."
—— 59 — 24 *and throughout the article, for* "sack," *read* "sac."
—— 60 — 4 "orbitar," *read* "orbital."
—— — — 10 "interval," *read* "internal."
—— — — 29 "lips," *read* "tips."
—— — — 34 *dele* "by."
—— 60 — 15 *for* "compressed and hard; before," *read* "compressed and hard before;"
—— — — 28 *for* "lips," *read* "tips."
—— 62 — 11 *for* "this Chiru," *read* "the Chiru."
—— 63 — 10 *for* "bambdoidal," *read* "lambdoidal."
—— — — 14 *for* "malars," *read* "molars."
—— 65 — 8 *for* "$1\frac{1}{8}$," *read* "$\frac{3}{16}$."
—— 67 — 2 *from bottom, after* "than," *read* "the."
—— 74 — 15 *for* "9°," *read* "9^h."
—— 75 — 21 *dele* "rufous," repeated.
—— 79 — 17 *from bottom, for* "done," *read* "donc."
—— 148 — — *foot note, for* "Rutboo," *read* "Kubboo."
—— 226 1st par. 5th line *for* "Ekadantashtra," *read* "Ekadanshtra,"
—— 226 4th „ 4th — *for* "Kridama," *read* "Srid'ama."
—— 229 2nd „ 5th — *for* "Vrishapati," *read* "Vrihaspati."
—— 231 — „ 3rd — *for* "Viswaséna" *read* "Viswakerma."
—— 238 — „ *after* "Ganges river," *insert* "at Gházipur."
—— 245 10 „ *from bottom, for* "it," *read* "the mirror."
—— — 1st „ 7th — *for* "He having," *read* "Having."
—— 296 line 3 *for* "but mostly," *read* "and,—"
—— — — 7 *for* "hydrogen. When," *read* "hydrogen, where."
—— 305 — 20 *for* "circumference," *read* "diameter."
—— — — 21 *for* "$27\frac{1}{2}$ rupees," *read* "$2\frac{1}{2}$ rupees."

Errata in Meteorological Register, for June.

Date	Hour.		Bar.		
13	Sun-rise,	*for*	,365	*read*	,465
14	,,		,399		,499
22	,,		,517		,617

Add 0,010 to all the figures in the Barometrical column for 10½ P. M.

—— 340 — 6 *after* “*Rhinolphus*,” *insert* “and two species of *Vespertilio*.”
—— 355 — 13 *for* “ *ακαυσα*,” *read* “ *ακαυστα*.”
—— 355 — 2 *from bottom, after* “*nilam*,” *insert* “ *níl maní*, (or *maník*.)”
—— 356 *after* “ College of Fort William,” *insert* “ the word *bahrmani* is also used in the *Khawás-ul-hejár*, as a variety of the *yaqút*.”
—— 358 — 20 *dele* “or a species of garnet.”
—— 358 — 22 *for* “ *manik*,” *read lâlrí*.”
—— 403 — 5 *from bottom, for* “ ΔΙΟΚΛΠ,” *read* “ ΔΙΟΚΛΗ.”
—— 404 — 14 *for* OVA,” *read* “ ΟΥΑ.”
—— 411 — 8 *for* “Latitude 25° 43′,” *read* “Lat. 25° 47′ 26″.”

In Table IV. of the Estimate of Life in India, page 284, the first four figures in the second and third column should stand thus:

Age.	Survivors.	Deaths.
20	52221	473
21	51748	489
22	51259	522
23	50737	557

The mistake arose from the calculations having originally been made to commence with the age of nineteen, instead of twenty: and the 5 year averages in Table III. page 283, will all be slightly affected by the same cause. The last figure in the second column, page 284, should be reversed; and in the last column but one, *for* “ 2080,” *read* “2008.”

Line 414 line 3 *from below, for* “ molluscæ,” *read* “ mollusca.”
—— 444 — 36 *after* “ ministry,” *insert* “ of a man.”
—— 445 — 3 *from below, for* “ 2125,” *read* “ 212.5.”
—— 446 — 7 *for* “ in bullion,” *read* “ bullion.”
—— 447 —. 21 *for* “ will be,” *read* “ would be.”
—— — — — *after* “ at any,” *insert* “ rate.”
—— 480 — 15-16 *for* “ Taríqa-i-Chishíta,” *read* “ Taríqa-i-Chishtía.”
—— 483 — 36 *for* “ lost about,” *read* “ tost about.”
—— — — 39 *for* “ Mújtahid-i-mústuqill,” *read* “ Mújtahid-i-mústaqill.”
—— 485 — 20 *for* “ Taqwíat-ul-Imám,” *read* Taqwíat-ul-Imán.”
—— 487 — 15 *erase* “ 5” at beginning of line.
—— 488 — 7 *for* “ differences,” *read* “ difference.”
—— 489 — 20 *for* “ Káfr,” *read* “ Kufr.”
—— 491 — 23-24 *for* Ishrák f’il Tasarraf,” *read* “ Ishrák f’il Tasarruf.”
—— 492 — 10-11 *for* “ the authority or influence of Saints, as respecting intercessors,” *read* “ respecting the authority or influence of Saints as intercessors.”
—— 498 — 23 *for* “ Khátim,” *read* “ Khátima.”
—— 501 — 12 *after* “ A B C,” *insert* “ [fig. 5.]”
—— 505 — 20 *for* “5 53 59,” *read* “ 5 52 59.”
—— 506 — 11 *r* “5 53 10,” *read* “5 53 27.”

JOURNAL

OF

THE ASIATIC SOCIETY.

No. 1.—*January,* 1832.

I.—*Abstract of the Contents of the Dul-vá, or first Portion of the Káh-gyur, from the Analysis of Mr. Alexander Csoma de Körös. By* H. H. Wilson, *Sec. A. S.*

[Read 9th November.]

At the last Meeting of the Asiatic Society, a general view of the contents of the two great Tibetan works, the *Káh-gyur* and *Stán-gyur*, and especially of the former, was submitted, founded on materials supplied by Mr. Csoma de Körös. It was also stated, that that gentleman had consented to prepare a more detailed analysis of the whole from the copy in the Society's possession; and he has accordingly furnished the Society on the present occasion, with the result of his subsequent labours, being an analytical sketch of the contents of the *Dul-vá*, or first great division of the *Káh-gyur*.

It was stated in the preceding sketch, that the *Káh-gyur* usually consisted of 100 large volumes, classed under seven great divisions; each comprising a greater or lesser number of volumes, treating of the religious practices and tenets of the Baud'dhas; written originally in Sanscrit, but translated into Tibetan, for the greater part in the ninth century.

Of those divisions, it was also mentioned, that the first, or *Dul-vá*, termed in Sanscrit *Vinaya*, Decorum or Discipline, occupied 13 volumes; and, as introductory to the whole, described the different observances to be followed by the votaries of Bud'dhism, but more especially by those, whether male or female, who adopted a religious life. These observances are of a very comprehensive description, extending not only to moral and ceremonial duties, but to modes of personal deportment, and the different articles of food or attire. The precepts are interspersed with legendary accounts, explaining the occasion on which Sákya thought it necessary to communicate the instructions given.

The *Dulvá*, according to the analysis now submitted, comprises seven portions.

1. *Tib.* Dul-va-zhi; *Sans.* Vinaya-vastu. The substance or basis of discipline, 4 vols.

2. *Tib.* So-sor-t'har-pé-do; *Sans.* Pratimoksha Sútra. Rules for emancipation, 30 leaves.

3. *Tib.* Dul-vá-nám-pár-jet-pá; *Sans.* Vinaya-vibhanga. Neglect of discipline or transgression, 4 vols.

4. *Tib.* Gé-long-má-so-sor-thár-pé-do; *Sans.* Bhikshuni-prati-moksha Sútra. Rules for emancipation for nuns, or female mendicants.

5. *Tib.* Gé-long-má-dul-vá-nám-pár-jet-pá; *Sans.* Bhikshuni-vinaya-vibhanga. Neglect of the discipline by female mendicants, in one volume, with the preceding tract.

6. *Tib.* Dul-vá-phrán-tshegs-kyi-zhi; *Sans.* Vinaya-kshudraka-vastu. Minor essentials of discipline, 2 vols.

7. *Tib.* Dul-vá-zhung-la-má; *Sans.* Vinaya Uttara-grantha. The last treatise on discipline, 2 vols.

Some admit only four divisions of the Dul-vá, termed in Sanscrit:—1. Vinaya-vastu. 2. Pratimoksha Sútra, and Vinaya-vibhanga. 3. Vinaya-kshudraka-vastu; and 4. Vinaya Uttara-grantha.

The first part of the Vinaya-vastu treats of the *Pravrajita-vastu*, the circumstances under which the religious profession may be adopted.

It opens with an account of the hostilities that usually prevailed between the kings of *Anga*, the country about Bhágalpur, and the kings of *Magadha*, or Behar, until Padma-chenpo, sovereign of the latter, became tributary to his rival, an event that happened shortly before Sákya's appearance on earth.

Before the same occurrence also, the birth and education of Vimbasa'ra, surnamed Sreníka, the son of Padma-chenpo, are described. The young prince encourages his father to withhold the tribute, and in the war that ensues, defeats, and kills the sovereign of *Anga*, and annexes that country to his patrimonial government. He subsequently succeeds his father, and is ruling at his capital *Rájagriha*, at the time of Sa'kya's birth.

The particulars of Sa'kya's birth are not enumerated in this place; but an account is given of his two first disciples Sariputra and Mangalayana, two young philosophical Brahmans, who have studied under different masters, without being satisfied with any of their instructions; the particular of whose tenets are enumerated. At last they find Sa'kya teaching in *Rájagriha*, and attach themselves to his person.

The doctrine of Sa'kya finds a patron in Vimbasa'ra, and he is described as residing some time in *Rájagriha*, enjoying great fame as a teacher and master of numerous converts; his mode of teaching is also exemplified, and various philosophical controversies between him and the advocates of other systems are detailed.

The mode in which his converts are received into the order of the priesthood, either by himself or by his disciples, is then particularized. Two presidents are appointed, and five classes of teachers ordained. Questions to be propounded are given, and the description of persons inadmissible from bodily imperfections or disease described. A variety of rules on the subject of admission is laid down.

The behaviour of the person after admission is then regulated; the cases in which he should require the permission of his principal specified; and various moral obligations prescribed, particularly resignation and forbearance, when maltreated or reviled.

Stories are related of improprieties committed by some juvenile members of the community, and in consequence Sa'kya desires that none shall be admitted under 15, and no priest be ordained under 20 years of age. Other stories give rise to other limitations, prohibiting the admission of slaves, debtors, runaways, hermaphrodites, diseased or maimed persons, young men without the consent of their parents, and persons who have families dependent upon them. No person is to be admitted, except in full conclave—nor any one to be allowed to reside amongst the priests without ordination—no thieves, parricides, matricides, nor murderers are to be admitted. Each of these prohibitions arises out of some incident occurring in the course of Sa'kya's peregrinations between *Magadha*, *Kosalá* or Oude, *Srávastí*, and *Kapila*.

The next subject is the performance of confession and expiation, which should be observed every new and full moon, in a public place, and congregation: the manner of conducting the ceremony is fully detailed.

The rest of the first volume is occupied with a number of precepts and prohibitions, some of them of a whimsical character: such as that a priest shall not wear wooden shoes, nor lay hold of a cow's tail to assist himself in crossing a river.

The second volume continues the subject of dress, especially on the fitness of leather or hides for the shoes of the priests; a treatise on drugs and medicaments then follows, which the disciples of Sa'kya are allowed to use or to carry about them.

The king of *Magadha* entertains Sa'kya for three months, and various legends are told.

In the course of them, the six chief cities of India are said to be *Srávastí, Sáketana, Varánasí, Vaisálí, Champá* and *Rájagriha.*

The two first are in Oude, *Varánasí* is Benares, *Vaisálí* is considered to be Allahabad, *Champá* is Bhagalpúr, and *Rájagriha*, or *Rájgiri* is in Behar.

From *Magadha*, Sákya goes to *Vaisálí*, upon the invitation of the *Lichchivi* inhabitants of that city, who appear to have been republicans, and to have possessed great riches.

The peregrinations of Sa'kya are continued throughout the volume, in which he encounters and converts many individuals, whose stories are told, not only during the present, but their past lives. Amongst others, Sa'kya relates his own, and how he became a Bodhisatwa, or sage. The conclusion of the volume leaves him at the lake *Manasarovara*, with 36 of his principal disciples.

The third volume continues in the same strain. At a place in *Kosala*, Sa'kya and his followers are entertained by way of test, and are found to be moderate and easily contented. The Brahmans are tried by a similar test, and proved to be greedy and insatiable.

Similar lessons, as in the preceding volumes, are given to the priests. They are permitted to eat treacle—to cook for themselves in time of famine, and to cook in ten places—to eat meat under certain restrictions—to accept gifts from the laity. The stories and lectures are interspersed with notices of medicines, and the mode of administering them, and the medical employment of charms and incantations.

The subject of the succeeding pages is the proper attire to be worn by the disciples of Sa'kya; they are directed to wear not more than three pieces of cloth, of a red colour—to wear cotton garments when bathing—to be clean in their dress and in their bedding—and never to go naked :—an injunction at variance with some notions of Bud'dhism, the images of the saints of which have been supposed to be represented without clothes, and furnishing a distinguishing characteristic between them and the images of the Digambara Jains.

The subject of dress is followed by that of the use of mats or sheets to lie upon.

A more important division then succeeds, on the conduct to be observed towards refractory and disputatious brethren. They are first to be admonished in public congregation, and if impenitent, to be expelled from the community. The mode in which confession, repentance, and absolution are observed is next explained, and illustrated by examples.

The residences and furniture of the monks are next described, and the next subject is said to be dissensions in religious communities. Little on this head, however, is given, and the rest of the volume is occupied with miscellaneous matter. One subject is an account given of the origin of the Sa'kya race by Mangalayana, at the desire of Sa'kya, to the people of *Kapila vastu;* and another the birth and education of Sa'kya himself.

Volume IV. continues the story of Sa'kya, especially the circumstances that led to his entering upon the life of an ascetic, and his subsequent proceedings. In this book, the *Sákyas* are called inhabitants of *Kosalá*, a country bordering on the *Kailás* mountains, and descendants of the Hindú king Ikshwaku. The birth place of Sákya is said to be *Kapila-vastu*, near the Himalaya, on the banks of the Bhagirathí. The latter pages illustrate what is considered to be the subject of the whole book, the evils of causing schisms, by instances of the inveterate hostility of L'has-kyim, the nephew of Sa'kya, towards his uncle.

The fifth volume commences with the *Pratimoksha Sútra*, short precepts for the securing of final felicity; the sum of which is, that vice is to be diligently avoided, virtue invariably practised, and the passions be kept under entire subjugation.

Then follows, and extends through the rest of this volume and the three next, a code of laws for the monks, comprehending 253 rules. Each of these arises in general from some improper conduct in a religious person, which forms a separate incident or tale. The matter comes to Sa'kya's knowledge, who sends for the culprit into the congregation, where he is duly lectured. On his confession and penitence, he is pardoned, and Sákya enacts the rule or law preventive of a like transgression.

The ninth volume is of the same general character as the preceding four; but it is addressed to the female followers of Bud'dha, priestesses or nuns, *Gélong-má*, or *Bhikshuní:* many of the rules and illustrations are repeated from the foregoing volumes, and in the same terms.

The tenth and eleventh volumes relate to matters and rules of minor importance, such as that the monks shall not use vitrified brick as a flesh-brush, nor fragrant unguents, nor rings, nor seal rings of the precious metals, nor eat garlic, nor learn music or dancing. There are also directions for the construction of *Chaityas*, and the deposit therein of reliques, as the hair, nails, &c. of Bud'dha, given by him to various persons during his life. There are also some tales of a political or historical character, especially the destruction of *Kapila* by the king of *Kosala*, and the murder or expulsion of the *Sákyas*, many of whom are said to have fled to Nepal. The eleventh volume closes with an account of the *Nirván*, or emancipation of Sa'kya in *Kamrúp*, or Western Assam. Eight cities contend for his remains, which are divided amongst them, and deposited in *chaityas* or mausolea.

On the death of Sa'kya, Kasyapa, the head of the Baud'dhas, directs 500 superior monks to make a compilation of the doctrines of their master. The *Do* is also compiled by Ananda; the *Dul-vá* by Upali; and the *Ma-moon*, *Abhidharma*, or *Prájná-páramita* by himself. He presides over the sect at *Rájagriha* till his death.

Ananda succeeds as hierarch. On his death his reliques are divided between the *Lichchivis* and the king of *Magadha;* and two *chaityas* are built for their reception, one at Allahabad, the other at Pataliputra.

One hundred years after the disappearance of Sa'kya, his religion is carried into Kashmír.

One hundred and ten years after the same event, in the reign of Asoka, king of *Pataliputra*, a new compilation of the laws of Sa'kya was prepared by 700 monks, at *Yangs-pa-chen* (Allahabad).

The twelfth and thirteenth volumes contain supplementary rules and instructions, as communicated by Sákya to Upali, his disciple, in answer to the inquiries of the latter.

We shall be better prepared, upon the completion of the catalogue of the whole of the *Káh-gyur*, to offer any remarks upon the doctrines it inculcates, or the historical facts it may be supposed to preserve. It is therefore rather premature to make any observations upon the present analysis, confined as that is to but one division of the work, and unaccompanied by extract or translation; but we may perhaps be permitted to inquire what new light it imparts, as far as it extends, to the date and birth-place of Sa'kya.

Any thing like real chronology is, if possible, more unknown in Baud'dha than Brahmanical writings; and it is in vain therefore to expect any satisfactory specification of the date at which the *Bud'dha* Sákya flourished. We find however that 110 years after his death, Asoka, king of *Patalíputra*, reigned: now in the *Vishna Purána* and one or two other Puránas, the second king of *Magadha* from *Chandragupta*, or *Sandrocoptos,* bears the title of Asoka, or Asokaverddhana. If this be the prince intended, Sákya lived about 430 years before the Christian æra, which is about one century posterior to the date usually assigned for his appearance. It is not very different, however, from that stated by the Siamese, to Mr. Crawfurd. "By their account, his death took place in the first year of the sacred æra, being the year of the little snake; on Tuesday, being the full moon of the sixth month of the year. The year 1822 was the year 2364 of the æra in question, and as Bud'dha is stated by them to have died when 80 years of age, his birth by this account took place 462 years before the Christian æra." *Crawfurd's Siam*, 367.

A discrepancy apparently of a more decided character occurs as to the place of Sákya's nativity. This has been hitherto considered to have been *Kikata* or *Kagadha*, the modern province of Behar, the latter being evidently intended by that country in *Jambu Dwip*, or India, which is called *Makata* by the Burmese and the Siamese, *Mo-ki-to* by the Chinese, and *Makata Kokf* by the Japanese, according to several European writers of authority.

Now according to the *Káh-gyur* the birth place of Sákya is not in *Magadha*, but in *Kosala*, or Oude, at a city called *Kapila* or *Kapilavastu*, and this latter term explains the nature of the mistake. The Chinese specify *Kau-pi-le*, the Burmese *Ka-pi-la-vot*, the Siamese *Ka-pi-la-pat*, the Cingalese *Kimboul-pat*, and the Nipalese *Kapila-púr*, as the city in which their legislator was born—considering, therefore, *Makata* to be the principality or province in which it was situated. For some centuries before Christ, and about the probable period of Sákya's nativity, the greater part of central India was subject to *Magadha ;* and it is not extraordinary therefore that *Kosala*, in which *Kapila* is situated, was considered as a subordinary, and may have been a tributary or dependant principality, and so far therefore *Kapila* was in the kingdom, though not the country of *Magadha*. At any rate, that *Magadha* was the first and principal scene of Sákya's labours is universally admitted. Minutely accurate topography, and history, are not to be expected in these cases; and it is not wonderful that the followers of Bud'dha, who derived their traditions from sources of a less authentic description than those of Tibet, should have placed Kapila in Behar, or elevated its chief, a petty Raja, to be king of central India. The latter mistake is committed by the Mongols, who as neighbours of the Tibetans, should have known better ; yet even they call Soduduni, the father of Sákya, king of *Magadha*, Der Königvon Magadha. (Klaproth, Asia Polyglotta, 123.)

The precise situation of *Kapila*, it is not now easy to ascertain. The Tibetan writers place it near *Kailas*, on the river *Bhagirathi*, or as elsewhere stated, on the *Rohini* river. These indications, connected with its dependency on *Kosala*, render it likely that it was in Rohilkhund, or in Kamaon, or perhaps even rather more to the eastward ; for the river now known as the *Rohini* is one of the feeders of the *Gandak*—at any rate it must have been on the borders of Nepal ; as it is stated that when the *Sákyas* were dispossessed of their city, those who escaped retired into that country.

Another question is, who were the *Sákyas ?* The Bud'dha traditions trace them from Ikshwaku, a prince of the solar line, and ancestor of the race that reigned in *Ayodhya* or Oude. The name however does not occur in the Hindú genealogical lists, either as that of a tribe or people. It is most akin to the term *Sakas*, the *Sacæ* or Scythians of antiquity, the Tartars of modern time; and it is not at all unlikely that a colony of these people settled in this part of India, as did the Afghàns many centuries later in Rohilkund. In that case, they probably brought with them the faith of Bud'dha, and communicated it to India, whence it returned to them improved by the scholarship of learned converts. It is very doubtful, if Bud'dhism ever prevailed extensively in central Hindustán, whilst it is quite certain, that it flourished exceedingly in the north and west of India, about the commencement of the Christian æra. We know that it is still widely cultivated throughout central Asia, and that part of the world is most probably its ancient and original seat. Some additional light may possibly be thrown on these subjects by the succeeding portions of the *Káh-gyur.*

II.—*On the Native Method of making the Paper, denominated in Hindustán, Nipalese. By* B. H. Hodgson, Esq. *Acting Resident, Nepal.*

For the manufacture of the Nipalese paper, the following implements are necessary, but a very rude construction of them suffices for the end in view.

1*st.* A stone mortar, of shallow and wide cavity, or a large block of stone, slightly but smoothly excavated.

2*nd.* A mallet or pestle of hard wood, such as oak, and in size proportioned to the mortar, and to the quantity of boiled rind of the paper plant which it is desired to pound into pulp.

3*rd.* A basket of close wicker work, to put the ashes in, and through which water will pass only drop by drop.

4*th.* An earthen vessel or receiver, to receive the juice of the ashes after they have been watered.

5*th.* A metallic open-mouthed pot, to boil the rind of the plant in. It may be of iron, or copper, or brass, indifferently; an earthen one would hardly bear the requisite degree of fire.

6*th.* A sieve, the reticulation of the bottom of which is wide and open, so as to let all the pulp pass through it, save only the lumpy parts of it.

7*th.* A frame, with stout wooden sides, so that it will float well in water, and with a bottom of cloth, only so porous that the meshes of it will stay all the pulp, even when dilated and diffused in water; but will let the water pass off, when the frame is raised out of the cistern; the operator must also have the command of a cistern of clear water, plenty of fire-wood, ashes of oak, (though I fancy other ashes might answer as well,) a fire place, however rude, and lastly, quantum sufficit of slips of the inner bark of the paper tree, such as is peeled off the plant by the paper-makers, who commonly use the peelings when *fresh* from the plant; but that is not indispensable. With these "appliances and means to boot," suppose you take four seers of ashes of oak, put them into the basket above-mentioned, place the earthen receiver or vessel beneath the basket, and then gradually pour five seers of clear water upon the ashes, and let the water drip slowly through the ashes and fall into the receiver. This juice of ashes must be strong, of a dark bark-like red colour, and in quantity about 2lbs.; and if the first filtering yield not such a produce, pass the juice through the ashes a second time. Next, pour this extract of ashes into the metal pot already described, and boil the extract; and so soon as it begins to boil, throw into it as many slips or peelings of the inner bark of the paper plant as you can easily grasp, each slip being about a cubit long, and an inch wide; (in fact the quantity of the slips of bark should be to the quantity of juice of ashes, such that the former shall float freely in the latter, and that the juice shall not be absorbed and evaporated with less than half an hour's boiling.) Boil the slips for about half an hour, at the expiration of which time, the juice will be nearly absorbed, and the slips quite soft. Then take the softened slips, and put them into the stone mortar, and beat them with the oaken mallet, till they are reduced to a homogeneous or uniform pulp, like so much dough. Take this pulp, put it into any wide-mouthed vessel, add a little pure water to it, and churn it with a wooden instrument like a chocolate mill, for ten minutes, or until it loses all stringiness, and will spread itself out when shaken about under water. Next, take as much of this prepared pulp as will cover your paper frame, (with a thicker or thinner coat, according to the strength of the paper you need,) toss it into such a sieve as I have described, and lay the sieve upon the paper-frame, and let both sieve and frame float in the cistern: agitate them, and the pulp will spread itself over the sieve; the grosser and knotty parts of the pulp will remain in the sieve, but all the rest of it will ooze through into the frame. Then put away the sieve, and taking the frame in your left hand, as it floats on the water, shake the water and pulp smartly with your right hand, and the pulp will readily diffuse itself in an uniform manner over the bottom of the frame. When it is thus properly diffused, raise the frame out of the water, easing off the water in such a manner, that the uniformity of the pulp spread shall continue after the frame is clear of the water, *and the paper is made.*

To dry it, the frame is set endwise, near a large fire; and so soon as it is dry, the sheet is peeled off the bottom of the frame, and folded up. When (which is seldom the case) it is deemed needful to smooth and polish the surface of the paper, the dry sheets are laid on wooden boards, and rubbed with the convex entire side of the conch-shell; or, in case of the sheets of paper being large, with the flat surface of a large rubber of hard smooth-grained wood; no sort of size is ever needed or applied, to prevent the ink from running. It would probably surprise the paper-makers of England to hear, that the *Kachár* Bhoteahs can make up this paper into fine smooth sheets of *several yards square.* This paper may be purchased at Katmandú in almost any quantity, at the price of 17 annas sicca per *dharni* of three seers: and the bricks of dried pulp may be had* at the same place, for from 8 to 10 annas sicca per *dharni.* Though called Nipalese, the paper is not in fact made in Nepal Proper. It is manufactured exclusively in Cis-Himalayan Bhote, and by the race of Bhoteahs denominated (in their own tongue) *Rangbo,* in contradistinction to the Trans-Himalayan Bhoteahs, whose vernacular name is *Sokhpo*†. The *Rangbo* or Cis-Himalayan Bhoteahs are divided into several tribes, (such as *Múrmi, Lapcha,* &c. &c.) who do not generally intermarry, and who speak dialects of the Bhote or Tibet language so diverse, that, ignorant as they are, several of them cannot effectually communicate together. They are all somewhat ruder, darker, and smaller, than the *Sokhpos,* or Trans-Himalayan Bhoteahs, by whom they are all alike held in slight esteem, though most evidently *essentially* one and the same with themselves in race, and the language, as well as in religion.

To return to our paper-making—most of the Cis-Himalayan Bhoteahs, east of the Kali river, make the Nipalese paper; but the greatest part of it is manufactured in the tract above Nepal Proper, and the best market for it is afforded by the Nipalese people, and hence probably it derived its name; a great quantity is annually made

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* The pulp is dried and made up into the shape of bricks or tiles, for the convenience of transport. In this form, it is admirably adapted for transmission to England. See the P. S.

† The Newar language has terms precisely equivalent to these; the Rangbo being called, in Newary, Paloo Sén; and the Sokhpo, Thá-Sén. The Sokhpo here spoken of is not really a different word from Soghpúr-nomade, the name *ordinarily* applied in Bhote to the Mongols. But this word has at least a different sense in the mouths of the Tibetans towards *this* frontier, on both sides of the snows.

and exported southwards, to Nepal and Hindústan, and northwards, to *Sakya-Gúmba*, *Digarchí*, and other places in Tramontane Bhote. The manufactories are mere sheds, established in the midst of the immense forest of Cis-Himalayan Bhote, which afford to the paper-makers an inexhaustible supply, on the very spot, of the firewood and ashes, which they consume so largely : abundance of clear water (another requisite) is likewise procurable every where in the same region. I cannot learn by whom or when the valuable properties of the paper plant were discovered ; but the Nipalese say, that any of their books now existent, which is made of Palmira leaves, may be safely pronounced, on that account, to be 500 years old : whence we may perhaps infer that the paper manufacture was founded about that time. I conjecture, that the art of paper-making was got by the Cis-Himalayan Bhoteahs, viâ Lhassa, from China—a paper of the very same sort being manufactured at Lhassa ; and most of the useful arts of these regions having flowed upon them, through Tibet, from China ; and not from Hindústan.

Nepal Residency, *Nov.* 1831.

P. S.—Dr. Wallich having fully described the paper *plant*, it would be superfluous to say a word about it. The *raw produce* or pulp (beat up into bricks) has been sent to England, and declared by the ablest persons to be of unrivalled excellence, as a material for the manufacture of that sort of paper upon which proof-engravings are taken off. The *manufactured* produce of *Nepal* is for office records incomparably better than any Indian paper, being as strong and durable as leather almost, and quite smooth enough to write on. It has been adopted in one or two offices in the plains, and ought to be generally substituted for the flimsy friable material to which we commit all our records.

III.—*Account of a new Genus of Land Snails, allied to the Genus Cyclostoma, of Lamarck ; with a description of a Species found on the outlying Rocks of the Rájmahal range of Hills.* *By* W. H. Benson, Esq. *Bengal Civil Service.*

[Plate I. fig. II. *a*. *b*. *c*.]

Genus PTEROCYCLOS. Testa discoidea, suprà convexiuscula, subtùs concava, latè umbilicata ; anfractibus cylindraceis, vix cohærentibus, omnibus utrinque apparentibus ; suturis excavatis ; peristomate reflexo, supernè sinu obliquo interrupto ; labro suprà alâ fornicatâ sinum obtegente instructo ; alâ latâ, tumidà, anticè declivi, mucronatà, anfractui penultimo adhærente.

Animal adhuc incognitum, forsàn Cyclostomati simile.

Habitat in rupibus umbrosis Patharghatæ et Sikrigali.

Shell discoid, somewhat convex above, concave below, and widely umbilicated; whorls cylindrical, slightly adhering together, and visible on both sides. Sutures channelled. Peristome reflected, interrupted at the summit of the aperture by an oblique sinus. Outer lip furnished, at the upper part, with an arched wing, which overhangs the sinus. Wing broad, tumid, bending downwards, and mucronate in front, adhering to the penultimate whorl.

This new form I dicovered on the 15th and 16th December, 1831, among the jungle-covered rocks of the hill of Pathargháta, one of the western outliers of the Rájmahal range, situated a little below Kalgaon, on the Ganges; and on the eminence of Sikrigali, another outlier of the same range to the north-east. The specimens were met with under the perpendicular and overhanging faces of low rocks, and under accumulations of dead leaves. All those found were unfortunately destitute of inhabitants, a circumstance the more to be regretted, as the conformation of the upper part of the peritsome and the presence of a wing, (a character hitherto unknown to belong to land shells, as far as my information on the subject extends,) argue a corresponding variation in the animal from any known type. The sinus probably affords a passage to some process of the mantle, which the wing is intended to defend from injury.

The genus which most nearly approaches to Pterocyclos is Cyclostoma, which is furnished with a circular aperture and a continuous peristome; but the characters above referred to will necessarily exclude this shell from it. Lamarck's species, C. planorbula, which varies much from his other species, and which is also widely umbilicated, appears to have the greatest affinity to the shell before me; and it has a still closer affinity to it than would be supposed from Lamarck's description, if Wood's figure of Helix cornu-venatorium is to be relied on, for the latter shell has a sinus (not alluded to by Lamarck) at the top of the aperture; but it shews no trace of the overhanging wing. Lamarck gives Helix cornu-venatorium of Gmelin as a synonyme of his C. planorbula, but with a mark of doubt, and refers to a figure in Chemnitz, to which Wood also refers for his Helix cornu-venatorium. It is probable, that that species will be found to be osculant between the genera of Cyclostoma and Pterocyclos.

If it had been my good fortune to have procured any of the Pterocycli alive, I should have had a good opportunity of comparing the characters of the animal with those of Cyclostoma; having found several fine specimens of a new species of the latter genus, with the live animals, at

Sikrigali and at Rájmahal. It is highly probable, that Pterocyclos will be found on the neighbouring outlying rocks of Pírpointí, on the ridge between Pathargháta and Kásita, on the isolated hill in the neighbourhood of an Indigo-planter's house, between Kásita and Kalgaon; and on a similar hill, at the back of the latter place, as well as on any part of the neighbouring main range of Rájmahal. It would be worth a conchologist's while, who may have an opportunity of visiting these rocks in showery weather, or shortly after a fall of rain, to seek for specimens of the shell for the purpose of inspecting the animal. I regretted, that I had no time to spare for a careful search at either of the places cited as localities of the species. Those which I found were with several specimens of a Cyclostoma, a reversed Carocolla and Macrochlamys*, collected in the space of a few minutes, and in a hurried search. The best method of collecting is to take several servants up the rocks, and after shewing them what objects are required, to employ them in turning over the fallen leaves, and in inspecting the loose rubbish in the crevices of rocks.

The species, which appears to be confined to rocky hills, I shall name P. rupestris. Its specific character is subjoined. It is probable, that some of the less material characters, which I have added to the generic character, in order to make the description as perfect as possible, will be required to be added to the specific character of P. rupestris, when other species shall be discovered, in consequence of their not being found to be common to all.

P. rupestris. Testa longitudinaliter confertim striata, albida, subdiaphana, lineis longitudinalibus castaneis suprà et infrà picta; versus apicem piscescens, anfracte ultimo fasciâ mediâ castaneâ ornato.

Var. 1. Fasciâ mediâ omissâ.
Var. 2. Lineis angulatis subtùs omissis.
Var. 3. Testâ totâ corneâ.

Shell sub-diaphanous, whitish, closely striated across the whorls, marked above and below with angular chesnut lines running across the whorls, and with a band of the same colour on the centre of the last whorl, purplish-brown towards the apex.

Var. 1. The same without the medial line.
Var. 2. Ditto without the angular markings underneath.
Var. 3. The whole shell horn-coloured.

The medial band in the type specimen, and in the second variety, appears to be composed of arrow-shaped spots, and is only a more pronounced expression of the angular lines.

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* A new genus of the Helicidæ, separated by me from Helix, in consequence of the wide departure of the animal from the type of that genus.

I am preparing a description of the Carocolla above-mentioned, the animal of which, as far as this particular species is concerned, fully justifies Lamarck's separation of the genus from Helix. Since writing the above account, I have discovered a new genus of amphibious shells, inhabiting the tract between high and low water mark in the river Hooghly, the animal of which, bearing only two tentacula, differs alike from the fresh water and land genera, which are similarly circumstanced in having the eyes (or, more properly speaking, the percipient points) on the summits of the tentacula, as in the quadri-tentaculated species, instead of at their base. The discovery of two new genera, and of as many new species in Bengal, in the course of a hurried trip down the country, and in an unfavorable season, leads us to the conclusion, that many other novelties in terrestrial and fluviatile conchology remain to be discovered in that province, and in the neighbouring unexplored territories of Arracan and Ava. It is to be regretted, that a species of Cyclostoma recently discovered alive at Tenasserim, and described in the Zoological Journal, as C. Perdix, was not described before death, as the keel, with which the shell is provided, gives reason to conjecture, that the animal differs in some respects from the animals of other species which have been described. Persons not conversant with conchology would do well to preserve the shells, with the animals alive, in a small box, with cotton around them, in which state land-shells may be preserved for several months, and when excited by moisture, they will make their appearance, and afford instruction to observers competent to note their characters, to whom they may be submitted. I have kept numbers of species of Bulimus alive for nine months, without any of them manifesting an inclination to come forth: and I have now by me in good health the species of Cyclostoma and Caracolla, which I collected in the localities mentioned in the early part of this paper.

Calcutta, Jan. 17, 1832.

V.—*Examination of Minerals from Ava. By* J. Prinsep, *Sec. Ph. Cl.*

[Read 16th Nov.]

Major H. Burney has favored us with a further supply of minerals from Ava, proving that country to be as promising a field for varieties of the earthy minerals as it has already turned out prolific in metallic ores: among the present series may be enumerated;

1.—*Asbestos*, from the crevice of a rock among the hills of *Tsa-gain;* fine silky white Amianthus, crystallized on *silicious dolomite*, as it may be called from its behaviour with tests : the colour of the latter is greyish white, with greenish yellow imbedded nodules : before the blow-pipe it is unalterable, but it hardens so as to scratch glass easily : it effervesces strongly with nitric acid, and leaves a silicious residue: the solution lets fall a small precipitate with sulphate of soda, and a more copious one with ammonia and phosphate of soda.

2.—Small hexagonal plates of *Mica ;* splitting into thin plates of a dark-brown colour : non-elastic : heated on charcoal, they assume a golden colour from the separation of the plates : with a stronger heat they fuse into a black enamel : resembles Hauy's *Mica annulaire.*

3.—Crystallized and anhydrous *Gypsum.*

4.—Dark green prismatic *Hornblende ;* obliquely hexahedral, with rhomboidal cleavage :—fuses with difficulty into a black enamel.

Metallic Minerals.

5.—*Quartzy Malachite ;* of a light-green colour : by digestion in boiling nitric acid this mineral yielded 18½ per cent. of oxide of copper.

6.—*Black oxide of Manganese ;* fracture dark grey, granular, earthy : exterior surface shining black and mammellated ; with borax, in the blow-pipe flame, gave a peuce coloured glass, discriminative of manganese.

7.—*Pisiform oxide of Iron*—in dark-brown balls of the size of peas : exhibiting a stellated structure on fracture : before the blow-pipe, and cupellated with lead, proved to be almost entirely composed of red oxide of iron.

8.—*Argentiferous Galena*—from a newly discovered mine near Ava : yielded on analysis ⅓ per cent. of silver, with slight contamination of copper and zinc.

9.—Crystallized oxide of Lead or *Litharge.*—This mineral is believed to be new, at least it is not described in any catalogue of the ores of lead, which have been consulted.

The specimen resembles yellow micaceous schist in general appearance : it is composed of a confused aggregation of micaceous crystals of a pink-yellow colour : the interstices in some places filled with yellow earthy litharge :—and the exterior of the nodule coated with white carbonate of lead.

The analysis was effected by solution in nitric acid, and precipitation by sulphate of soda, which yielded 133,5 grs. of sulphate, equivalent to oxide of lead .... 99.

Prussiate of potash proved the existence of copper and iron, weighing.. 1.

100.

This natural litharge is readily fusible without effervescence, and resembles, in the reddish brown colour it assumes, the vitreous coat, which is always remarked upon the *Dain* and *Yowetni* silver cakes from Ava : I had previously occasion to examine the composition of this substance, which I had found to consist of

Oxide of lead,	70.5
Oxide of antimony,	12.2
Oxide of copper,	10.0
Silver, probably entangled in the slag,	6.0
Earthy matter,	1.3
	100.

I at the time concluded, that the Burmese refiners made use of antimony and lead in refining their silver, and that a little of the artificial slag remained attached to the surface of the silver upon its being suddenly cooled before the litharge was entirely worked off. I have been assured, however, that they use a natural ore to produce the peculiar effect remarked ; and if so, the mineral now under description must undoubtedly be the substance employed.

It is worthy of remark, that the Burmese assayers judge of the quality of silver by the crystallization of this coat, or rather by the crystallization of the surface of the metal itself under its protection. A star is the emblem formed upon their standard silver, which consists nearly of the proportion of 1 atom. copper (10.5) to 5 silver (89.5). It would be curious to ascertain whether this crystallization is a concomitant of other definite mixtures of the same metals. The *Kharúbát* silver, containing 5 per cent. of copper, exhibits spiral circles of litharge on its surface, in lieu of the star.

10.—*Platina Ore.* In addition to our information respecting the locality of the platina ore of Ava, Major H. Burney has favored us, through Mr. Swinton, with the following interesting particulars :

" I find that a good deal of the platina ore is brought from some mountain torrents or small streams, which fall into the *Kyendween* river from the westward, near a town called *Kannee ;* and it is collected in a very curious manner, as Mr. Lane is informed, although he hesitates to believe the fact. The horns of a species of wild cow in this country called *T'sain*, perhaps the same as the *Nylgao* of India, have a velvet coat before the animal reaches the age of two or three years : a number of these horns are taken and fixed in the beds of the small streams, and at the close of the rainy season, when the water subsides, a coth is put down over each horn separately ; and the horns, and cloth as well as a portion of the sand around it, are taken up together. The horns appear to collect around them a good deal of gold dust, which the streams have washed down, and with this dust grains of platina are found mixed.

The Burmese look chiefly for the gold dust, separating and bringing that alone generally to Ava; and although Mr. Lane has often urged the men who are engaged in this trade to bring at once the whole of what they take up with the horns, he has not yet been able to persuade them to do so. These horns sell sometimes for 12 or 13 ticals a piece, and deer's horns are sometimes used instead of them.

The Burmese call platina, *Sheenthan;* much of this ore is also found with the gold dust collected among the small streams which fall into the *Erawadi*, to the northward, in the direction of Banman."

The same officer also writes, in allusion to a newspaper notice, "I observe, that some correspondent in the Calcutta Government Gazette states, that *Kannee*, where the platina ore of Ava is found, is not a town, but signifies a mine. *Kannee-myoo*, or town, is well known as a place forming the assignment of the King's aunt and step-mother, whom I visited on my first arrival here; and *Kannee* certainly does not mean a mine in the Burmese language."

V.—*New Bridge over the Mússí at Hyderabad.*

Our notice of the Caramnassa Bridge in the GLEANINGS of last October has, we are happy to observe, put us in possession of further materials on the interesting subject of public works. On the present occasion, the merit of the undertaking is not due to a simple individual, but to the enlightened policy of a native government. Several indications of a similar liberal system of public improvement have been manifest of late; and that too, it must not be forgotten, after the British Government has avowed a general determination of non-interference in the internal administration of the native states. In Oude in particular, the present ministry has been forward in promoting public works: the cast-iron bridge which was sent out fifteen years ago, and which has since lain in rust and neglect on the banks of the Gumtí, is, we understand, about to be erected over that river; and several other bridges on the suspension principle are also in the course of preparation: an astronomical observatory, to be provided with the best instruments, has been lately established at Lakhnaō: a survey of the country is in contemplation; and yet all these benefits have gone hand in hand with retrenchments and reform of the civil expenditure.

Of the progress of public works at Hyderabad, we have now an opportunity of judging from the account of the completion of a handsome stone bridge over the Músśi river, communicated by Captain James Oliphant, the engineer who erected it, to the British resident at the Nizam's court, which has been obligingly put into our hands for publication. We regret, that we are unable to add any particulars of the river itself, or of the precise situation of the bridge; but we believe that it lies on the high road between the residency and the city.

" The first stone of the bridge was laid on the 15th January, 1829.

According to the original plan, there were to have been eight arches, semi-elliptical, each 56 feet span, and 18 feet rise. The piers 10 feet wide, the breadth of the bridge 24 feet.

Eight arches were fixed upon, because by this division of the channel, the best foundations were obtainable for the piers; and the chief reason for the general preference of an odd number of arches was inapplicable, as it will be seen by reference to the plan, that the strength of the current is not in the centre of the channel, but at the arch next the abutment on the left bank.

By October, 1829, the whole of the piers had been raised above what was then considered high-water mark; two arches had been finished, and a third was almost completed, when the river rose to the extraordinary height shown by the dotted line in the elevation: the piers were destroyed, and the third arch fell in, the centering having been carried away.

The sudden shock must have been a severe trial to the neighbouring arch; but it stood firm, nor on examination did it appear to have sustained any damage.

In consequence of the disaster, the work was discontinued; and nothing was done till it was recommenced 14 months afterwards, on the 21st of December, 1830.

The engineer, having been alarmed at the height to which the river rose in the floods, determined to deviate so far from the original plan, as to give two feet additional rise to the two centre arches, and a proportional increase to the adjoining ones; and instead of making the approach on the left bank solid, as he at first intended, to provide additional water-way by throwing an arch across the ravine. These alterations were carried into effect, as shown in the plan.

The arch under the approach is the arc of a circle of 63 feet radius; its span 77 feet, and rise 16 feet; breadth of the road-way 30 feet.

The piers and arches throughout are composed of squared granite stone, brought from a distance of from four to five miles. The spandrels are solid to the height of the top of the cut-waters, after which they are completed with longitudinal stone walls, covered over with large stones, just under the road-way. The arch stones are five feet long at the spring, and diminish gradually to the key stones, which are 2 ft. 9 in. In the arch under the approach, they are six feet at the spring, and 3-2 at the crown.

During the progress of the work, it was invariably observed, that before the keys were driven, the centres had sunk 3½ inches at the crown; and when they were struck, which was done the second or third day after the arch was finished, that there was a settling of 2½ inches. The large arch settled 3½ inches, and several of the long stones at the haunches cracked, which however can hardly be considered detrimental, as it is only a proof that the hollows, which would otherwise have existed, have by the fractures been filled up."

We are greatly surprized to find, from the statement furnished to the resident by Captain Oliphant, that the outlay upon this extensive structure exhibits a total of less than 95,000 rupees, or including the labour of 90 men from the Corps of Engineers, rupees 1,02,000, not including the repair of the damage sustained in the flood of the 22nd October, 1829. Considering the dimensions of the bridge, and the high price of labor in the Nizam's dominions, this seems exceedingly moderate: it must however be remembered, that the foundations rest upon rock, and that the granite quarries, whence the stone was extracted, are close at hand.

We have given a reduced engraving of the architectural elevation and plan of the bridge, in Plate II. figs. 1, 2, 3, 4, which do not require any explanation: the plan adopted of springing the voussoirs of the elliptical arches from an inclined bed on the piers, so as to rest at right angles *to the thrust of the arch*, instead of forming right angles with the curvature of the ellipse, reminds us of Mr. Seaward's elegant design for the new London bridge, wherein the advantage of such a construction is fully developed. The attempting of elliptical arches in stone, with native *mistrís*, was a work of daring, and its successful accomplishment does credit to the perseverance and abilities of Captain Oliphant.

VI.—*A Method of rectifying a Route Protraction.*

It frequently happens, that a surveyor has to protract a survey of his route between two fixed points on a map, and that when the operation is performed, he finds the work does not close, and perhaps the terminating point of his protraction either goes beyond or falls short of the fixed one. And if the survey be hastily executed, he will probably find the *general direction* of the *line*, as given by his protraction, to be considerably at variance, with that connecting the two fixed points. To divide the error, which is generally in excess, proportionally among the smaller lines of the protraction, according to the principles of geometry; or in fact, to make the route fit in between the two fixed points, is our present purpose.

Let AB then (Plate II. fig. 2) be the two fixed points on a map; and A*a*, *ab*, *bc*, *c*B', the protracted route. (The error is apparent; in the general direction, as much as the angle BAB'; and in the direct distance, too much by the quantity B''B'.) First, draw lines from A to each bend in the route, as A*a*, A*b*, and A*c*. Then on the line AB' lay off AB'' equal to the true distance AB. Now, parallel to B'*c* from B'', draw the line B''*c*', and observe where it cuts the line A*c*; make a mark, and call that point *c*': then parallel to *cb*, draw *c*'*b*', and where it intersects the line A*b*, mark the point *b*': proceed similarly till you find the point *a*'. Join A*a*', *a*'*b*', *b*'*c*', and *c*'B'', and the route is reduced to the true distance. But we have yet to transfer this to the line AB: for this purpose, take A*a*', A*b*', A*c*', each as radius in your compasses, and from the points *a*', *b*', *c*', describe arcs cutting both the lines AB'', and AB, in the points 1, 2, 3, and 1', 2', 3'. Lay off the distances 1*a*', 2*b*', 3*c*', on the arcs from 1' to *a*'', 2' to *b*'', and 3' to *c*'': lastly, draw the lines A*a*'', *a*''*b*'', *b*''*c*'', *c*''B, and the route is duly transferred. This method also admits of applying correction, where the protraction of the route falls *short* of the true distance.

Calcutta, 28*th Nov.* 1831. J. G.

VIII.—*Comparison of the Indus and Ganges Rivers.*

Lieutenant A. Burnes, Assistant Resident in Cutch, who lately communicated to the Bengal Government a geographical report upon the Indus, drawn up from notes and surveys made on his recent mission to Lahore, estimates the magnitude of the Indus, at Tatta, a place situated equidistant from the ocean with Sikrigali on the Ganges, as four times greater than the latter river, upon the estimation given in the Gleanings, III. 185, in the month of April: but it may reasonably be doubted, whether the discharge of water in the Ganges is not underrated at 21,000 cubic feet per second at Sikrigalí, since the same quantity is also estimated to flow past Benares, and that upon more accurate data, at the same season. Lieutenant Burnes thus states the chief data of the comparison.

" In the middle of April, I found the Indus at Tatta to have a breadth of 670 yards, and to be running with a velocity of 2½ miles an hour. It happens, that the banks are steep on both sides of the river in this part of its course, so that the soundings, which amount to fifteen feet, are regular from shore to shore, if we except a few yards on either side, where the water is still. These data would give a discharge of 110,500 cubic feet per second, but by Buat's equations, for the diminished velocity of the stream near the bed, compared with that of the surface, it would be decreased to 93,465 cubic feet; some further deductions should be made for the diminished depth towards the shores, and 80,000 cubic feet per second may be taken as a fair rate of discharge for the Indus in the month of April. It is a source of regret to me, that I am unable to extend my observations to the river during the rainy season; but I had not an opportunity of seeing it at that period, and do not desire to place opinion in opposition to fact. I may mention, however, that at Sehwan, where the Indus is 500 yards wide, and 36 feet deep, and sweeping with great velocity the base of a rocky buttress that juts in upon the stream, there is a mark on the precipice, which indicates a rise of 12 feet during the inundations. This gives a depth of 8 fathoms to this part of the Indus in the rainy season: if I could add the increase of width on as sound data as I have given the perpendicular rise or depth of water, we should be able to determine the ratio between its discharge at the opposite seasons; but I have only the vague testimony of natives to guide me, and therefore dismiss the subject.

" From what has been above stated, it will be seen, that the Indus, in discharging the enormous volume of 80,000 cubic feet of water in a second, exceeds by four times the size of the Ganges in the dry season, and nearly equals the great American river the Missisippi. The much greater length of course in the Indus, the tortuous direction of itself and its numerous tributaries, among towering and snowy mountains near its source, that must always contribute vast quantities of water, might have prepared us for this result; and it is not extraordinary, when we reflect on the wide area embraced by some of these minor rivers, and the lofty and elevated position from which they take their rise: the Sutlej in particular flows from the sacred lake of Manasarovara in Tibet, 17,000 feet above the sea. The Indus traverses too a comparatively barren and deserted country, thinly peopled and poorly cultivated; while the Ganges expends its waters in irrigation, and blesses the inhabitants of its banks with rich and exuberant crops. The Indus, even in the season of inundation, is confined to its bed by steeper and more consistent banks than the other river, and, as I have shewn in my memoir, seldom exceeds half a mile in width ; the Ganges, on the other hand, is described as an inland sea in some parts of its course, so that at times the one bank is scarcely visible from the other, a circumstance which must greatly increase the evaporation. The arid and sandy nature of the countries that border the Indus soon swallow up the overflowing waters, and make the river more speedily retire to its bed. Moreover, the Ganges and its subsidiary rivers derive their supply from the southern face of the great Himalaya, while the Indus receives the torrents of either side of that massy chain, and is further swollen by the showers of Cabúl, and the rains and snow of Chinese Tartary. Its waters are augmented long before the rainy season has arrived ; and when we look at the distant source of the river, to what cause are we to attribute this early inundation, but to melting snow and ice.

" The slope on which the Indus descends to the ocean would appear to be gentle, like that of most great rivers. The average rate of its current does not exceed 2½ miles an hour, while the whole of the Punjab rivers, which we navigated on the voyage to Lahore, were found to be one full mile in excess to the Indus ; we readily account for this increased velocity by their proximity to the mountains, and it will serve as a guide in estimating the fall of the great river. The city of Lahore stands at a distance of about 1,000 British miles from the sea, by the course of the river ; and I am indebted to the kindness of Dr. J. G. Gerard, of the Bengal Establishment, for a series of Barometrical observations made at Amritser, a city about 30 miles eastward of Lahore.

The mean of 18 of these observations gives us the height of the Barometer at......................	28.8613
The corresponding observations at Calcutta give....	29.7115
Making a difference of.....	.8502

" I am informed, that the height of instrument registered in Calcutta may be 25 feet above the level of the sea, and as the city of Amritser is nearly on the same level as Lahore, (since both stand on the plains of the Punjab,) it must have an elevation of about 900 feet from the sea. It remains to be considered in what and how great a proportion this slope is to be distributed among the rivers from Lahore downwards. On a comparison with the Ganges, we cannot give a greater fall downwards from Mittun, where the Indus receives the Punjab rivers, than 6 or perhaps 5 inches per mile ; nor can we allow more than 1-4th of the 900 feet as the height of that place about the level of the sea, for the river has not increased here in velocity of current, though we have neared the mountains. Mittun is half-way to Lahore, and about 500 miles from the sea, and nearly 220 feet above it. The remaining 680 feet we may fairly apportion to the Punjab rivers, from their greater rapidity of course, which would give them a fall of 12 inches per mile.

"It is an additional proof of the greater magnitude of the Indus, that at its lowest it retains a velocity of two and a half miles with a medial depth of 15 feet, moving throughout the year in one majestic body to the ocean; while the Ganges partakes more of the nature of a hill stream, insignificant at one season, and overflowing its banks at another.

"Before bringing these remarks on the Indus to a close, I wish to add a few words regarding the effect of the tide on the two rivers. In the Ganges, it runs considerably above Calcutta, whereas no impression of it is perceptible in the Indus 25 miles below Tatta, or about 75 miles from the sea. We are either to attribute this occurrence to the greater column of water resisting the approach of the sea,

> 'Whose vanquished tide, receding from the shock,
> 'Yields to the liquid weight,'

or to the descent of the water of the one river being greater than that of the other: the tide in the Indus certainly runs off with incredible velocity, which increases as we near the sea. It would appear, that the greatest mean rise of tide in the Ganges is 12 feet. I found that of the Indus to be only 9 feet at full moon, but I had of course no opportunity of determining the mean rise of the tide as in the Ganges. The tides of Western India are known to exceed those in the Bay of Bengal, as the construction of docks in Bombay testifies; and I should be disposed to consider the rise at the mouths of the Indus and Ganges to be much the same. Both rivers, from the direction of their fall into the ocean, must be alike subject to an extraordinary rise of tide, from gales and winds; and with respect to the whole coast of Sinde, the south-west monsoon blows so violently, even in March, as to break the water at a depth of 3 and 4 fathoms, and long before its depressed shore is visible to the navigator."

Lúdiana, Nov. 14, 1831.

VIII.—*Summary of Meteorological Observations made at the Surveyor General's Office, in Calcutta, during the years* 1829-30-31.

The monthly tables kept by the Surveyor General, and uniformly published in the Gleanings, since its commencement, are now capable of furnishing three years data for the illustration of the climate of Calcutta, as regards the pressure, temperature, moisture, rain, state of the winds, and aspect of the sky; and as such regularity prevails in atmospherical phenomena within the trôpics, there is no occasion for further delay in presenting our readers with a summary of the results, adding a few observations and comparisons with such other registers of Oriental climates as are within our reach. Meteorology is now attracting more and more attention in Europe. Societies have been established for its exclusive cultivation in some countries, and more recently at Paris, a "correspondance pour l'avancement de la meteorologie" has been undertaken by M. Morin, who not only hopes to frame a complete "histoire du tems" for the whole world, but even eventually to be able to predict the future weather of any climate from accurate analysis of the effects of past seasons: towards this laborious undertaking Mons. Morin invites assistance from all those who are in the habit of recording their observations, and we with pleasure give circulation to his proposals, in return for the copy of his Essays on Meteorology, with which he has kindly favored us: but we should rather recommend, [for our own sakes, no less than to save labour to M. Morin himself,] that our pages should in the first instance be made the medium of his *Indian correspondence;* and we further recommend, that the tables with which we may be favored may be abstracted by observers in a convenient form for reference and comparison, such perhaps as we have prepared on the present occasion, to exemplify the climate of Calcutta. We hope hereafter to lay before our readers some extracts from the essays of M. Morin; they abound in curious remarks upon the phenomena, which he has professedly engaged to study, not only from nature, but from written authorities in all the current languages of Europe, nay even from the Chinese manuscript of *Youe-ling*, the Daniel of the celestial empire, now under translation by M. Brosset, which besides meteorological facts "contient encore beaucoup d'autres choses curieuses."

But the object of the present paper is to exhibit a tabular view of the climate of Bengal, from the registers already published in detail. These registers have been purely *instrumental*, for as M. Morin remarks, there are two modes of observing the weather, one by means of fixed instruments, the other by a continual log-book of ocular observations on the formation and dispersion of clouds, force and direction of winds, influence of the ground, hills, water; of storms, lightning, auroræ, and so forth. In this department, our registers are perhaps deficient, but the regularity of our seasons is such, that there is not the same interest in watching the sky as in the ever-changeable tropics: it is no difficult matter here to predict the course of seasons, and the occurrence of occasional gales and north-westers is almost the only phenomenon not restricted to stated periods in the revolution of our Indian year.

The first of the following tables comprehends the general range of the weather; the wind, the clouds, and the rain: having the same letters to denote the nature of the clouds as are applied in the monthly registers: zero denotes the absence of wind or cloud, and the degree of force or of prevalence of particular winds is shewn by the form or size of the type, appealing at once to the eye.

The south or south-easterly monsoon prevails from the spring to the autumnal equinox, and northerly winds for the remainder of the year; there are intervals of calm and variable winds at the equinoxes and solstices: the registers do not particularize storms, but two or three very severe ones have occurred in the interval under review. We may instance the storm of May, 1830, which injured so many houses in Calcutta; and the gale of November, 1831, which committed such havoc in the Cuttack district. As a sample of the course and disastrous effects of these storms, we extract a description of the one last mentioned from Mr. G. A. Prinsep's recent work on Saugor Island.

" While these pages have been in the press, another inundation has occurred more destructive than that of 1823, at a period of the year when such an event was unknown in the upper part of the Bay. Since the 22nd of October, the northerly monsoon seemed to be steadily set in with a cloudless sky; and the freshness of the mornings, indicating an early and a long cold season, was the common subject of congratulation among the Europeans residing in Calcutta. A depression of less than a tenth of an inch in the Barometer on the 30th excited no attention: the day was fine as usual, with very light northerly airs; but towards evening, a veil of cirrus enfeebled the sun's rays, and some heavy clouds shewed themselves in the south-east. At 8 P. M. a light puff or two from that quarter momentarily interrupted the northerly breeze, which had freshened a little, about the time that a gust from the same direction was felt in Howrah, strong and sudden, like a north-wester. At day-break, on the 31st, the sky was overcast with a drizzling rain, the wind rather fresh at N. E. and increasing: by noon it was blowing a gale, and at short intervals heavy showers succeeded each other, during the rest of the day: violent gusts after sunset reminded us of the storm in May last year. The direction of the wind was still N. E. to E. After midnight, it suddenly veered to the southward, blowing tempestuously for several hours. During the 1st, it came round to the S. W. abating in force with every fresh point of westing. The 2nd was a dull cloudy cold day, with the wind at west to N. W. but the gale had ceased: while it continued, there fell about 2 inches of rain. The Barometer indicated at its lowest ins. 29.672 at 4 P. M. on the 31st, and at sunrise on the 1st November, being only a fall of .348 with reference to the highest point at which it stood on the 29th. But the river was unusually troubled, and much damage occurred among the boats: at Mr. Kyd's dock-gates, the water rose to the mark of 21 feet 6 inches* in the night tide of the 31st, having been only at 14 feet 6

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* 20 feet by the river gauge reduced to correspond with his tide tables.—In the great storm of May 1823, the water only rose to the mark of 20 feet (River 18. 6) being 1 foot 4 inches above the proper level: the greatest difference was then at

inches at high water in the morning, although, when the springs came on, the highest level was only 17 feet 9 inches in the night tide of the 4th. The low-water level was raised more than 5 feet, being by the mark 13 feet, instead of 7 feet 10 inches, its proper level, in the day tide of the 1st November.

Such was the character of the storm at Calcutta, where few fallen trees exhibited signs of extraordinary violence. Indeed, it would seem to have been more sparing of its ravages here than almost in any place exposed to its influence. Hundreds of boats are said to have been lost upon the Ganges, some of them laden with Indigo; and a letter from Bancoorah reports the destruction of trees to have been very great in that neighborhood. The weather at Saugor is thus described by a gentleman residing at Ferntosh.

" 30th October, 2 P. M. clouds gathering in the E. quarter—3 P. M. some drops of rain.

31st, morning, strong breeze from N. E. with light rain—increasing towards noon with heavy rain—evening, hard gale at E. and heavy driving rain—8, 30 P. M. blowing very hard from S. E. and the tide beginning to pass over the bunds of the estate—10 P. M. wind S. W. blowing a hurricane—trees and houses falling—the wooden bungalows shaking very much, and the water within a foot of the floor, which is raised between 5 and 6 feet above the ground.

1st November—wind S. W. moderating, but strong squally breezes all day from S. W. to W. S. W. without rain.

2nd—wind N. to N. W. and cloudy."

Here the gale was much more severe than that of 1823, and the water rose at least a foot higher over the land: but its greatest fury was spent in the Midnapore district, and on the unfortunate coasts of Kedgeree, Hidgelee, and Balasore. The large bunds of those coasts, behind which a numerous population slept in fancied security, were suddenly overwhelmed by a tremendous wave, sweeping away with resistless force every house and every article of property in the native villages, and destroying the paddy crops, all the cattle of an extensive tract of country, and a large portion of the inhabitants. Hundreds of cattle were seen floating past the ships at the Sand Heads. The Collector of Balasore, who with difficulty saved himself and his family, has given a frightful picture of the desolation around him—the atmosphere being infected by the carcases of men and animals, which the retiring waters had left scattered upon the ground. A letter from Cuttack, published in the newspapers, estimates the destruction of lives at 10,000, the entire population of 300 villages, which are said to have been annihilated by the waves. The inundation extended from Kedgeree as far as Cuttack, and even broke through the bunds at Culpee and Diamond Harbour, besides creating a tremendous bore of 5 feet in the Roopnarain, at Tumlook, which destroyed a great many boats and nearly all the people in them.

Saugor has been more fortunate than the opposite coast; but, although from age and the grass upon them, the bunds of all the estates were stronger, while at the same time they were in general larger than in 1823, and mostly in good repair; no part of the island has escaped inundation, except a few of the tanks—a very important exception, with reference to the time of year, and the number of persons dependent upon them for subsistence.

low water, the river level being 9 feet 3 inches, instead of 6 feet 4 inches, as it ought to have been by calculation.

Most fortunately the storm came on during neap tides: had it occurred at any time between the 2nd and 6th November, the tide would have risen three feet six inches to four feet higher at Saugor, and the frail asylum of the fallen thatch of their houses would have been swept away with most of the inhabitants. The destruction of lives would then perhaps have been as great upon the island, as it has been at Kedgeree, Hidgelee, and Balasore; and in those districts the desolation would have been awful indeed. Nor it is unlikely, that the inundation might have extended even to Calcutta, where the river would overflow its banks at less than 23 feet, (by Mr. Kyd's tide register,) which is but 3 feet above the level it attained."

By the papers it appears that a most severe hurricane was experienced at Manilla, a few days previous to this storm, and if the whole intervening space could be submitted to enquiry, a connection between the two might very probably be proved.

TABLE I.—*Winds, Rain, and aspect of the Sky, most prevalent at Calcutta, from three years' observations.*

MONTH.	SUN-RISE.		NOON.		SUN-SET.		RAIN.
	Winds.	*Clouds.*	*Winds.*	*Clouds.*	*Winds.*	*Clouds.*	*Inches.*
January ..	0	0	N ne.	0 ci.	0 nw.	0	0.00
	0 nw.	0 fogs	NW n.	0 cu.	0	0	
	0 ne.	0	NW var.	0	0	0	
February	0	morning	N var.	0 ci.	0	0	0.53
	0 ne.	fogs	NE var.	cir. cu.	n.e. 0	0 cum.	
	0 nw.	cir.	W var.	cum.	n.w. 0	0 cum.	
March ..	ne. var.	0 ci.	variable	cum.	0	0	0.74
	0	0 ci.	SW var	cum. st.	0 s.	cum.	
	se. sw.	0 ci.	variable	cum.	s.e.	cir.	
April	southerly	cum.	SW SE	cum. ci.	*SE*	cir.	4.08
	0 s.	cum.	S sw.	cum. ci.	*SE*	cum.	
	sw. se.	cir.	SE sw.	cum.	*S* var.	cu. ci.	
May	0 s.	cum.	S var.	cum.	*S* s.w.	cum.	5.78
	0 s.	var.	S sw.	cum. str.	*S* s.e.	cum.	
	0 se.	cir.	SSE	nim. ci.	*SE*	cum. ci.	
June	sw. 0	cum.	SE sw.	cum. str.	S	cum. str.	16.71
	se.	var.	*SE* var.	cum. str.	*SE*	n. ci. s.	
	s. 0	var.	S calms	cum. n.	*SE*	cum. str.	
July	sw. se.	cir. str.	SE sw.	cum. str.	sw. 0	cum. st.	8.98
	0 s.	cum. str.	var. *SE*	cir. n.	se. var.	ci. str.	
	0 se. v.	nim.	var. w.	nim. cu.	sw. var.	ci. cu.	
August ..	s.	cum. str.	SE	cum. str.	*SE*	cum. str.	10.41
	se.	cum. str.	SE -s.	cum. str.	*SE* var.	cir. str.	
	s. ne.	sun. str.	SE var.	cum. str.	*S* var.	cir. n.	
September	0 se.	cum. str.	*SE* var.	cum. str.	*SE*	cum. str.	6.70
	0	cum. str.	*S* var.	cum. str.	S sw, se.	cir. str.	
	0 s. ne.	cir. str.	variable	cum. cir.	variable	cum. ci.	
October ..	0 ne. se.	cum. ci.	*E* var.	cum.	ne. 0	cum.	5.84
	0 var.	cum.	*NE* var	cum.	0 var.	cum.	
	0 n. ne.	0 cu.	*N* e.w.	cum.	ne. var.	cum.	
November	0 ne.	0	NE	cum.	*NW* 0	0	0.06
	0 n.	cir.	N var.	0	var. 0	0 cu.	
	0	cir.	NE n.	cum.	0 n.e.	0 ci.	
December	0 n.	0	NE nw.	0 cu.	0 n.	0	0.00
	0 n.	0	N nw.	0 cum	0	0	
	0	0	NW ne.	0 c.s.	0 n.w.	0	

Average of Rain for three years, 59.83

Barometer and Thermometer.

The next two tables require no explanation; they shew the usual range of the atmospherical pressure and temperature throughout the year.

The registers of the Barometer have been uniformly reduced to the temperature of 32° Fahr. which greatly facilitates their application to useful purposes. The periods of diurnal minima and maxima also have wisely been chosen for observation, but it is to be regretted that the same precaution could not have been extended to the parallel hours of the night.

TABLE II.—*Mean Atmospherical Pressure in Calcutta, for* 1829-30-31.
Barometer reduced to 32° Fahrenheit.

Month.	Sun-rise.	Maximum Pressure at 9 h. 40 m.	Apparent noon.	(for 1830-31) 2h.50m. P. M.	Minimum Pressure, 4 P. M.	Sun-set.
	inches.	inches.	inches.	inches.	inches.	inches.
Jan.	30.034	30.084	30.033	30.019	29.961	29.971
Feb.	29.959	29,995	29.960	29.904	29.878	29.892
March,	.877	.922	.885	.825	.797	.808
April,	.748	.796	.763	.721	.672	.685
May,	.625	.670	.638	.579	.555	.579
June,	.526	.563	.532	.497	.468	.484
July,	.558	.591	.571	.529	.501	.520
August,	.589	.624	.599	.532	.525	.537
Sept.	.655	.700	.667	.616	.599	.609
Oct.	.796	.839	.792	.736	.729	.743
Nov.	.935	.978	.928	.875	.871	.916
Dec.	30.038	30.079	30.025	.971	.965	.978
Means	29.778	29.818	29.783	29.734	29.710	29,727

Mean of the columns of maxima and minima for three years, 29,764

TABLE III.—*Mean Thermometrical Range for the same period.*

Month.	Minimum temperature Sun-rise.	IX. 40 A. M.	Apparent noon.	Maximum temperature 2h. 50m P.M	IV. P. M.	Sun-set.
Jan.	56°.8	67°.5	73°.5	77°.5	75°.3	70°.1
Feb.	63.6	74 7	77.9	82.1	82.0	76.5
March,	72.8	80.0	84.4	86.8	86.4	81.2
April,	76.6	85.8	89.6	91.2	90.5	85.3
May,	79.9	88.4	91.3	93.6	91.4	86.6
June,	80.5	85 6	88.6	88.1	86.8	83.8
July,	80.3	84.3	85.6	86.4	85.1	82.9
August,	79.4	84.4	85.5	85.3	84.4	82.5
Sept.	79.4	84.9	86.1	85.6	84.7	82.9
Oct.	77.1	83.2	85.6	85.5	84.1	81.1
Nov.	66.7	74.8	78.8	80.1	78.7	75.4
Dec.	59.7	69.7	74.9	76.8	75.4	70.9
Means	72.73	81.11	83.49	84.89	83.57	79.86

Mean of extremes,................ 78.81
Mean temperature of the day,...... 81.26
of the night,..... 75.00
Deduced mean of the 24 hours,..... 78.13
Mean temperature of Calcutta in 1784-5 78°.0 (As. Res. IV.)

To place the relative course of the two instruments in a more convenient form for comparison, the following tabular view of their range throughout the year has been constructed; and it derives additional utility from the paralled columns which we have been enabled to insert for other localities, so that the whole presents a convenient epitome of meteorological phenomena between 12° and 30° of north latitude. Of the climate of Madras, the minutest details are recorded in the voluminous and careful reports of the late astronomer Mr. Goldingham; whose results merely required to be reduced to the freezing point. The Ava tables are abstracted from Major Burney's registers published in the GLEANINGS; the Benares tables are taken from the Oriental Magazine, 1827: for the Seháránpúr results we are indebted to Dr. Royle, who allowed us to look through his copious registers for the purpose. As the several Barometers were never absolutely compared together, entire dependence cannot be placed upon the mean altitudes given; but with regard to Calcutta, Benares, and Seháranpúr, as some opportunities occurred of comparison through the instruments of different travellers, the relative altitude of these places can be estimated tolerably well: Thus, Seháranpúr will be found to be almost exactly 1000 feet above the sea, as was before estimated by Captain Hodgson:—Benares in like manner may be safely stated in even numbers to be 300 feet above the sea.

TABLE IV*. *Monthly Deviations of the Barometer and Thermometer from their annual mean height at Calcutta; and at several other places, introduced for the sake of comparison.*

Month.	*Barometer at 32° Fahr.*					*Thermometer.*				
	Madras mean of 21 years from 1796 to 1821.	Ava 1830.	Calcutta, for three years 1829-30-31.	Benares, 4 years' observations 1822 to 1826.	Seháranpúr, 1826-27.	Madras, mean of 21 years' observations max. and min.	Ava, 1830, sun-rise and 4 P. M.	Calcutta, three years' observations max. and min.	Benares, 4 years' observations max. and min.	Seháranpúr, 1826-27.
	inch.	*inch.*	*inch.*	*inch.*	*inch.*	*deg.*	*deg.*	*deg.*	*deg.*	*deg.*
Jan.	+.146	+.229	+.208	+.273	+.274	— 6.5	—13.7	—11.6	— 17.0	—21.8
Feb.	+.131	+.115	+.172	+.175	+.219	—4.5	— 4.9	— 6.0	—11.5	—20.9
Mar.	+.087	+.051	+.095	+.107	+.151	—1.8	— 2.8	+ 1.0	— 1.5	+ 0.1
April,	—.006	—.028	—.030	—.043	+.061	+9.7	+ 7.8	+ 5.1	+ 9.5	+ 6.1
May,	—.124	—.105	—.152	—.136	—.060	+5.2	+ 5.6	+ 7.5	+13.9	+11.6
June,	—.117	—.156	—.248	—.289	—.217	+7.4	+ 7.1	+ 5.5	+ 13.1	+17.5
July,	—.103	—.176	—.218	—.308	—.398	+3.9	+ 4.4	+ 4.6	+ 6.9	+12.8
Aug.	—.088	—.126	—.194	—.203	—.278	+3.0	+ 4.1	+ 3.6	+ 6.4	+10.0
Sept.	—.057	—.098	—.115	—.098	—. 158	+2.1	+ 4.3	+ 3.7	+ 5.8	+ 9.5
Oct.	—.018	—.010	+.020	+.074	—.047	+0.1	+ 2.2	+ 2.5	+ 1.3	— 0.8
Nov.	+.006	+.102	+.161	+.181	+.209	—3.1	— 4.2	— 5.4	— 9.7	—10.8
Dec.	+.124	+.201	+.258	+.279	+.245	—4.9	—10.1	—11.5	— 17.6	—13.8
Ann. mean	29.810	29.573	29.764	29.464	28.766	81.69	78.39	78.13	77.81	73.5
	.270	.405	.506	.587	.672	13.9	21	19.1	31.5	3

It will be remarked that the range of variation in the weight of the atmosphere increases with the latitude, even up to the foot of the Himalaya mountains, and that it is accompanied by a corresponding increase in the range of the thermometer. We have elsewhere reasoned on this subject, and do not intend, in the present view of observed facts, to enter into any theoretical discussions ; at any rate before doing so, it is to be wished that we may be able to extend the table of comparisons to other principal points on the continent of India ; it is evident that in calculating barometrical altitudes, by corresponding observations at distant places, a corrective equation must be introduced, depending on the time of year, having its maxima at the two solstices.

We now come to the *diurnal oscillation* of the Barometer, for which the same sources have furnished me with materials for framing a comparative table for five localities considerably distant from one another ; we could have added Múrshedabád to the list, but that the thermometric series for that place was incomplete. At Seháranpúr the horary observations were confined to a single day, the fifteenth, of each month. At Madras, to three similar days : at Benares perhaps the hour of the minimum was not always exactly observed : thus a little irregularity must be expected, but on the whole the results are wonderfully equable.

TABLE V. *Diurnal Oscillations of the Barometer and Thermometer at Calcutta, with comparative observations at other places.*

Month.	*Barometer at 32_0.*					*Thermometer.*				
	Madras, max. and min. every tenth day for 1823.	Ava, 10 A. M. and 4 P. M.	Calcutta, 9 40 A.M. and 4 0 P. M.	Benares, 9 to 10½ A. M. and 4 to 6 P. M.	Seháranpúr, max. and min. of one day in month.	Madras, 4 A. M. and 2 P. M.	Ava, sunrise and 4 P. M.	Calcutta, sunrise and 2 50 P. M.	Benares, daily extremes by register thermometer.	Seháranpúr, extremes of one day in each month.
	inch.	*inch.*	*inch.*	*inch.*	*inch.*	*deg.*	*deg.*	*deg.*	*deg.*	*deg.*
Jan...	.072	.144	.123	.097	.103	11.0	9.4	20.7	17.8	24.5
Feb...	.070	.126	.117	.103	.093	10.0	16.8	18.5	19.2	21.0
Mar.	.076	.107	.125	.121	.146	7.0	20.8	14.0	20.7	26.0
April,	.081	.110	.124	.125	.107	9.0	20.9	14.6	23.2	31.0
May,	.081	.113	.115	.124	.160	9.0	20.4	13.7	21.9	38.0
June,	.092	.136	.095	.113	.178	9.0	9.0	7.6	16.1	31.5
July,	.097	.133	.090	.077	.103	7.0	6.6	6.1	9.0	15.3
Aug.	.105	.109	.099	.088	.079	7.0	8.8	5.9	8.3	11.5
Sept.	.094	.145	.101	.103	.123	6.0	7.8	6.2	10.3	13.0
Oct...	.068	.144	.110	.100	.120	8.0	5.0	8.4	18.1	31.5
Nov...	.071	.127	.107	.107	.147	8.0	6.7	13.4	16.8	29.3
Dec...	.071	.126	.114	.098	.124	9.0	8.5	17.1	16.3	17.5
Mean tide	.081	.126	.110	.105	.120	8.5	10.6	12.2	16.6	24.2

With due allowance for the difference of sensibility in the instruments the above table shews that the average diurnal tide of the Baromete between the equator and 30° north latitude exceeds one-tenth of an inch, and that it is progressively greater as the variation of temperature during the day is also greater. With regard to the *nocturnal tide* of the atmosphere, the Calcutta tables afford us no data, for want of an observation at 10 P. M., the hour of the supposed maximum at night; all that is indicated therein is, that the Barometer is constantly *lower* at sunset than at sunrise. At the Madras observatory, in 1832, a series of horary observations was made for three days in each month, which seems to establish the fact of a night-tide beyond a doubt to the extent of .04 inch; when however the corrections for the temperature of the mercury are applied, this amount is reduced to two hundredths of an inch, which is one-fifth only of the *diurnal tide*.

The same result is obtained from a month's horary observations undertaken by Col. Balfour at Calcutta, in the year 1784. We have also in manuscript a diary kept by Mr. G. A. Prinsep, during 32 days of a voyage from Calcutta to Bombay, whence it appears that upon the ocean the

Barometer	falls	from	10 P. M.	to	sunrise	—.022
	rises	from	sunrise	to	10 A. M.	+.044
	falls	from	10 P. M.	to	4 P. M.	—.102
	rises	from	4 P. M.	to	10 P. M.	+.080

on the other hand, the Berhampúr register exhibits a constant *rise* from 10 P. M. to 5 A. M. but as the corresponding thermometrical register is unfortunately not in our possession, we have been obliged to substitute a correction from the means of the Calcutta register, and the results may be in some measure erroneous: they cannot however be so far from the truth as to reverse the apparent issue. At Sehâranpúr also the existence of a nocturnal tide is equivocal; the following table exhibits all that we can gather towards the elucidation of the point in India, expressing by minus signs the real tide, or fall of the barometer, from 10 P. M. to 5 A. M. and vice versâ.

TABLE VI. *Nocturnal Oscillation of the Barometer from* 10 P. M. to 5 A. M. *reduced to* 32° *Fah.*

Month.	Madras, 3 days in each month.	Berhampúr, from Dr. Russel's tables.	Sehâranpúr, Dr. Royle's observations.	Vera Cruz in Mexico, by Fray Juan.
January, ...	—.004	+.034	—.043	+.018
February, ...	—.029	+.026	—.009	+.009
March, ...	—.026	+.009	—.008	—.002
April, ...	—.027	+.088	—.007	+.008
May, ...	—.014	+.020	—.020	+.005
June, ...	—.026	+.012	+.039	+.003
July, ...	—.009	+.000	—.005	—.002
August, ...	—.028	+.014	—.016	—.007
September,.........	—.024	+.011	+.011	—.012
October, ...	—.033	+.009	—.004	—.021
November, ...	—.010	+.009	+.024	+.001
December, ...	—.019	+.027	+.015	—.023
Means,............ .	—.021	+.020	—.001	—.002

The last column is taken from the manuscript observations of Fray Jaun, at Vera Cruz, in 1817-18, in the possession of a friend : the latitude of that place, 19° N., should make the results applicable here.

There is still sufficient ambiguity respecting this second tide, therefore, to render further enquiry necessary ; and it would be desirable to employ a barometer for the purpose, which should not require to have any correction applied for the temperature of the mercury; this might be easily effected by enclosing the barometer tube in an outer tube of the same length, also filled with mercury, upon the surface of which the scale might float.

Hygrometry.

The Calcutta tables afford sufficient data for calculating the state of the air with respect to moisture, whenever the temperature of an evaporating surface can be converted with certainty into equivalent expressions of the more obvious phemomena of Hygrometry, such as the *tension* or relative dryness ; or the absolute quantity of aqueous vapour contained in a given space.—The first of these points may be found within the limit of 2 or 3 per cent by the tables published in the first volume of the Gleanings :—and the second may easily be calculated therefrom by the formulæ of Dalton or Ure.—In the following tables this has been done, and the uniformity of the results is satisfactory enough. August is the most damp month of the year to the sense ; but June is the month in which the atmosphere is really loaded with the greatest weight of aqueous vapour. January is in every respect the driest season of the year, but the drought at Calcutta naturally falls far short of what is experienced at Benares and Sehâranpúr, where the depression of the moistened thermometer sometimes exceeds 35 degrees.

Table VII. *Depression of the Wet-bulb Thermometer and deduced Tension of Vapour in the atmosphere, at Calcutta*, 1829-30-31.

Month.	Sunrise.		9 40 a. m.		Noon.		2 50 p. m.		4 p. m.		Sunset.	
	Dep.	Ten.	Dep.	Ten.	Dep.	Ten.	Dep.	Ten.	Dep.	Ten.	Dep.	Ten.
January, ...	2°.3	.82	8°.4	.51	13°.1	.37	15°.9	.31	14°.4	.32	9°.3	.50
February. ..	1 .6	.87	8 .5	.56	12 .4	.41	14 .4	.38	13 .9	.39	11 .1	.47
March, ...	1 .9	.89	8 .7	.59	12 .6	.47	14 .2	.41	14 .1	.41	10 .7	.51
April, ...	1 .4	.94	8 .1	.66	11 .7	.53	13 .9	.46	12 .7	.50	8 .1	.64
May, ...	1 .8	.92	7 .3	.69	9 .8	.62	10 .8	.58	9 .7	.61	6 .0	.73
June, ...	1 .6	.92	4 .4	.78	6 .6	.71	6 .6	.73	5 .2	.76	0 .5	.83
July, ...	1 .9	.90	4 .6	.79	5 .5	.75	5 .5	.74	5 .0	.77	3 .5	.83
August, ...	1 .6	.93	4 .4	.80	5 .4	.77	4 .9	.77	4 .8	.78	3 .1	.85
September, ..	1 .7	.91	5 .3	.76	6 .5	.71	5 .8	.73	5 .2	.76	3 .8	.81
October, ...	1 .5	.92	6 .1	.71	8 .0	.65	8 .6	.63	7 .4	.66	4 .3	.79
November, ..	2 .8	.85	9 .0	.55	12 .3	.44	13 .9	.40	12 .6	.43	8 .1	.59
December, ..	2 .4	.83	7 .4	.59	10 .8	.47	12 .5	.43	11 .3	.44	6 .9	.61
Mean Tension		.892		.665		.577		.547		.570		.680

TABLE VIII. *Mean Barometric Pressure of Aqueous Vapour in the Air during the same period, deduced from Table VII. and Dalton's Table of Aqueous Tensions.*

Month.	Sunrise.	*h. m.* 9 40 a. m.	Noon.	*h. m.* 2 50 p. m.	4 p. m.	Sunset.
	inch.	inch.	inch.	inch.	inch.	inch.
January, ...	0,336	0,336	0,300	0.288	0.275	0.275
February, ..	.513	.476	.413	.407	.300	.403
March,......	.703	.590	.546	.504	.500	.535
April, ...	.846	.792	.721	.649	.690	.755
May, ...	.904	.931	.911	.911	.902	.941
June, ...	.994	.980	.975	.985	.995	.987
July, ...	.909	.908	.900	.903	.901	.910
August, ...	.911	.920	.916	.914	.897	.926
September, ..	.892	.889	.859	.869	.887	.861
October, ...	.840	.788	.773	.738	.760	.814
November, ..	.588	.495	.449	.424	.432	.543
December, ..	.465	.456	.424	.413	.404	.485
Means, ...	.751	.713	.682	.667	.669	.710

It is here observable, that besides the *apparent* drying of the air caused by the increase of heat during the day, it actually seems to become less loaded with moisture from sun-rise to 3 P. M. to the extent of about 10 per cent. : this is not easily explained without recourse to suppositious errors of the instruments or of the formulæ of calculation; for it is difficult to imagine that the vapour should rise independently of the air with which it is mingled ; or if it does rise, that it should fall again so rapidly, to resume its place in the lower atmosphere on the following morning.—It might be expected â priori that where fogs prevailed in the morning, or where dew was deposited, the pressure of aqueous vapour measured in the morning would be less than in the middle of the day ; and the appearance of a contrary result, if it does not point to a probability of errors in the instruments, or in the experiments upon which the calculations are grounded, tends at any rate to show that much remains to be done to explain facts, and to place this branch of meteorological inquiry upon a firm basis.

It is however some satisfaction to know, that the register, kept at the surveyor general's office, is in this, as well as other respects, superior to most of those published in the scientific journals of England, where the column devoted to the hygrometer is generally a mere mass of figures, convertible to no useful purpose. It is to be hoped, that all who register their observations in India will adopt the same kind of hygrometer, namely a thermometer with a bulb projecting from the scale, and covered with a wetted muslin bag. Its indication should first be carefully compared with the dry thermometer, and corrected for any errors of division. P.

IX.—Scientific Intelligence.

I.—*Extract of a letter from Leiut. Alex. Burnes, dated Lahore,* 23*rd January*, 1832.

"As you will have perceived by the date of my letter, I have crossed the frontier, and am now at Lahore. An event occurred here last night, which will, I am sure, prove of interest to you—a severe shock of an earthquake. There were two distinct vibrations, the last continuing for about 10 seconds, with alarming violence. The principal shock occurred at 11 P. M. after we had retired to bed, and were asleep. The door of my apartment and all the furniture were shaking with a rattling noise, when I awoke and ran into the open air. The house in which we are lodged is a most substantial dwelling of two stories, built of bricks and chunam, and the garden-house of Mr. Allard; yet it was shaken most violently.

"I am informed by the Chevalier, that earthquakes are of frequent occurrence in this city, particularly during winter; but he does not remember so violent a vibration as in the one I have just mentioned. The shock was from east to west, or rather S. E. to N. W. The lofty minarets of this city afford however convincing proof that there can have been no very violent commotion of nature in Lahore within these 200 years. The earthquakes of Kashmír are frequent, and the natives inform me, that the shocks are more violent nearer the mountains.

"I should mention, that the atmosphere had indicated nothing unusual before the earthquake, nor did the barometer undergo any variation before or after it. The Thermometer stood at 37°; for the last 10 days it has been four degrees below the freezing point every morning at sun-rise, a much greater depression than I had expected in the Punjab, where it rose to 102° daily when I was here last July."

2.—*Population of Allahabad.*

The following estimate of the population of the town of Allahabad was drawn up by the native officers of police, under the magistracy of G. Brown, Esq. in 1824, as an accompaniment to Major (then Captain) Irvine's map of the city; and although evidently not made with particular attention to accuracy, as the proportion of males and females sufficiently proves, yet, in the absence of a more minute census, it is worthy of being placed on record among the statements of a similar nature already published in the GLEANINGS. Contrary to custom, it is considerably in excess of the statement given in Hamilton's Hindústan, which makes the population of Allahabad, in 1803, only 20,000. The town itself does not seem to have been on the increase, but rather to have suffered in size and importance: an extensive suburb, Kydgunj, has however sprung up between it and the fort, but this is not included in the present census.

Mehala.	*Houses.*	*Mehala.*	*Houses.*	*Hindús.*		*Musulmáns.*	
Púraní Nakhás,	127	Ganga Dás Chouk,	65				
Thatherí-bazar,	103	Mahájaní tola,	143				
Chouk,	100	Tripaolia,	40				
Bajáza-bazar,	45	Unchí mandei,	227	M.	F.	M.	F.
Raní mandei,	123	Gosain tolá,	157	1936	3136	987	2057
Khatrí tola,	151	Chak Mehala,	94				
Utr-Suyia,	112						
		Total of the Kotwálí Thána,	1487	5072		3044	

Mehala.	*Houses.*	*Mehala.*	*Houses.*	*Hindús.* M.F.	*Musulmáns.* M.F.
Badyabád,	274	Shahganj,	122	2865 6275	1425 2767
Badshahí mandei,	388	Mahajaní tola,	125		
Múlasim ganj,	315	Núr ganj,	204		
Pandaréba,	139	Súrj Kund,	196		
		Badshahí m. Thána,	1733	9140	4192
Khuldabád,	133	Chandrí tolá,	262	1157 2390	889 1888
Shahajmet daireh,	299	Dúndipurá,	185		
Bakshí-bazar,	69	Muezamá Jarhí,	174		
		Khuldabád Thána,	1122	3547	2777
Nya katra,	86	Koréshipúr,	78	1236 1090	340 260
Nya bastí,	43	Bahadur ganj,	406		
Katgarh,	173				
		Motí ganj Thána,	786	2326	600
Daryabád,	392	Yahiapur chhota,	39	1849 3162	1634 888
Mínapúr,	83	Rání mandei,	174		
Yahiapúr bará,	253	Bhor mal,	96		
		Daryabád Thána,	1037	5011	2322

Hindús,..	25,096
Musulmáns,.............	13,135
Total population,...........................	38,231
Number of houses, ...	6,165
Proportion of inhabitants per house, ...	6.2
Ratio of males to females, Hindús, ...	100 : 177
Musulmáns,.............................	100 : 148
Ratio of Hindús to Musulmáns, ...	100 : 52

X.—*Proceedings of Societies.*

1.—Asiatic Society.

Wenesday, 4th January, 1832.

The Honorable Sir Charles Grey, President, in the chair.

Mons. Du Marcel was elected an Honorary Member. The Hon'bles Sir J. Franks, Sir E. Ryan, and Sir C. T. Metcalfe, Bt. were elected by ballot, as Vice Presidents, for the ensuing year; and for the Committee of Papers, Messrs. Calder, Carey, Everest, Gordon, Mill, J. Prinsep, Tytler, Thomason, and Troyer.

Read a letter from Mons. Petit, proposing to exchange the duplicates of his Entomological Cabinet. The Society, not having an entomological cabinet, were obliged to decline Mons. Petit's offer with thanks.

Reported, that the floor of the lower story was in a bad condition, upon which Mr. Prinsep was requested to examine it, and estimate what it would cost to repair the same.

Read a letter from Mr. Witsen, Secretary to the Royal Academy of Prussia, forwarding a question for the Prize Essays of 1832.

The following Presents were received, and thanks voted for the same.

A description of Tamul Castes, by Simon Casie Chitty.—*Presented by the Author.*

A copy of the *Inaya*, and a Persian and English Dictionary.—*Babu Rámdhan Sen.*

Transactions of the Medical and Physical Society, 5th vol.—*The Society.*

Journal Asiatique, Nos. 40, 41.—*Asiatic Society of Paris.*

The following books,—*by the General Committee of Public Instruction.*

Fatawa Alemgeri, vol. 2, 3.
Inayah, 3 vols.
Æsop's Fables, Persian.
Naya Sutra Vriti, Sanscrit.
Vedánta Sára.
Sahitya Durpan.
Dáya Bhága.
Menu Sanhita, 2 vols.
Mrichhakati.
Vikramarvasi.
Málati Mádhava.
Uttara Ráma Cheritra.
Mitákshara.

The Meteorological Register for October.—*The Surveyor General.*

The question proposed by the Class of Philosophy and History of the Royal Academy of Science at Berlin has reference to Oriental History, and it is to be regretted, that its announcement was only made to the Asiatic Society in the year when the prize will be awarded. It is accompanied by the following remarks:

"Quoique l'étude de l'Histoire Orientale, grâce à la publication de matériaux precieux et aux recherches profondes de plusieurs savants distingués, ait fait de notre temps des progrès très-considérables et que l'élan que la philologie Orientale a pris récemment, n'ait pas manqué d'exercer une influence utile sur la critique de l'histoire des peuples et royaumes de l'Asie: il paraît cependant que l'organisation intérieure des peuples Orientaux, les détails de leurs institutions politiques, et les rapports mutuels des élémens dont se composent les monarchies de l'Orient, n'ont pas encore excité l'intérêt que ces objets importants réclament à juste titre. L'histoire intérieure même de l'Empire Arabe et le systeme d'administration que les Arabes adoptèrent pour les provinces conquises et qui est très-mémorable sous plus d'un rapport, n'a pas encore été suffisamment éclairci, quoiqu'on ait reconnu et signalé dans plusieurs ouvrages anciens et modernes l'importance des effets, souvent même salutaires, que la domination des Arabes eut pour plusieurs pays, p. ex. pour l'Egypte et l'Espagne.

" Ces considerations ont déterminé la Classe de Philosophie et d'Histoire de l'Académie Royale des Sciences de Prusse de rappeler l'attention des historiens et des orientalistes vers le développement historique du système de l'administration provinciale des Arabes, en proposant pour le concours de l'an 1832 la question suivante:

" *Quel fut l'état de l'administration des provinces de l'Empire Arabe pendant la*
" *durée de la puissance seculiére des Khalifes, c. à. d. depuis l'origine de l'Empire*
" *Arabe et sa fondation, par l'introduction de l'Islamisme, jusqu'a la fin du onziéme*
" *siècle de l'Ere Chrètienne.*"

La Classe désire que l'administration que les Arabes introduisirent dans les provinces conquises, ne soit pas seulement discutée et exposée en général, mais qu'elle soit surtout développée par rapport aux différents pays qui furent successivement soumis à la domination des Arabes; que la condition des habitans originaires des différentes provinces, et les rapports, tant politiques et juridiques, que religieux et moraux, dans lesquels ils entrèrent avec leurs nouveaux maîtres, soient éclaircis, ainsi que les attributions et les fonctions des gouverneurs et des magistrats inférieurs, les relations qui subsistaient entre ces magistrats et la cour des Khalifes, et les changements que ces relations subirent successivement. La Classe désire principalement qu'on répande du jour, tant sur l'organisation judiciaire des provinces Arabes et sur les formes de la jurisdiction qui s'y exerçait pendant l'époque marquée, que sur les institutions que les Arabes établirent, soit pour seconder l'administration financière, soit pour faciliter les progrès des arts et des sciences de l'agriculture, du commerce, et des autres branches de l'activité humaine, et sur les effets que ces institutions produisirent. Il seroit aussi à désirer, que les traces que les institutions des Arabes ont laissées dans les pays soumis à la domination des Khalifes, fussent indiquées. Enfin la Classe demande, que non seulement en général les résultats des recherches, dont on vient de préciser le point de vue et l'étendue, soient justifiées par des citations exactes des sources, mais qu'en particulier dans le cas où les concurrents pourraient puiser dans des sources manuscrites, on ajoute les textes des passages cités dans les langues originales avec l'exactitude la plus scrupuleuse.

" Les mémoires envoyés au concours devront porter chacun une épigraphe ou devise qui sera répétée dans un billet cacheté joint au memoire et contenant le nom de l'auteur, et ne seront reçus que jusqu'au 31 Mars 1832, ils devront être écrits d'après le choix des auteurs en Allemand, ou en Francais, ou en Anglais, ou en Italien, ou en Latin. Le prix sera de 100 ducats, dont l'adjudication se fera dans la séance publique, anniversaire de Leibnitz, au mois de Juillet 1832."

2.—Medical and Physical Society.

Saturday, 7th January, 1832.—Messrs. Wood, Macnee, Christopher, and J. P. Grant were elected Members of the Society. The Ballot was then taken for Office Bearers for the year 1832, and the following Gentlemen were elected.

J. Tytler, Esq. Vice-President.

W. Twining, Esq. Secretary and Treasurer.

C. C. Egerton, Esq. Assistant ditto and ditto.

H. S. Mercer, Esq.; John Grant, Esq.; Geo. Waddell, M. D.; Duncan Stewart, M. D. Members of the Committee of Management.

H. S. Mercer, Esq.; John Grant, Esq.; Dr. Macqueen; Geo. Waddell, M. D.; A. R. Jackson, M. D.; Duncan Stewart, M. D. Committee of Papers.

The following communications were then presented to the Society:

1st.—Dr. Boswell's case of Pendulous Tumors of the nose, with a drawing, by which it seems the patient must have had a most grotesque appearance, as some of the tumors hung down as low as the chin: the disease occurred in a Malay man. The tumors were removed by ligature and the knife.—2nd. An account of the varieties of East India Opium, by Dr. Smyttan, of the Bombay Service.—3rd. Dr. R. Tytler's account of a plant used by natives, to prevent the Scorpion from stinging them, with a relation of the trials made to provoke the Scorpion to sting the arm of a man while the plant was held near it. These trials were made in presence of other witnesses besides Dr. Tytler, and as far as can be judged of the experiments related, it appears, that the Scorpions then used were not easily provoked to sting those who handled them; but there is no information as to whether any trials were made to irritate these reptiles when the plant, which is supposed to stupify or fascinate them, was not held near. A large blue Scorpion and a brown Scorpion were used in these experiments. A well finished drawing of the Scorpion, and of the root alluded to, accompanied this communication, and two specimens of the plant, in its dried state, which is said to be of the class Syngenesia; but not being accompanied by the flower, its Botanical characters cannot be exactly ascertained. A short notice of similar experiments, which were made in the presence of Brigadier O'Halloran, was also transmitted through the Medical Board, by Mr. Playfair of Benares.—4th. Mr. Boswell's abstract of

Meteorological Register, kept at Penang, for the months of August, September, and October, 1831, whereby it appears that in those three months, the quantity of rain which fell on the hill was 35.25 inches; while in the valley, at North Beach, the quantity of rain, in the same period, was 25.92 inches. The Thermometer was, on an average, nearly eight degrees lower on the hill than in the valley.—5th. Two Tables, presented by the Medical Board of Bengal, shewing the number of sick and rate of mortality in the European and native Troops at the Madras Presidency, for several years.—6th. Observations on the contagious nature of Cholera, by James Hutchinson, Esq.—7th. Medical Report on the diseases at Penang, for three months, ending September, 1830, with copy of cases, by Mr. J. C. Boswell, Assistant Surgeon at Penang.—8th. Case of Elephantiasis of the Scrotum, with a drawing, by Dr. J. N. Casanova.—9th. An Essay on the peculiarities of the fœtal circulation, printed in the Oordoo language, by J. Tytler, Esq.—10th. A letter from Dr. Gregory Vos, of Calcutta, offering to the Society an analysis of authenticated facts relative to the contagious nature of Cholera.

Dr. Mouat's observations on the prevalance of Hepatitis at Bangalore were then read, and discussed by the Meeting. A detail of Meteorological Observations, made at Bangalore, is prefixed to this Essay, shewing, that for a considerable period of the year, the morning temperature in a cool room is from sixty-two to seventy-four degrees of Fahrenheit, while there is often a bright sun at noon, and frequent variations of temperature from the refreshing showers of two monsoons. The climates of Bangalore, altogether, is described as excellent, conducive to rapid convalescence after acute diseases, not liable to cause a tendency to pulmonary complaints; and for the greater part of the year agreeable to the feelings of Europeans —inviting them to use active habits, often inducing them to expose themselves much in the sun. The station of Bangalore, in the province of Mysore, between the eastern and western ghats, is described as a barren table land, at an elevation of nearly three hundred feet above the level of the sea; and surrounded by luxuriant vallies at a little distance. The prevailing diseases in the Regiment of European Dragoons, above six hundred strong, stationed at Bangalore, are stated to be Fever, Dysentery, Hepatitis, and Rheumatism. The causes of Hepatitis among Europeans are considered to be stimulant food and drink, active exertions, and exposure to the diurnal vicissitudes of temperature, &c.

Dr. Mouat concludes with observing, that Medical writers of repute have considered Hepatic diseases as endemial to certain parts of the Madras territories; and others, particularly Dr. James Johnson, who is supported by Dr. Annesley, supposes its frequency to be attributable to the nature of the soil and seasons, causing the high medium annual average temperature which prevails in the Indian peninsula.

Dr. Annesley, besides enumerating a great variety of exciting causes, agrees with the views of Dr. Johnson, and says, the greater prevalence of Hepatitis and Dysentery amongst the European troops, on the Madras than the Bengal Presidency, seems in some degree to be owing to the greater warmth of the climate.

Dr. Mouat says, therefore, Europeans residing at Bangalore may be looked upon as peculiarly subject to Hepatitis; nor can this be accounted for, on consideration of the high prevailing temperature, since the medium range of the Thermometer, as extracted from the records of the corps, would give but an annual average of seventy-four degrees of Fahrenheit, for several years past. Dr. Mouat is therefore of opinion, that the causes assigned by Dr. Johnson and Mr. Annesley for the prevalence of Hepatitis, so far from being correct, are positively refuted as far as regards high temperature at this station: (as Hepatitis much affects the natives, and in a very small proportion the European women or children.) The author says, we must look to other sources for its frequency at Bangalore. The real cause of the prevalence of Hepatitis, at particular stations, can only be ascertained by the most careful comparison of correct data.

3.—SOCIETE' D'HISTOIRE NATURELLE *of the Mauritius.*

January 11*th*, 1831.

Mr. C. Telfair, President, presented on the part of the Governor, Sir C. Colville, the Transactions of the Royal Asiatic Society, and several other valuable works; in return for which the Society presented a copy of the Meteorological Observations made in 1827-28-29-30, by their colleague Mr. L. Geoffroy.

Upon a communication from the Reverend J. Adamson, Secretary of the South African Institution, it was mutually agreed, that a Member of one Society should be admitted to an honorary seat in the other, during his residence at the place; and further, that copies of their proceedings should be interchanged.

Mr. R. Lyall presented a collection of 598 plants, made at Madagascar, with a catalogue.

Mr. Barry addressed the Society in English, on the occasion of his admission: he expatiated on the effects of terrestrial refraction, particularly on the phenomenon of *nauscopie:* MM. Geoffroy, Lyall, and Faraguet were nominated a commission to examine his memoir.

Mr. L. Bouton presented a specimen of eagle-wood (Aloexylon, Agallochum de Loureiro).

Mr. Faraguet described several curious objects met with on his voyage of discovery in the *Astrolabe.*

Mr. Desjardins, Secretary, read a description of some Sumatra fish; as well as of two species prevalent in the Mauritius. Mr. Leguitte presented a preserved specimen of a puppy, with six feet, which lived for several days.

Seeds of a *tetile* plant of Diego were forwarded by Mr. Hockyns, from which excellent cordage was made by Captain Pole of the Maidstone.

Corresponding Members proposed. *Mr. Priée, directeur du jardin botanique de Pondicherry*, and *the Baron du Ferussac of Paris.*

8th February. Mr. A. Lyall continued his verbal observations on the manufacture of sugar. He objected to the employment of the coral lime for the purification of the syrup, and recommended the substitution of the Madagascar stone-lime.

Mr. Telfair explained, that the stone-lime of Bristol had been used without much difference of effect.

Mr. L. Bouton read a note upon the posthumous work of Mr. Thouin, entitled "*Cours de culture et de naturalization des vegetaux.*"

The Secretary read a paper by Mr. G. Longmore, on the subject of the replacing of one of the extreme points of the base laid dawn by Lacaille, in 1753, on the plain of *Fort Blanc.*

Messrs. Delisse and Lyall were appointed a commission to examine some minerals, received from Mr. Cameron of Madagascar.

Mr. J. Desjardins read a note on the zoological part of the voyage of the *Uranie,* pointing out a few errors in the account of the vertebral animals of the Mauritius.

The President presented Mr. Chaix's work on artesian wells, &c.

Meteorological Register, kept at the Surveyor General's Office, Calcutta, for the Month of January, 1832.

	Minimum Temperature observed at sunrise.					Maximum Pressure observed at 9h. 50m.					Observations made at Apparent Noon.					Max. Temp. and Dryness observed at 2h. 40m.					Minimum Pressure observed at 4h. 0m.					Observations made at sunset.				
Days of the Month.	Barometer reduced to 32°.	Temper. of the air.	Depres. of M. B. Ther.	Wind.	Aspect of the sky.	Barom. red. to 32°.	Temper. of the air.	Depres. of M. B. Ther.	Wind.	Aspect of the sky.	Barom. red. to 32°	Temper. of the air.	Depres. of M. B. Ther.	Wind.	Aspect of the sky.	Barom. red. to 32°.	Temper. of the air.	Depres. of M. B. Ther.	Wind.	Aspect of the sky.	Barom. red. to 32°.	Temper. of the air.	Depres. of M. B. Ther.	Wind.	Aspect of the sky.	Barom. red. to 32°.	Temper. of the air.	Depres. of M. B. Ther.	Wind.	Aspect of the sky.
1	29,940	61,5	1,8	cm.	cl.	,975	73,	4,3	cm.	cl.	,927	77,5	7,	s. w.	cu.	,879	81,3	10,6	s. w.	cl.	,777	79,5	10,	s. w.	ci.	,851	76,5	5,6	cm.	cu.
2	,885	65,2	2,	n.	cis.	,946	69,3	6,6	n.	cu.	,890	72,3	9,4	n.	do.	,842	73,7	9,5	n.	ci.	,842	75,7	12,7	w.	cu.	,846	69,7	7,2	n.	cl.
3	,994	53,3	2,5	cm.	cl.	,035	61,5	6,3	do.	cl.	,996	64,	10,3	do.	cl.	,906	67,7	11,7	do.	cl.	,897	67,	11,3	do.	cl.	,905	63,7	9,2	do.	do.
4	,969	51,5	2,	n.	do.	,024	60,7	5,8	n. w.	do.	,982	66,4	9,9	n. w.	do.	,930	67,2	11,3	n. w.	do.	,928	67,	10,8	n. w.	do.	,928	64,5	8,3	n. w.	do.
5	,986	50,7	1,	cm.	do.	,044	61,	6,8	do.	do.	,973	66,	9,8	do.	do.	,938	67,7	10,8	do.	do.	,931	67,3	10,5	do.	do.	,931	64,3	7,8	do.	do.
6	,982	53,3	2,1	do.	do.	,046	61,7	4,8	do.	do.	,010	67,3	9,4	do.	do.	,939	70,3	12,6	do.	do.	,933	68,7	11,8	do.	do.	,945	66,3	11,4	cm.	do.
7	30,014	52,5	1,7	do.	do.	,045	64,5	7,6	cm.	do.	,000	69,3	12,6	n.	do.	,936	73,5	15,6	n.	do.	,936	71,3	14,4	n.	do.	,952	66,2	7,7	do.	do.
8	29,987	52,3	1,2	do.	do.	,046	66,7	7,5	do.	do.	,014	70,3	10,4	do.	do.	,963	73,3	10,8	do.	do.	,962	72,5	10,3	do.	do.	,976	70,3	8,6	do.	do.
9	30,013	55,	1,3	do.	do.	,060	67,7	6,	do.	do.	,999	74,5	10,6	do.	do.	,947	76,7	10,8	do.	do.	,943	75,7	11,8	do.	do.	,961	72,	7,6	do.	do.
10	,057	58,5	1,1	do.	cu.	,111	70,3	4,4	do.	do.	,057	77,	10,8	do.	cu.	,009	76,5	9,5	do.	cus.	,008	76,	9,5	do.	cus.	,022	74,5	7,4	do.	cis.
11	,042	60,3	1,4	n.	do.	,094	69,5	7,4	n.	do.	,036	75,5	12,	do.	cl.	,985	77,7	14,7	do.	cl.	,985	75,5	13,3	do.	cl.	,991	72,	9,8	n.	cl.
12	,011	55,5	1,6	cm.	do.	,058	68,7	10,5	n. e.	do.	,008	74,	15,	n. e.	do.	,929	76,5	14,3	n. w.	do.	,927	75,5	13,6	n. w.	do.	,977	70,3	7,1	cm.	do.
13	29,987	58,3	1,4	do.	do.	,017	69,	9,2	n.	cu.	,975	71,7	12,8	n.	cu.	,906	72,8	14,3	n.	cu.	,903	73,	14,3	n.	ci.	,908	69,5	9,3	do.	do.
14	30,014	54,3	3,4	do.	do.	,074	65,5	12,	n. e.	cl.	,048	70,7	15,8	n. e.	cl.	,982	72,7	14,8	do.	cl.	,973	72,3	14,4	do.	do.	,972	66,5	7,6	do.	do.
15	,061	52,5	3,	do.	do.	,129	63,5	9,6	do.	do.	,092	68,7	12,9	do.	do.	,024	71,	13,5	n. e.	do.	,018	70,3	14,	n. e.	do.	,019	66,6	9,4	do.	do.
16	,075	49,8	2,6	do.	do.	,135	62,3	10,8	n.	do.	,092	67,	12,	n.	do.	,029	70,6	14,4	n.	do.	,025	70,	13,5	n.	do.	,028	67,7	12,2	do.	do.
17	,060	50,7	2,8	do.	do.	,115	62,	8,	do.	do.	,064	69,3	13,	do.	do.	,011	72,3	17,5	do.	do.	,010	71,5	16,8	do.	do.	,016	67,3	13,6	do.	do.
18	,083	52,	4,3	do.	do.	,139	60,7	8,5	do.	do.	,067	69,5	12,6	do.	do.	,007	71,7	13,5	do.	do.	,006	70,7	14,5	do.	do.	,018	67,8	12,3	n.	do.
19	,058	50,7	3,2	cm.	do.	,105	60,5	7,3	n. w.	do.	,055	67,3	11,3	n. w.	do.	,989	70,7	13,	n. w.	do.	,977	70,7	13,5	n. w.	do.	,977	66,7	10,7	n. w.	do.
20	29,995	51,3	3,1	n.	do.	,052	62,3	8,6	cm.	do.	,011	68,	11,8	n.	do.	,945	71,7	15,	n.	do.	,940	70,7	14,	n. w.	do.	,948	66,5	10,	n.	do.
21	30,023	51,8	3,1	cm.	do.	,086	63,7	9,	n. w.	do.	,041	69,	13,5	n. w.	do.	,991	72,3	15,8	n. w.	do.	,991	72,	15,8	n.	do.	,004	67,7	11,5	n. w.	do.
22	,102	51,3	1,8	do.	do	,160	63,5	7,4	do.	do.	,117	71,5	11,5	do.	do.	,053	72,7	13,	do.	do.	,052	72,	10,	do.	do.	,068	69,3	9,4	cm.	do.
23	,103	53,	1,3	do.	do.	,143	63,	6,3	cm.	do.	,095	72,3	10,6	w.	do.	,004	74,7	14,8	w.	do.	,993	74,	14,8	w.	do.	,006	69,7	9,9	do.	do.
24	,040	51,3	1,8	do.	do.	,081	64,7	7,8	w.	do.	,005	72,7	13,2	do.	do.	,943	73,5	14,	do.	do.	,940	72,3	13,1	do.	do.	,955	66,6	7,1	do.	do.
25	,003	54,	2,1	do.	do.	,045	65,5	8,3	cm.	do.	,980	72,7	13,	do.	do.	,919	75,5	13,8	do.	do.	,900	73,7	14,	do.	do.	,924	69,6	8,1	do.	do.
26	,001	51,5	1,3	n. e.	do.	,061	63,5	9,8	n. e.	do.	,005	75,	15,1	n. e.	do.	,919	77,5	15,8	n. e.	do.	,919	76,	15,8	n. e.	do.	,936	70,5	8,	do.	do.
27	29,974	55,	1,8	cm.	do.	,035	67,7	9,2	w.	do.	,986	76,	13,8	w.	do.	,916	77,7	16,2	w.	do.	,908	76,3	13,8	w.	do.	,916	69,3	6,1	do.	do.
28	,961	56,7	2,	do.	do.	,020	67,	7,1	n. w.	do.	,963	75,5	13,	n. e.	do.	,904	77,3	15,1	n. w.	do.	,892	76,	13,5	n. w.	do.	,917	72,3	7,8	do.	do.
29	30,013	55,5	1,3	do.	do.	,078	70,7	7,5	cm.	do.	,052	78,	13,6	w.	do.	,979	81,3	13,1	w.	do.	,978	80,3	16,4	w.	do.	,977	73,3	7,8	do.	do.
30	29,991	64,3	2,1	n. e.	do.	,056	69,5	5,7	w.	do.	,028	77,3	16,1	n. w.	do.	,943	81,6	16,1	s. w.	do.	,939	80,7	16,2	s. w.	do.	,945	74,5	8,	do.	do.
31	30,050	57,7	2,5	m.	do.	,107	68,	11,5	n. w.	do.	,053	74,5	18,3	do.	do.	,994	78,	19,8	n. w.	ci.	,980	77,7	18,5	n. w.	ci.	,995	74,7	14,	do.	ci.
Mean,	30,051	54,6	2,1			,071	65,5	7,7			,020	71,6	12,3			,956	74,1	13,7			,949	73,3	13,7			,962	69,2	9,0		

Abbreviations. In the column " wind," small letters have been used instead of capitals; *cm.* means *calm.* In the column " aspect of the sky," *cy.* is *cloudy; cl. clear; rn. rain; ci. cirrus; cu. cumulus; cs. cirro-stratus; cus. cumulo-stratus; cc. cirro-cumulus; n. nimbus.*

JOURNAL

OF

THE ASIATIC SOCIETY.

No. 2.—*February,* 1832.

I.—*Account of the Honorable Company's Botanic Garden at Seharánpúr. By* J. F. Royle, *Esq. late Superintendent.*

[Read before the Physical Class, 7th January, 1832.]

As vegetables contribute a great proportion of the food of man, conduce much to his comfort, supply many of the most valuable medicines, afford a variety of products useful in almost every œconomical art, and produce some of the most beautiful objects for the gratification of the most elegant tastes ; the study of plants becomes one of the most extensive, and at the same time most interesting branches of natural knowledge.

The first stage in this study is, the accurate discrimination of plants, and this constitutes the science of *Systematic Botany.* The second is, their naturalization in any particular situation ; for a successful realization of which, a knowledge of the *Geography of plants* is necessary, or an acquaintance with the places where plants naturally grow, and the causes which influence their distribution over the globe, and not a dependence upon chance. *Applied Botany* forms the third stage, for which the two others are preparatory, which consists in a knowledge of the various products of plants, whether useful as articles of diet, or as medicinal agents, or for their œconomical properties.

For the promotion of the study of plants, gardens have been so generally established, that there are no capitals, and few great towns, of civilized nations, which do not possess such institutions, frequently maintained at a very considerable expence in the most unfavourable situations, where the difficulties opposed by nature are overcome by the ever-varying resources of art ; and the successful result is displayed, in the productions of nature which luxuriate only under the heats of an equatorial sun, being seen in all their beauty alongside of plants which would naturally languish if not braced by the cold of almost polar winters.

A Government in forming an establishment for the naturalization of plants, will only do so with the most expanded and philosophical views; and as climate is the great regulator in the distribution of vegetable forms, it is obvious that as this is dependent chiefly upon latitude and elevation, such institutions placed at the extreme and central points of an extended territory, particularly if there should be any mountains in their vicinity, would insure the most extensive success, and be enabled to distribute to every part of the country the beneficial results of their experiments.

The territories of the Indian empire, extending from 8° to 31° of northern latitude, and including within their bounds the most stupendous mountains of the world, afford a varied and magnificent field for the naturalization of the valued productions of every region of the globe.

The utility of such institutions, however, depends not only upon their intrinsic merits, but also upon the inhabitants of a country being sufficiently enlightened to profit by their advantages. In India, the European residents are in general too unsettled to take much interest in that which is intended for permanent advantage, while the natives themselves are too well satisfied with the course followed by their forefathers to think of adopting any practice which has not the sanction of their experience. On such accounts, therefore, the benefits spread by such institutions may be less rapid, but they will not be less certain. For the enlightened policy which now sanctions the diffusion of European knowledge among the natives of India cannot fail to produce a class, who will not only desire their existence, but contribute even to their support; and in proportion as they are able to appreciate their tendency, so will they endeavour to benefit by their progress.

The most southern parts of the Indian peninsula afford a favourable site for naturalizing all the tropical productions which grow within 15° north and south of the line; while the Nílgherís, between 11° and 12° of latitude, with an elevation of from 8 to 9000 feet, afford every variety of climate for the products of more northern climates. Somewhere in their vicinity, I have no doubt, the Cinchona or Peruvian bark might be successfully cultivated.

The situation of Calcutta, nearly on the tropic of Cancer, affords an admirable site for a great proportion of tropical plants, while its northern situation enables it to support many of the products of the temperate zone; though it is hardly to be hoped, that much success will attend the attempt at naturalizing the plants of European climates. The richness and variety of the Calcutta Botanic Garden are however a sufficient indication of the eligibility of its situation.

It is singular, and at the same time most fortunate, that nearly at the most northern limit of the British territories, and in one of the most eligible situations for the purpose, a public garden should have been established by the native Governments which preceded the British. Zabita Khan first appropriated in 1779, the revenues of seven villages, for the maintenance of this garden. Gholām Kádir, as well as the Mahratta power after him, continued the same revenue until the time of Bapú Scindia, who reduced the establishment, allowing only the revenues of two villages, with that of a third held in *mudut mash.* The Marquis of Hastings, with the enlightened views of a statesman, determined, on his visit to the Upper Provinces, that that which was intended only for the gratification of an Asiatic sensualist, should contribute to the advancement of science, at the same time that it increased the comforts of the people, and administered to the tastes of the most civilized European. The establishment was accordingly ordered to be formed into a Botanic Garden.

The situation of Seharánpúr, in point of latitude, elevation, vicinity to the hills, the nearness of water to the surface, and now the facility of irrigation from the Doab canal, makes it particularly eligible for the purpose. The parallel of latitude of 30°, or that which nearly passes through the Seharánpúr Garden, embraces in its course a greater variety of interesting country than perhaps any other; and as temperature is dependent upon latitude, and may be deduced by a formula, simple and sufficiently accurate for practical purposes, it follows that the vegetable productions in the neighbourhood, at least of the above parallel, will bear a considerable resemblance to one another; for it is well known, that the vegetation of each country depends upon its climate; and that plants of one country will easily grow in another which possesses a similar climate. Before proceeding, it may be useful to indicate, that the above parallel, or that of 30°, leaving India, passes through Persia, Arabia, and Egypt, and over the southern boundaries of Lybia, Barbary and Morocco, across the Atlantic, through New Orleans, between Old and New Mexico, and passing the Pacific Ocean, crosses the very centre of China and Tibet.

An analogical comparison of the climate and botany of these various countries would lead into too much detail for the present occasion; but that the object is not visionary of introducing into one country the useful productions of another which approximates in climate, or possesses a similarity in vegetation, may be inferred not only from the success which has already attended the efforts to introduce the useful productions of other countries, but also from the fact that the more valuable indigenous plants of India have already been transferred to and cultivated in countries, which possess many valuable productions peculiar to themselves.

As instances of the interchange, which has already taken place in the useful productions of the old and new world, I have prepared the following lists, to the second of which I have added a few plants which have become so common as to be thought natives of India, together with some others sent up from the Calcutta Botanic Garden, which have become perfectly naturalized in that of Seharánpúr.

Plants introduced.

From Asia, chiefly India, into America.

The Vine.
Rice.
Ginger.
Coffee.
Cinnamon.
Pomegranate.
Lime.
Citron.
Orange.
Sesamum Orientale.
Cassia Fistula.
Eleusine Indica.
Melia Azedirach.
Cytisus Cajan.
Coriandrum Sativum.

From America into India.

The Potatoe.
Tobacco.
Pine Apple.
Guava.
Capsicum.
Carica Papaya.
Achras Sapota.
Annona Cherimolia.
Logwood.
Mahogany.
Parkinsonia Aculeata.
Argemone Mexicana.
Cerbera Thevitia.
Allamanda Cathartica.
Asclepias Curassavica.
Martynia Diandra.
Canna Glauca.
Jatropha Multifida.

The Sugar-cane, Indigo, and Tamarind are supposed by many to have been introduced from India into the new world; but as the subject is doubtful, I have preferred omitting them in the above comparison.

Besides the latitude and elevation, which is 1000 feet, the climate of Seharánpúr is particularly favourable for the introduction into India of the plants of more temperate countries; as the temperature for nearly six months in the year is sufficiently European, for the easy cultivation of most of the annuals of that part of the globe, while the cold is not sufficiently great or long enough continued to destroy the plants of more southern countries, with the exception of only such tropical ones as cannot bear any frost.

Though they may be sown earlier, the best crops of European vegetable and medicinal plants are those obtained from seed sown in November. After which, the weather becomes steadily colder until Christmas, when some heavy rain usually occurs, but which is sometimes deferred to a latter period. During this season, the growth of perennials is stopped, as well as of the herbaceous plants of warm countries. In March, a rapid rise takes place in the mean temperature of the month, and the increase amounting to 12° is a sufficiently powerful stimulus to rapidly accelerate the vegetation of the spring. About the beginning or middle of April, the hot winds begin to blow, and continue to do so until the middle of June, when the rainy season commences, and according as it terminates towards the beginning or end of September, depends the late or early diminution of temperature which ushers in the cold weather.

A general idea of the temperature of the different months at Seharánpúr may be obtained, by a reference to the following abstract of the meteorological observations which I have made, and the results will serve as points of comparison with the mean temperature of other countries of which we wish to acclimate the productions.

The mean temperature of the year at Seharánpúr is about 73°, and of the months of

Jan.	Feb.	Mar.	April	May	June	July	Augt.	Sept.	Oct.	Nov.	Dec.
52°	55°	67°	78°	85°	90°	85°	83°	79°	74°	64°	55°

From the middle of October to the middle of April, the various useful and ornamental plants of European climates may be successfully cultivated; while the temperature of the other half of the year is suited for the cultivation of tropical products.

In introducing the productions of other, particularly temperate, climates, considerable advantage has been derived from having at command the climate of the hills, of which the temperate months occur at different seasons of the year from those in the plains : as is well known, but may be exemplified in the following table.

The mean temperature of the year at Masúrí is about 57°, and of the months of

Jan.	Feb.	Mar.	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
42°	45°	53°	59°	66°	67°	67°	66°	64°	57°	50°	45°

The season for cultivation in the Masúrí climate is from March to October. Hence by taking advantage of the different months adapted for cultivation in the hills and in the plains, a complete year of moderate climate may be obtained for the germination of the seeds, and for the growth of the plants of the temperate climates of every part of the globe. Thus

At Seharánpúr in					At Masúrí in						
Nov.	Dec.	Jan.	Feb.	Mar.	April	May	June	July	Aug.	Sept.	Oct.
64°	55°	52°	55°	57°	59°	66°	67°	67°	66°	64°	57°

In this way, a year with a mean temperature of 60°, of which each of the months is temperate, may be obtained, and seed sown at one or the other, during the whole twelve months. Many plants have actually been thus introduced and preserved, which if confined to either would, while young, have been destroyed by the hot winds of the plains, or killed at Masúrí by the frosts of winter.

The garden having now been established for several years, during which it has both advanced and retrograded, it may be useful to indicate the progress it has actually made, both as a scientific and as an useful institution. A few words may, therefore, be well devoted to an account of its internal arrangement.

The garden contains 40 acres of ground ; a sum of 200 rupees is allowed for its monthly expences. The establishment consists of 40 men, which, with the assistance of some convicts, carries on the several duties of the institution. By comparing the plan of the garden, as it was in 1823, with that of its present state, it will be observed, that a good deal of new ground has been enclosed, and many alterations made in laying out the grounds. In these the English style of gardening has been as much as possible adhered to ; but previous to this being effected, many preliminary labours were required.

In the first place, all the new and many of the old parts of the garden were cleared of jungle, and every where thinned of exuberant vegetation. The surface was levelled or sloped, as well to improve the general effect as to prevent the lodgment of water, which was conducted by drains into neighbouring rivulets. On either side of the boundary ditch, a hedge was planted ; new gateways built, and a free communication effected with every part of the garden by a series of new roads; additional wells were sunk, and the Persian wheel introduced; but the latter has, in a great measure, been superseded since the opening of the Doab canal, from which a cut runs through the garden, and much facilitates the almost constant irrigation which in some seasons of the year is indispensable to the existence even of herbaceous vegetation in the Upper Provinces. A conservatory was built, where the plants of warm countries might be placed, so as to be protected from the frosts of winter, and those introduced from the hills equally saved from the scorching effects of solar radiation during the months of hot weather. Two tanks, one rather a large piece of water, have been formed, which, contributing to the picturesque beauty of the garden, serve also for the introduction of aquatic plants. The parts not in cultivation, after being ploughed and smoothed, were laid in grass. The cultivated parts, as well as the borders of the roads, were trenched to the depth of two feet, by which means the clayey substratum became well mixed with the sandy surface, when the whole was enriched with the addition of vegetable and animal manure. The borders of the roads were planted with different varieties of trees, flowering shrubs, and herbaceous plants, the latter in front and opposite to the vacancies of the rear lines, by which means a view of the plants in the latter was not obstructed by those in front. It may perhaps not be uninteresting to remark, that some English tools were introduced, and the use of wheelbarrows made general.

In order to insure due attention being paid to the several objects contemplated in the institution of the garden, it was divided into several departments. In one, plants were arranged according to the Linnæan system of classification, though now it would be preferable to change it for the natural method; another was devoted to agricultural experiments, and a third for horticultural purposes. Of the plants introduced from the hills, some are planted in nurseries; others in an artificial rock-work; and some in flower-pots in the conservatory; but in all the soil requires to be enriched by the addition of decayed vegetable matter. Nurseries were likewise formed for fruit and ornamental trees and shrubs, for general distribution. A portion of the garden was allotted for the experimental medicinal garden, and another as a nursery of timber trees for the Dehlī and Doab canals.

For a furtherance of the objects of the institution, as a scientific one, pains were taken to obtain a knowledge of the Botany of the surrounding country; a catalogue was made of the plants which the garden contained, parties were sent out in every direction to bring in such as the garden did not contain, and those extended their labours from the neighbouring hills into the Dehra Dún, and from that into the Himalayan mountains, and even into Kashmír.

The collection, as may be seen by the accompanying abstract of the catalogues, consists of upwards of 4000 species, and probably amount to about 30,000 specimens, independent of a complete set left with my successor, Dr. Falconer, at Seharánpúr.

These have been chiefly collected in the northern provinces of India, but contain, of course, specimens of the plants which have been sent from the Calcutta to the Seharánpúr Botanic Garden.

In the northern provinces I include specimens of the plants indigenous in the tract of country running along the Ganges and Jumna from Allahabad up to the Satléj, with those growing on the low range of hills which skirt the Himalaya, as well as those of the Dehra Dún. Among those of the two latter tracts are many more of a European than an Indian type. Another series consists of plants of that part of the Himalayan range extending from the plain to the sources of the Ganges and Jumna, and included between the former river to the east and the Satléj to the west. A third series consist of plants from Kanáwar, or the tract of country lying along both sides of the Satléj within the British territories, but beyond the snowy passes of the Himalaya; but the most interesting collection is, perhaps, that which has been obtained from the valley of Kashmír and the mountains in its vicinity and on the road leading to it.

These collections have been formed since 1824, as previous to that the garden itself required the labours of the whole establishment for its internal improvement and management. In 1825, I first endeavoured to get a collection of specimens from Kanáwar, but the gardeners whom I sent, unfortunately, ran away; the late Lieutenant Maxwell, of H. M.'s 11th Dragoons, who had promised to look after them, brought down a collection of about 100 species, nearly the whole of which were new. A much larger collection has been obtained in 1831.

The plants from Kashmír were first procured in 1828, by sending two of the gardeners belonging to the Seharánpúr establishment along with the northern merchants who bring down fruit, &c. for sale. In the following year or 1829, the merchants themselves brought me down a number of dried specimens in a book which I had given them for the purpose, but these were generally duplicates of the former year. Last year I again sent two of the establishment, but they brought an indifferent collection in point of numbers, though the specimens were generally large and well dried. By these means I also obtained living bulbs of the Saffron of commerce, as well as of the plant furnishing the true salep misrí, and along with the former in 1828, living plants of the fruit trees of Kashmir, most of which are now thriving in the garden at Masúrí. Among these are the apple, pear, peach, nectarine, plum, cherry, walnut, and vine.

The whole of the plants of the herbarium have been arranged in two catalogues, one according to the Linnæan or artificial classification, and the other according to the Jussieuan or natural method. To the botanical names, the Hindústaní ones are added, together with the place of growth, time of flowering, of ripening of their seed, with notices respecting such as are applied to any use. In an appendix, all the plants which are known to be useful in agriculture or medicine, or which afford timber, materials for rope-making, or the tanning principle, or resin, gum, oil, or fæcula, are enumerated in separate lists.

Of many of the new plants, drawings have been made by the painters attached temporarily to the garden.

As exemplifications of what has already been effected in the naturalization of plants, and as guides in the course which it would appear proper to follow, it may be useful to indicate some of the plants of the different countries, which have already been naturalized in the open air, in the Seharánpúr garden.

Among the plants of more southern latitudes, for which the cold of the Seharánpúr climate is not too severe, may be enumerated, along with such common fruits as plantain, shaddock, custard, apple, and jack fruit, the cinnamon and sweet laurel, great dillenia, species of anona, uvaria, and pterospermum.

Of those from more northern climates, such as Kábul and Kashmír, which the parching heats of May and June, and the tepid moisture of the rains have allowed to naturalize in the Seharánpúr climate, may be mentioned the almond, peach, nectarine, plum, pomegranate, walnut, quince, saffron, henbane, atropa physalodes, clover, vine, apple, species of sage, of pink, of centaurea, aster, balsam, rhubarb, iris, and polemonium.

But the greatest variety of plants which have been acclimated, are those which have been procured from the hills : this does not proceed from their more easy naturalization, but from the greater facility of communication ; for the difference between the climate of the hills, and that of the plains, is much greater than occurs in places differing only in latitude ; for not only the temperature of the atmosphere is different, but also its pressure and density, as well as the radiation of light, and the variations between dryness and moisture. But here the success has been so complete in so many instances, that, within certain bounds, hardly any difficulties appear insurmountable.

Trees.		Flowers.		Fruits.	
Oak.	Horse Chesnut	Primula.	Delphinium.	Myrica Sapida.	Cherry.
Fir.	Blackthorn.	Viola.	Aconitum.	CoriariaNipalensis.	Apricot
Dogwood.	Juniper.	Clematis.	Thyme.	Berberis Asiatica.	Pear.
Maple.	Yew and Box.	Anemone.	Gentian.	——— Aristata.	Apple.
Service tree.	Buckthorn.	Potentilla.	Hypericum.	Juglans Regia.	
Holly.	Spindle tree.	Geum.	Spiræa.	Rubus, 3 sp.	

As the climate of the hills bears the nearest resemblance to that of European countries, the transition is easy, from a consideration of the former to those of the latter; and the success would, I conceive, be most extensive, but in this place so remote from the sea, the means of obtaining European plants are few, and seeds in a vegetative state arrive but seldom: but the introduction of the various European kitchen vegetables, the naturalization of many of the flowers, and the suscessful cultivation of many medicinal plants, afford the most rational prospect of the eventual success being only limited by the means afforded of insuring it. The horticultural catalogue exhibits the names of the several vegetables which are successfully cultivated in the Seharánpúr climate. The medicinal one will point out others, while among flowers may be enumerated sweet-brier, wall flower, heart's ease, several snapdragons, mignionette, mallow, &c.

In proceeding westward, in the latitude of Seharánpúr, the first countries of which it would be desirable to acclimate the productions are Persia, Arabia, and Egypt; and as there is considerable resemblance between their Botany and that of the Upper Provinces of India, and as some of their fruits have already been introduced, while others, as well as many of their vegetables and useful productions, are the same as those of India, I have no doubt, that a considerable proportion of their valuable products, as asafœtida, ammoniacum, myrrh, galbanum, &c. might be naturalized at Seharánpúr, where the coffee tree flourishes, and the senna is produced in the fullest perfection.

In examining the genera in Pursh's Flora of North America, and those of Mexico, in Humboldt's Synopsis, a very considerable resemblance will be found to exist with those of the Seharánpúr catalogue, of which the plants are chiefly such as are indigenous near Seharánpúr, or in the hills: hence it may reasonably be concluded from this Botanical analogy, similarity of temperature, and in one case from identity of latitude, that little difficulty will be experienced in cultivating the useful productions of both countries, either in the Seharánpúr or Masúrí garden, particularly as such plants as have been hitherto introduced have succeeded remarkably well. Among these may be enumerated the mahogany logwood, sapota, cherimolia, ash-leaved maple, pimento, dahlia purpurea.

The plants of China, which have succeded in the Seharánpúr Garden, and are now in a flourishing state, are the litchee, loquat, wampee, longan, flat peach, and digitated citron, spiræa corymbosa, dianthus chinensis, rosa chinensis, and althæa rosea. The numbers are few, but they are all that have been introduced, and now appear so perfectly naturalized as to excite the wish to make a more extended trial, and to attempt the cultivation of the tea plant, of which the geographical distribution is extended, and the natural sites sufficiently varied to warrant its being easily cultivated.

The countries in the southern hemisphere, which have the nearest approximation in latitude and temperature to northern India, are the Cape of Good Hope and New Holland : the most populous parts of both are about the 34th parallel of latitude. Though the Botany of each is distinguished from that of the other by possessing a number of genera peculiar to itself, yet is there the closest affinity between that of the two countries, and a marked difference from that of every other. Though they possess but few plants in common, we must not from this circumstance conclude that the plants of the Cape and New Holland will not succeed in India ; but rather take into consideration, that as there is a similarity with its northern parts in point of latitude and temperature, and as they have possessed themselves of every species of vegetable and fruit tree known in other parts of the world, some of which are natives of, and the greater number flourish in, India, so their own peculiar or useful productions may no doubt be as easily transferred to the latter country. Of those which have been attempted, the success has been complete, as of the aloes, pelongenium (geraniums), slopelias, amaryllis, casuarina, and cajaputi.

A view having been given of what has been effected by the Seharánpúr garden in Systematic Botany, as well as for the naturalization of plants, it remains to show, that the third branch, or that of Applied Botany, has not been neglected.

In the agricultural department less has been done than might, perhaps, have been effected; but here the difficulty to contend with is the want of a population ready to take advantage of any novelties that might be introduced ; still much good might be effected by introducing improved kinds of the seed which the natives themselves are in the habit of sowing. The agricultural division of the catalogue before alluded to shows the number of plants from which the natives of India derive the means of increasing the supply of food. The *rabi* crop is sown about November, and reaped in April, while the *kharíf* crop is sown in June, and cut in October.

As instances of what may be effected, it may be noticed, that the barley of the hills called *ooa*, from an elevation of 10,000 feet, has become naturalized in Seharánpúr; and a singular species of wheat from Kanáwar, at an equal elevation, succeeds remarkably well. Of plants affording fodder for cattle, which have been introduced, and are in a thriving state, Guinea, and Fiorin grasses may be noticed, as well as lucerne, soccory, and clover. All have become naturalized, and the three latter are valuable as affording green food when there is little or no grass in the country.

The Horticultural catalogue exhibits a large proportion of the plants used as vegetables both in European and Indian climates. Of the former most have been introduced since the British reign, many by means of the garden; and of native vegetables, pains have been taken to bring together those which are common in different parts of the country. The list of fruit-trees displays, collected in one place and naturalized in the open air, the various fruit-trees of very different countries, as of India and China, Kabúl, Europe, and America. A view of the list of annuals and of flowering shrubs will prove the variety which are always ready in the different nurseries for general distribution, and of which, as well as of fruit-trees, many thousands are yearly distributed, together with packets of seeds, to all those who are inclined to send for them.

In the list of medicinal plants will be observed many which form the most powerful articles of the European materia medica, while others, perhaps not less valuable, are known only to native *hakíms*. So much time has been occupied in preliminary investigations, that it is not easy to give an idea of the results that may finally be obtained. But it may at present be stated in general terms, that the materia medica in use among the natives of India, is very extensive in the number of its articles; and which, according as they have derived their knowledge from the Greeks through the Arabs and Persians, or from the Hindús, are the produce of both European and Asiatic countries. To one unacquainted with the subject, it will appear surprising to be told, that the natives are in the habit of administering, or rather of prescribing such medicines as hemlock, hellebore, henbane, and colchicum.

Having derived much of their knowledge of medicine from the Greeks, they are naturally anxious to prescribe that which they find praised in their works; but as most of the articles are of European growth, the distance which they have to travel is great, and the adulterations proportionally numerous: the natives, both physicians and patients, being too ignorant of the original article to be able to detect the falsification. As considerable anxiety however is now displayed, and expence incurred by the Government in the instruction of native doctors for the public service, the benefit of which must eventually extend to the class of practitioners who administer to the mass of the population, it would appear the part of a wise and provident foresight, that as a more correct knowledge of medicine is imparted, and the art of detecting the impostures in drugs is acquired, means should be adopted of more genuine articles being provided. This might be effected by first investigating the true value of genuine Indian medicines, and then naturalizing in the hills or plains such articles as they are deficient in, or which are now of foreign growth.

That the success would be considerable, I feel warranted in assuming, from the results of the experiments I have already made, even in introducing medicines for the use of the public service, which have borne the test of comparative trials with the best from European depôts. The difficulties to be surmounted may not be so obvious, except to those who have made similar attempts; but if it be considered that not only the seed or plant is first to be procured, then grown with all the care of an exotic, extended into a crop, and converted into a form fit for exhibition as a medicine, then proved equal in medical virtue and at the same time cheaper than those already in use, the attempt will not appear so easy; particularly if it be remembered, that not an oil can be distilled, without first making a still, nor an extract prepared without first constructing an apparatus for expressing the juice, and then evaporating it to a proper consistence in an apparatus of steam.

Among the articles which have been introduced and reported upon by Mr. Twining*, after experiments made at the General Hospital, it appears, that "the cultivation of rhubarb at the Masúrí Tabba, is expected to afford a very valuable remedy, which is less disagreeable to take than the best Turkey rhubarb, nearly equally efficacious as a purge, and very superior in small doses as a tonic and astringent in profluvia;" and Mr. Twining concludes his report with saying, that "the acquisition of this remedy to the materia medica of this country will be of the utmost importance." The medicine has been introduced, and

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* Mr. Twining's experiments, on the Rhubarb of the Hills, and the Senna and Henbane grown at Seharánpúr, are published in the 4th and 5th volumes of the Transactions of the Medical Society of Calcutta.

considerable quantities supplied to the depôts. The oil of turpentine distilled from the turpentine of the common long-leaved fir is considered in a letter from Mr. Hutchinson, to be of "very superior quality." The extract of henbane has been pronounced by many, from its freshness, to be superior to that imported from Europe, and by Mr. Twining to be of "most excellent quality." It has been sent to Madras, and the supply discontinued from Europe, regular supplies being annually furnished to the depôts. Senna has only this year been introduced into practice. The Medical Board, after the trials made at the General Hospital, express their gratification at the result, and direct that its cultivation be extended as much as possible for the public service. Mr. Twining pronounces the senna cultivated at Seharánpúr very superior to that commonly supplied for Hospital use, possessing in a high degree the peculiar aroma of the best senna, and after 45 trials, considers it equal to the best senna he has ever seen. The other articles which have been cultivated or prepared for Hospital use will be exhibited in the catalogue which forms an appendix to the report*.

In considering the cultivation of medicines in India in an economical point of view, it may be safely assumed, that by cultivating a sufficient number of articles to keep in full employment whatever establishment may be entertained, a very considerable saving will eventually be effected; for the cost of the production of medicines must, like every other product of the soil in India, be less than can be produced in and exported from Europe, particularly if some machinery be employed for the grinding of powders and the expressing of oils and extracts, and this might easily be done by the water-mill in the garden.

Though the subject would not be less interesting, it would lead into much too extended detail to enter particularly into the economical purposes to which the various products of plants are applied. But it may be mentioned generally, that there are few of the principles of plants which form the subject of vegetable chemistry, which are not produced by the plants introduced into the Seharánpúr garden, as will be seen by the various lists which form the appendix.

Among the timber trees, the teak, saul, toon, sissoo, seriss, maple, casuarina, bamboo, jamún, mulberry, may be mentioned; as of these many thousands are furnished annually, to be planted along the banks of the Doab canal. One of the subjects, to which attention might be beneficially turned, is that of finding efficient substitutes for, or actually

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* The above account formed the substance of a report to the Right Honourable the Governor General, on his Lordship's visit to the garden in 1831.

cultivating, the hemp, as during the war, when the usual supplies were cut off, it was proposed to grow it in large quantities in this country, and Dr. Roxburgh made numerous trials on the comparative strength of the several articles employed by the natives in India, and proposed that hemp should be cultivated in large quantities in the Upper Provinces. This was before it was known, that some of the finest hemp in the world is to be found in the hills, where it is already employed by the natives for making ropes to cross their rivers, and for the manufacture of a coarse cloth much valued in the plains. The most beneficial results might also be obtained by the introduction of better kinds of cotton seed for the cultivation of superior kinds of cotton. Attempts have been made with two species. Samples of both were sent, the one an American, and the other an indigenous perennial species, to Mr. Saunders, who pronounced the staple of the former to be better than that of specimens sent of cotton commonly cultivated in this country, which he however considered of very excellent fabric; but the cotton of the perennial species, or gossypium arboreum, he thought the best description of cotton, the fabric and staple being both good.

As useful in the different arts, it may be mentioned that a very excellent *rosin* is produced by the saul tree; while a variety of *gums*, which likewise form articles of commerce, are produced by several trees from the lower hills now naturalized at Seharánpúr. The fine sugar for which the Seharánpúr district is remarkable, is chiefly refined with the *mucilage* of two plants, kydia calycina and hibiscus abel-moschus. In the subjoined lists are shown the plants used as *dyes*, as well as those which afford materials for the *tanning* of leather. Among those which afford *fixed oils* are some of which advantage might be taken to supply excellent substitutes for the olive oil now imported from Europe. The apricot oil sent down to Calcutta was highly approved of. Of plants affording *saccharine matter*, it is needless to speak, as sugar is so abundant, and with very little trouble might be manufactured of very superior quality. *Fœcula or starch*, besides forming a principal part of the several grains, abounds in many tuberous roots, of which the peculiarities have been hitherto uninvestigated: very excellent *salep* has been made from some of the Orchis tribe, and *jelly* is afforded by a variety of plants.

The unaccountably little attention which has hitherto been paid in India to vegetable chemistry* must account for the want of precision

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* The analysis by Mr. Piddington of the Rohana bark, Swietenia febrifuga, published in the 5th volume of the Transactions of the Medical Society, is an useful indication of what may be effected by attention being turned in this direction.

in our knowledge respecting the vegetable products of India, as well as our ignorance respecting the nature of the acids furnished by different vegetables. I have no doubt that both Tartaric and Citric Acids might be manufactúred, while of Alkalies, both Potash and Soda exist in every bazar, and require only purification to be fit for every purpose.

From the above enumeration, it is hoped it will appear that endeavours have been made to make the H. C.'s Botanic Garden contribute to the progress of Botanical Science, at the same time that it has been made practically useful in distributing to the surrounding provinces plants both of a useful and ornamental nature.

As the situation was favourable, and little is known of the Natural History in other departments of the northern provinces of India, collections have been made of the skins and bones of mammalia; of stuffed specimens of birds; of insects, as well as of other branches of Natural History; together with a collection of articles used as medicinal agents in the north-western provinces, and a series of geological specimens of the parts of the hills I had an opportunity of visiting.

Contents of the Herbarium, arranged according to the natural families.

1. VASCULARES. 1. Dicotyledones. 1. *Dichlamydeæ.*

Thalamifloræ.

1	Ranunculaceæ	13	85	30	Temstræmiaceæ	2	2
2	Dilleniaceæ	1	1	31	Camellieæ	1	1
3	Magnoliaceæ	3	4	32	Olacineæ	1	1
4	Anonaceæ	3	7	33	Aurantiaceæ.... var. 31	7	12
5	Menispermaceæ	4	11	34	Hypericineæ	2	12
6	Berberideæ	1	5	35	Guttiferæ	2	4
7	Podephyllaceæ	1	2	37	Hippocrateaceæ	1	1
8	Nymphœaceæ	3	8	37½	Dipterocarpeæ	1	1
9	Papaveraceæ	3	8	39	Malpighiaceæ	3	4
10	Fumariaceæ	3	15	40	Acerineæ	2	5
11	Cruciferæ		98	41	Hippocastaneæ	1	1
12	Capparideæ	4	9	43	Sapindaceæ	6	8
13	Flacourtianeæ	1	3	44	Meliaceæ	3	7
14	Bixineæ	1	1	45	Ampelideæ...... var. 28	3	18
16	Violareæ	1	6	46	Geraniaceæ	3	13
17	Droseraceæ	2	2	47	Tropæoleæ	1	1
17½	Resedaceæ	1	3	48	Balsamineæ	2	9
18	Polygaleæ	1	7	49	Oxalideæ	3	4
20	Pittosporeæ	1	1	50	Zygophylleæ	3	4
22	Caryophylleæ	12	62	51	Rutaceæ	4	6
23	Lineæ	1	5	52	Simarubeæ	1	1
24	Malvaceæ	11	59	53	Ochnaceæ	1	1
25	Bombaceæ	2	3	54	Coriariæ	1	1
26	Buttneriaceæ	8	11				
27	Tiliaceæ	3	22				566
18	Elæocarpeæ	1	1				

Calyciforæ.

55	Celastrineæ	4	12
56	Rhamneæ	4	15
58	Samydeæ	1	5
62	Terebinthaceæ	13	29
63	Leguminosæ		354
64	Rosaceæ var. 107	20	105
66	Granateæ	1	3
68	Combretaceæ	5	7
71	Onagrariæ	5	23
74	Lythrariæ	5	10
75	Tamariscineæ	1	3
76	Melastomaceæ	1	2
78	Philadelpheæ	1	1
79	Myrtaceæ	9	15
80	Cucurbitaceæ	12	50
81	Passifloreæ	1	3
83	Turneraceæ	1	1
85	Portulaceæ	3	7
86	Paronychieæ	1	2
87	Crassulaceæ	4	16
89	Cacteæ	2	2
90	Grossulariæ	1	3
91	Saxifrageæ	5	19
93	Umbelliferæ		93
94	Araliaceæ	2	6
95	Lorantheæ	2	9
96	Caprifoliaceæ	5	23
97	Rubiaceæ	21	56
98	Valerianeæ	2	9
99	Dipsaceæ	3	10
99¼	Cichoraceæ		60
99½	Cinarocephalæ		59
99¾	Corymbiferæ		203
100	Campanulaceæ	4	17
102	Ericeæ	4	11
			1243

Corollifloræ.

104	Symplocineæ	1	3
105	Myrsineæ	4	11
106	Sapoteæ	3	5
107	Ebenaceæ	1	3
108	Oleineæ	3	7
109	Jasmineæ	2	18
110	Strychneæ	1	1
111	Apocyneæ	15	25
112	Asclepiadeæ		35
113	Gentianeæ	9	52
114	Polemoniaceæ	1	1
115	Didymocarpeæ	1	7
116	Bignoniaceæ	1	5
116½	Sesameæ	4	7
117	Hydroleaceæ	1	1
118	Convolvulaceæ	7	40
119	Boragineæ	12	55
120	Sebestineæ	1	4
121	Solaneæ	10	33
123	Scrophularineæ	27	76
124	Orobancheæ	2	4
125	Pedicularеæ	2	19
127	Labiatæ	38	124
130	Verbenaceæ	11	28
131	Acanthaceæ	8	56
132	Lentibulareæ	1	5
133	Primulaceæ	5	31
			656

2. *Monochlamydeæ.*

135	Plumbagineæ	1	1
136	Plantagineæ	1	9
137	Nyctagineæ	2	3
138	Amaranthaceæ	6	35
139	Chenopodeæ	9	23
140	Begoniaceæ	1	3
141	Polygoneæ	4	55
143	Laurinæ	3	14
146	Thymeleæ	1	5
147	Eleagneæ	2	4
148	Santalaceæ	2	2
149	Osyrideæ	1	1
151	Euphorbiaceæ	5	90
152	Resedaceæ	2	4
155	Urticeæ	4	27
156	Piperiteæ	0	0
157	Artocarpeæ	3	26
158	Ulmaceæ	1	3
159	Platanideæ	1	1
160	Amentaceæ	8	35
161	Coniferæ	8	19
			329

2. MONOCOTYLEDONES.

162	Cycadeæ	1	2
163	Hydrocharideæ	2	4
164	Butomaceæ	1	1
165	Alismaceæ	2	6
167	Orchideæ		82
168	Scitamineæ	10	23
169	Musaceæ	2	4
170	Irideæ	3	9
172	Amaryllideæ	6	12
173	Hypoxidæ	2	4
174	Liliaceæ	6	12
175	Hemerocallideæ	2	2
176	Asphodeleæ	12	25
176½	Bromeliaceæ	2	3
177	Dioscorinæ	1	5
178	Smilaceæ	5	20
179	Trilleaceæ	2	2
180	Colchicaceæ	1	1
181	Pontedereæ	1	2
182	Commelineæ	2	9
183	Junceæ	1	8
184	Juncagineæ	1	1
185	Restiaceæ	1	1
186	Palmæ	7	10
187	Gramineæ		356
188	Cyperaceæ		149
189	Typhaceæ	1	2
190	Pandaneæ	1	1
191	Fluviatiles	2	7
192	Aroideæ	4	14
193	Saurureæ	1	2
194	Piperiteæ	2	4
			783

CELLULARES.

1. *Foliaceæ.*

1	Filices	17	111
2	Marsileaceæ	2	2
3	Equisetaceæ	1	5
4	Characeæ	1	1
5	Lucopodineæ	1	9
			136

2. *Aphyllæ.*

6	Musci		84
7	Hepaticæ	2	8
8	Lichenes		52
9	Fungi		39
			143

General Synopsis.

VASCULARES.	1. DICOTYLEDONES.	1. *Dichlamydeæ.*	Thalamifloræ	563	2462	2791
			Calycifloræ	1243		
			Corollifloræ	656		
		2. *Monochlamydeæ*			329	
	2. MONOCOTYLEDONES.					783
						3574
CELLULARES.	1. *Foliaceæ*			136		279
	2. *Aphyllæ*			143		
Plants unadjusted, collected between Delhi and Allahabad						250
Plants of which the natural families are unknown						61
Total number of species....						4164

II.—*Further Illustrations of the Antilope Hodgsonii. By* B. H. Hodgson, Esq.

Having lately received two more stuffed specimens of the Chírú Antilope, these being the fourth and fifth which I have obtained in the last two seasons, I beg leave to send you the chief results of my examination of them, in emendation of, and addition to, the account of this animal with which I supplied you last year, and which you published in the Gleanings No. XXIII.

The average size of the mature male exceeds not 5 feet of length, from the tip of the nose to the end of the tail; nor two feet ten inches of height, at the shoulder. From the occiput to the insertion of the tail, 3½ feet. Length of the neck 12 to 14 inches: of the head, 10 to 11 inches: of the tail 5½ inches, without the hair; 8½, with it.

The nasal tumours are natural formations, and not the consequence of disease, as had been suggested to me. I have lately examined them with care, and find them to be composed of firm, elastic skin and cartilage, like the nostrils, immediately behind the posterior boundary of which they are placed, and into which they open freely and obviously; being in fact a prolongation backwards, and an accessary dilatation of that reflexion of the skin which lines the nostrils. Externally, these peculiar formations present a round, firm, elastic swelling on each lip, well defined, and covered with hair, like the proximate parts. Internally, they constitute a sac of capacity to hold a marble, lined with the same skin which lines the nostrils, and not communicating with the interior of the nose, except by and through the ordinary nostrils, into which the sacs open forwards by a slit that will admit the finger to be passed into it, and thence all over the interior of the sacs. These sacs or sinuses are usually defiled with mucus, secreted from the nose; and they seem to me (who am no anatomist) to be nothing more than accessary nostrils, designed to assist this exceedingly fleet animal in breathing, when he is exerting all his speed: for the expansion of the nostrils opens them also, and their elasticity allows of their being dilated in the manner of the nostrils. There is not the least appearance in the Chírú, either external or in the bones of the scull, of lachrymary sinuses: and the nose is ovine, that is perfectly clad and dry, but with somewhat of the cervine breadth and bluntness of termination. The Chírú is a very compactly formed animal, standing high on the legs, and full of vigour, grace, and spirit.

The body is rather short and full: the neck of medial length and bowed in : the head, nor long nor short; of considerable vertical but rather small transverse dimensions, except between the orbital ridges, which being very prominent, give to the head, when measured between them, a good breadth : the forehead sub-convex : the nose slightly arched : the muzzle thick, dry, and hairy : the ears small, erect, pointed, naked within, having a small quantity of longish soft hair standing up around their orifices ; fully clad without, in close short fur; no trace of striæ on their interval surface : the tail shortish, reaching to the buttocks only; rounded, tapered pretty fully, and uniformly covered with hair, of which that at the tip is a little prolonged, but not tufted : the limbs clean, long, slender, sinewy, covered, like the head and ears, with close fine fur of an ordinary stamp, and having no brushes on the knees : the pasterns, long and inclined : the hoofs finely formed, compressed and hard ; before rather spread, and padded behind : the false hoofs, mere callosities, but large. The withers are lower than the croup ; the back nearly straight ; the hind limbs stooped ; and the whole form, and accustomed attitudes those of an extremely agile and swift animal.

The hair of the body in general is of exactly the same character with that of the Tibetan musk and Himalaya wild sheep, but considerably finer and shorter than the hair of the former, and rather finer and shorter than that of the latter. All three animals are similarly furnished with a sub-fleece of fine wool; which, however, is scanty in all, and most so in the Chírú.

The hair spoken of is harsh, but feeble and brittle ; erect from the skin, very thickly set on, of a hollow quill-like feel and look, undulated throughout the greatest part, but the lips straight.

The wool is, in the main, closely applied to the skin. A small portion of it, however, insinuating itself between the interstices of the close set hair, passes up half way to its point. The wavy structure of the hair not only tends to keep the wool in close adaptation to the skin, but, by the manner in which the salient bends of one hair fit into the resilient curves of another, prevents as far as possible the access of cold air to the skin in all the various movements of the body.

The peculiar clothing of these animals is, in all its characteristic development at least, reserved for the cold season only ; the hair being, in summer, of a nearly ordinary quantity and quality, and the wool then scarcely discoverable.

I have now by me the skin of a Chírú, the covering of which is so little peculiar that it might almost pass for that of any ordinarily coated animal of the Antilopine, or Cervine family. The head, ears, and limbs, are *always* dressed in fine close fur of a common kind; and the hair of the tail, though longer and looser, is of a like ordinary description. The rufous tinge upon the superior surface of the Chírú is apt to be superseded in age, by a hoary dull white, on the crown of the head, neck, and buttocks. The dark marks on the face and fronts of the limbs are not black, but dark brown; darkest in the oldest animals. The lower part of the forehead only, or more properly the face, is darkened, and not the forehead, at least never the upper part of it; and the stripes down the limbs depend for their full development on maturity, young animals wanting them more or less, especially on the hind legs above the hocks. The tail, on its upper surface, is always coloured like the proximate part of the back.

The special habitat of the Chírú is north-eastern Tibet, and he is never seen, except casually, so far west as Ladakh. He inhabits open plains exclusively, never frequenting either mountains or woods; or associating with the musks or wild sheep.

If therefore the Kemas of Ælian is justly characterised as having a white tail, and residing in woods, the Kemas is not the Chírú, as Major H. Smith surmises it to be. The drawings and technical description of the skull and horns of the Chírú annexed (pl. IV.) will I think suffice to prove that the Chírú's horns are not set on "parallel to the plane of the face," according to the same able author's statement. Whether or not the horns rest on the "crest of the frontals," I cannot say; not precisely understanding the expression. But I fancy this must be a mistake; since the horns quit the forehead *between* the orbits and not *behind* them; and the frontal bones, continued behind the horns, are considerably higher *there* than where the horns rise from them.

I have taken peculiar pains in ascertaining the habitat of the Chírú, and have no doubt, now, that the species frequent the *open* plains of north-eastern Tibet, exclusively. Nor do I see any reason to distrust my present information, that the species is very gregarious, and that the females have no horns.

By the sinuses within the osseous cores of his horns, and by the signal compression of their bases, the Chírú is related to the genus Capra, as also, by the partial and peculiar development of the annuli. We might add, as additional features of resemblance, the total absence of the lachrymal sinuses and the dry muzzle. But here the slender analogy must be dropped: for, the Chírú has the graceful proportions proper to the Cervine race of Ruminants, and is not inferior in speed and elegance to the finest of the Antilopes, to which last intermediate genus, half Cervine, half Caprine, he belongs.

After a careful comparison of the indicative characters of Major H. Smith's several groups of the Antilopidæ, I am of opinion that the Chírú ought to be referred to the Gazelline group. As already mentioned, I am now satisfied that the species is gregarious, inhabits open plains, and has no horns in the females. Whether either sex has inguinal pores, and the females 4 or 2 mammæ, are points still undetermined. This Chírú must belong to one of the four following groups of the able author just mentioned: The Orygine, the Reduncine, the Gazelline, or the Antilopine. By the want of the following marks of the Orygine group, I presume it cannot be referred to that: high shoulders; large stature; long ears; a long tufted tail; a mane; horns parallel to the face; non-gregarions habits; horned females. With respect to the Reduncine division, the Chírú has none of the subjoined characters of it. Horns short, rounded, annulated less than half way up, and set on behind the orbits; ears large and open; fur long and loose; tail with the hair directed towards the sides; shortish thick limbs; residence on rocky mountains, or under cover of reeds or bushes; non-gregarious habits.

There remain only the Gazelline and Antilopine sections to choose between; and the preference is perhaps due to the former, as having more equivocal suborbital sinuses, and ovine nose. It must be confessed, however, that the *total* absence of lachrymal sinuses, united to an ovine nose, and horns turned forwards, in the Reduncine group, afford strong grounds for referring the Chírú to it; grounds which would have decided me in favour of that group, had I not been informed that such apparently permanent and immutable characters as the two former, are nevertheless dependent on climate.

Upon the whole, I refer the Chírú to the Gazelline group, chiefly because it is very gregarious, dwells in open plains, and has limbs of the finest mould. I would observe by the way, that these long slender limbs terminating in hoofs, the posterior part of which is somewhat dilated and padded, offer strong presumptive proof of the truth of the asserted residence of the species in open bare plains with a sandy soil, such as all the plains of Tibet have.

Dimensions and character of the Skull and Horns of the Antilope Hodgsonii.

The length of the skull, from the symphysis of the intermaxillary bone, to the superior edge of the great occipital foramen, by a line passing along the frontal and sagittal* sutures, and continued down the middle of the occiput, is 1 foot $1\frac{7}{8}$ inches.

From the extremity of the nasal bones to the central point of their insertion with the frontal, $3\frac{1}{8}$ in.; from the commencement of the frontal suture to its junction with the coronal, $3\frac{1}{4}$ in.; thence to the lambdoidal suture $1\frac{7}{8}$ in.; thence to the transverse crista of the occiput, 1 in.; thence to the edge of the foramen magnum, $1\frac{1}{8}$ in.

The utmost height, or vertical dimensions of the skull, from the ridge of the parietal to the lowest edge of the ramus of the jaw, $6\frac{1}{8}$ in. Utmost breadth of the skull, across the molars and before the orbital ridges, 3 in.

The orbits are placed laterally, with a decided obliquity forwards and outwards, and consists of very firm and complete bony circles, which are open behind to the temporal fossæ, as usual. The nearest interval between them measures $3\frac{1}{4}$ in. the widest and posterior interval $4\frac{7}{8}$ in.

The core or osseous nucleus of the horns has a large oval cavity, communicating by one clear canal with the frontal sinus.

The cavity has nothing porous or cellular about it; but is a perfect, smoothly-walled, sinus, partly excided from the frontal bones, and partly from the pedicular or basal portion of the horn's core.

It is $\frac{7}{8}$ of an inch broad and $1\frac{1}{8}$ inch high; and from the anterior and inferior edge of it is opened the canal communicating forwards. This canal, like the greater cavity, is smooth-walled, and free from cellular partitions. It is of an uniform cylindrical shape, with the diameter of a crow's quill. At the forward end it throws off a duct opening into the frontal sinus, and then proceeds to communicate with the nose, by means of 3 or 4 cellular perforations in this the anterior extremity of the canal or tube, and where alone there is the least appearance of cellular formation, either in the canal, or in the great cavity above it.

The bony nucleus extends about $\frac{2}{3}$rds up the horns, or as far as the annuli, and is of a remarkably compact and hard structure, towards their bases; more fibrous and soft, towards their tips.

As I have spoiled a beautiful skull to ascertain these facts, I must crave permission to say, scepticism avaunt!

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* *i. e.* by a line best so defined, for of course the sagittal suture exists not.

There are two species of Antelope* at least, besides the Chírú, wanting that solid character in the nuclei of the horns, which has heretofore been held to be so essentially indicative of the genus.

The frontal processes take their origin from the frontal bone at the distance of three quarters of an inch from the apices of the nasal bones, anteriorly; and half an inch from the proximate point of junction of the frontal and parietal bones, posteriorly: laterally, their distance from the orbital ridge of the temporal bone is $\frac{7}{8}$ of an inch; and from the proximate point of the frontal suture $1\frac{1}{8}$ths of an inch. The basal interval of the frontal processes, or *unsheathed pecicular* portion of the long nuclei, is rather more than $\frac{1}{2}$ inch: their circumference, pretty close to the base, $4\frac{3}{8}$ inches; and their height, from the adjacent part of the orbital arch to the commencement of the horny sheath, $\frac{1}{2}$ an inch.

The frontal processes proceed from the forehead, above and between the orbits, with a slight inclination outwards and backwards —so slight, however, that the long horns which they support assume very nearly an erect position in the natural state of the animal: and it is the outward, not the backward inclination, which prevents one from justly characterising the horns as vertical.

The occipital bone forms the posterior boundary of the skull, with exception of the triangular portion, on which arises the crista occipitalis; and this portion is locked between the ends of the parietal bones, and is situated *superiorly*. The occiput then proceeds almost perpendicularly downwards, with an inclination backwards, in consequence of which inclination the foramen magnum and its condyles form the most posterior and inferior part of the skull. The opening of the foramen is in the same parallel with the opening of the nasal bones.

The relative shortness of the frontal and correlative elongation of the parietal bones is worthy of remark; as well as the development of the entire longitudinal dimensions of the latter, upon the superior surface of the cranium.

The forehead is rather convex, and is sloped without any sudden dip to the nose, which latter is somewhat arched. A slight longitudinal ridge extends from the lambdoidal suture down the centre of the skull, a little beyond the anterior limits of the cores of the horns. There is no symptom on the skull of lachrymary sinuses.

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* A. Bubalis, the sinus discovered by Blumenbach and A. Thâr; the sinus discovered here, by Dr. Bramley, from a skull in my possession.

The molar teeth are only five in number, on each side of either jaw*. The eight incisors of the lower jaw are unusually erect, close, uniform, rounded, with broadish crowns.

The Horns.

		feet.	inch.
Length of the horns, in a straight line		2	0
Do. do. along the curve		2	1½
Basal diameter, fore and aft,	between the two lowest rings,	0	1⅞
Do. do. side to side,		0	1⅛
Basal interval		0	0⅜
Terminal interval		1	2

The skull and horns above described are those of an old male, the incisor teeth being long and full of marks, the sutures half obliterated, and the cristæ prominent.

In regard to the precise form and curvature of the horns, I may observe, in addition to what was said in the GLEANINGS No. XXIII. that if you lay a horn, separated from the skull, on a table, with that side downwards which in the natural state faces laterally *outwards*, and apply your hand to the base of the horn, so as to make it rest fairly on the table, you will find the horn touch the table at two points; one, the base merely, the other, the space of an inch situated within four inches of the tip. In other words, these two points form the ends of a long, gentle, lateral curvature, the bend of which is inwards, and its utmost divergency from the chord of the bow, or plane of the table, barely ¾ of an inch.

The tip of the horn you will observe to be elevated from the table about ¾ of an inch; which is caused by a pretty decided inflexure of that part. In young animals, this lateral bend, with the incurvation of the points of the horns, is scarcely traceable: nor is it other than trivial in the oldest. The great bend is the forward one, which is so material, that if you lay the horn on the table with that side downwards, which is the *frontal* surface in the natural state of the animal, (the horn must be supported to make it keep this position,) you will find the horn to touch the table only at the very extremities, the whole of its length being carried off the plane of the table in a bow, the most divergent point of which rises nearly 3 inches from the table, and is situated about ⅔ of the horn's length from its base.

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* Three skulls of old animals now by me exhibit uniformly this number of molars.

In size, the horns vary from 22 to 27 inches of straight measurement, and are straighter in proportion as they are less fully grown. The number of the annuli seems to depend on the size of the horns; their development, not so; for in the smallest that I possess the rings are as strongly marked as in the largest. The rings are round-edged, and very fully and uniformly displayed on the frontal surface; much less fully or regularly on the dorsal and lateral surfaces; round both which the annuli are apt to be continued brokenly only and evanescently. As if, however, to prove that the true character of these marks is annulation, you will sometimes find a ring carried all round the horn in equal and full development. The divergency of the horns at their tips is usually as half their length: the interval at the bases so small, that the little finger can barely be passed between the horns in that part.

The lateral compression is always strongly marked, and extends evanescently to within about six inches of the tips of the horns.

The terminal portion is smooth and rounded, and the extreme points sharp, and turned inwards as well as forwards.

Nipal, March 1, 1832.

III.—*Note relative to the account of the Cervus Jarâi, published in the Gleanings, No.* 34, *by the same.*

In my description of the Jarâi, above alluded to, I observed that it has "no peculiar elongation of the hair on any part of the body."

The materials of that description were chiefly derived from the examination of a living animal; which examination was conducted in August, or at the height of the hot-weather, when, their being really no signs of such elongation of the hair, I stated the fact accordingly.

Subsequently, it occurred to me, that the hairy covering of the Ruminantia is apt to vary considerably in character with the seasons as well as with increasing years, and I therefore again visited and examined the individual in question (a young male), in the beginning of February; when, somewhat to my surprise I confess, I found the inferior surface of his head, as far forwards as the gape, the whole of his neck, and the top of his shoulders, invested with shaggy hair more than twice the length of that of the body. So adorned, the animal is readily assignable, (with the assistance of Griffith's Cuvier, a copy of which I have just received from my bookseller,) to the *Rusa* group of Major H. Smith, and possibly to the species *Equinus* of that able writer. Since my description of the Jarái was composed, I have received some splendid spoils and important additional information relative to this animal, or rather group of animals; for, it would appear, by the testimony of some most respectable Nipalese, supported by skins, horns, and skulls, in my possession, that there are at least three distinct species (or most strongly marked varieties) of the Jarâi, inhabiting the Saul forest.

The Nipalese distinguish them, with reference to the different shades of their in general uniform dark colour, by the epithets Phúsro, Râto, and Kâlo, or gray, red, and black, Jarâi. The Phúsro is the largest, being not less than a horse in size; and has his dark hide copiously sprinkled with Phúsro or hoary. The Râto is the next in point of size; and is of a redder hue. The Kâlo is the smallest, and of a shining, clear black.

The horns of the Râto and Phúsro have a similar form and character, the only *invariable* difference between them being, that those of Ráto are considerably less in proportion. The horns of the Kâlo, on the other hand, present a character, not merely alien to the two others, but to the type and index of the group; for they have only one antler on each beam, viz. a brow antler.

All three species have the forehead flat or sunk, with a strong ridge down its centre; the nose straight; canines in the upper jaw, large lachrymary sinuses; shoulders, whole neck, and jaws, shaggy; very coarse, dark hair; longish tail; fan-like ears; massive rough horns, inclined outwards and backwards, which are set on stout pedicles, terminated by large granulated burrs. All, too, but the Kâlo species have a subterminal, as well as a brow antler.

The whole of the above characters are constant. But no reliance can be placed on the circumstances of the superior antler being thrown off near the top, or near the centre, anteriorly and externally; or, posteriorly and internally: nor upon that of the inferior antler being basal, or only subbasal.

I make these remarks, guided by Major H. Smith's admirable work, with ten good specimens before me; and I feel pretty confident that, that able author will find reason by and bye to abandon his present distribution into species of this group of Deer. With the wish to be of service to him, I subjoin drawings of the horns of the three presumed species of Nipal; but shall not attempt any further description of them at present. I apprehend that the Nipalese Phúsro Jarâi is identical with the great Rusa, or Hippelaphus, of Cuvier; that Cervus Equinus may be the Râto Jarâi; and possibly, the Rusa Ilam of Raffles (which he says is smaller than Equinus and black-coloured) the Kâlo Jarâi of Nipal.

IV.—*On Modes of obtaining Important Results by Simple Means.* *By* Capt. G. Twemlow, *Bomb. Arty.*

1*st.*— *Movement of heavy masses without expence of Machinery.*

Most persons may some time or other have to raise heavy bodies, or move ponderous masses, without having command of modern mechanical means; a few retrospective glances to the probable modes practised in ancient times, by comparatively rude nations, may perhaps elicit useful hints.

We know that in very remote times, enormous stones, such as no modern machinery could be made to lift, were placed on the tops of walls, or fixed over pillars to form gateways; for instance, "in the ruins of Balbek, (the ancient Heliopolis of Syria,) there are three stones lying end to end, in the same row, extending sixty-one yards. One of them is sixty-three feet long, the other two sixty each; their depth is twelve feet, and their breadth the same; and, what adds to the wonder, they are raised up into the wall above twenty feet from the ground*." Were these stones swung up by machinery? Most probably not; labour having been cheap, it is far more probable, that as the masonry advanced, an inclined plane of earth would be progressed; up which the common materials would be conveyed by donkey, camels, and labourers, as we read of in the accounts of ancient works; and this in hot climates would admit of lime-cement binding well and gradually. Having the inclined plane, there would be no difficulty in rolling the sixty feet in length stones upon it, to their intended positions on the top of the wall, there being an inclined plane on each side. When the work was finished and the cement (if used) been allowed time to bind, the earth would be removed, and be used in levelling the grounds, forming terraces, or in other modes. It will be found that in eastern climes the expence attending this mode of scaffolding is much less than that of machinery, where very heavy masses have to be raised†. Let us take another instance.

Suppose you had to place on two erect pillars, or pointed rocks, an enormous impost stone, similar to the egg-shaped stone said to be still existing in the parish of Constantine, Cornwall, England. "The longest diameter of this stone is thirty-three feet, pointing due north and south,

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* Extract from Maurice's Indian Antiquities, vol. v. page 142.

† In throwing arches of small span, the cheapest plan for (or instead of) centerings, where labour is cheap, is to erect two temporary walls; and fill the space between them with earth, or stones, bricks, &c.

end to end; it is fourteen feet six inches deep, and contains at least, seven hundred and fifty tons of stones*."

Say the pillars are twenty feet in height, and firmly imbedded, would you not be at a loss how to apply modern aids or obtain fulcra? Yet the thing is easy of accomplishment, if we would condescend to do what the people of old would have done; that is to say, employ the cheapest mode of imbedding the two pillars up to their tops in earth, so as to form an inclined plane equally all round them. Now, suppose the impost stone to be at the foot of the inclined plane, what would be the least expensive mode of rolling it to the top? I will give one plan to be followed, should there be no mechanical aid available other than obtainable by levers and ropes—men however being plentiful. Having procured twenty stout timbers of twenty-five feet in length, to one end of each I would attach a cable; the other ends I would insert at equal distances apart, perpendicularly (or rather sloping backwards) along the upper surface of the mass to be moved; the ropes being pulled on, by a sufficient number of men, the levers must be brought down to the ground, making the mass of stone turn nearly a quarter of its circumference: having people ready with earth and stones to throw behind it, to prevent retrogression: the stone-cutters will then cut out another set of lever-insertion holes, the levers be again applied; and the stone be turned over a second quarter turn; and so on, until there are lever-insertion holes on the four sides†, so that it may be turned over and over until it gets to the top, and is fixed on the pillars: then remove the earth, and the task is accomplished. If it should so happen, that the number of men are deficient to furnish power to pull down the levers, the cables might in that case be made fast to anchor stakes on the reverse inclined plane, taking a double turn of each; then by twisting the two ropes with hand levers inserted between them, enormous power may be obtained: this in fact was the power of the catapult and other ancient artillery. In the Dekhan, the power of twisted ropes is to this day made much use of. A *kûbi* (cultivator) will pile up an enormous height of straw on his cart, and then throw over the load several sets of simple ropes, with snatch-blocks of a simple construction at each end of them fastened to the side of the cart; then by twisting the ropes he will compress his load to a surprising degree.

Now let us consider how to move by simple means, masses which are nearly cylindrical, to considerable distances. For instance, ancient

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* Maurice's Indian Antiquities, vol. vi. page 140.

† Not however opposite each other, or so deep as to injure the stone.

pillars or statues, or enormous guns, as trophies. If wood is cheap and abundant, perhaps the easiest plan is, to fit beams of wood round the mass, after the manner of staves, so as to barrel it up into the shape of a cylindrical roller.—It has been practically proved, that an iron 18 pr. siege gun, weighing forty-two hundred weight, barrelled up in this way, the staves being about five inches thick, fitted exactly to the rings, astragals, and fillets of the gun, will travel easily on good roads with four gun bullocks, and over common roads with eight bullocks of 54-inches standard; inequalities in the roads, or even heaps of stones which would upset a gun carriage, are no obstruction to be barrelled up gun; some part of the cylinder is sure to act as a wheel. Narrow ravines or passes would be the only difficulty: the neck of the caseable has a ring passed over it, and forms the axle at one end; whilst an axle arm inserted in wood is driven into the muzzle of the gun, to form the opposite axle of the cylinder.

The Bíjapúr gun, which weighs about forty two tons, might be moved to the coast in this way with forty pair of good gun bullocks. It should be encircled with staves of tough wood, twelve inches in thickness, closely fitted to the surface of the gun: the staves to be dove-tailed and cross-pinned together, and then strongly hooped up; the centre of the cylinder to be purposely made rather larger than the ends, to admit of driving the hoops tight, and also to enable it to travel better: it would then form a roller six feet in diameter and fifteen feet in length, and might serve to roll a road to the coast. A powerful capstan (such as that described in the Memoires D'Artillerie, vol. ii. third edition, page 156,) might be carried on a cart to aid in passing the cylinder over mountains, and to drag it through rivers. It is believed that this plan would be better than two or more broad girdles or wheels round the gun. Let it not be supposed, however, that artillery officers of the present day would have any difficulty in making a suitable carriage for it: if it were desirable to go to that expense, a carriage might easily be made. An Italian of Otranto, who served in the Moghul armies, under the title of Rúmí Khan, had this gun in his park, and used it in several battles, occasionally firing sacks of copper coin out of it.

(*To be continued.*)

Termination of the measurement of the BARRACKPOOR BASE. Jan: 1832.

V.—SCIENTIFIC INTELLIGENCE.

I.—*Progress of the Indian Trigonometrical Survey.*

PLATE I.

The measurement of the base line on the Barrackpúr road was completed on the 21st January, and it is difficult to imagine that any similar work was ever brought to a more successful issue. Through the politeness of Captain Everest, the Surveyor General and Superintendent of the Trigonometrical Survey, we enjoyed the advantage of an invitation to witness the remeasurement of the first day's work, with the view of ascertaining what might be the probable amount of error: on which occasion the President of the Physical Class of the Asiatic Society and many distinguished officers of the Engineer department were present. An elegant breakfast was laid out in tents after the ceremonies of the morning were concluded. While contemplating with admiration the order and precision with which the whole process was conducted, we took an opportunity of sketching the apparatus as it stood, that the readers of the Journal might be better able to comprehend the nature of the operation of measurement, which was partially described in the GLEANINGS for November last.

Plate I. represents the six sets of bars resting upon their tripods, levelled, and in the act of adjustment, longitudinally, by means of the directing or boning telescope, to the left hand. The boning telescope ought to have been considerably more distant from the bars, but it would then necessarily have been excluded from the drawing. A movable covering of tent-frame work protects the bars from the influence of the morning sun; at their left extremity is seen a cast-iron tripod, firmly imbedded in the ground, bearing a brass vertical cylinder and plate, upon the surface of which is the minute dot which marks the termination of the last, and acts as the starting point of the present measurement: by the adjustment of the cross wires of the end microscope in the true vertical line bisecting the dot. These apparatus are represented on a larger scale in the foreground; as also one of the wooden boxes containing the compound bar, shewing the two projecting tubes, within which lie the cross levers of the compound bars, upon which are engraved the dots, or marks to be read off by the double microscopes interposed between each box, as described on a former occasion, and as will be readily comprehended by reference to the drawing. The right extremity of the line is seen to enter the door of the tower, where it terminated in a coincidence with the original dot, engraved upon a metallic disc attached to a sunken stone pier.

As it had been anticipated that the settling of the masonry of the tower might derange the terminal mark, precautions had been taken in the first instance to sink into the ground another adjusting point at a short distance in advance of the tower; and it was in fact to this point that the remeasurement was referred, to know the probable amount of error in measuring; as well as whether the tower had altered its position in any perceptible degree.

From conversation with the officers on the ground we picked up the following particulars regarding the Barrackpúr base. We must crave their indulgence if our memory leads us into any mistake in detailing them.

The measurement commenced on the 23rd November 1831, and ended on the 21st January 1832, an interval of 58 days, of which 13 may be set down as holidays; so that the actual time employed was about 45 days. The length of the ground measured upon an average was 750 feet, or 12 sets of bars: but towards the conclusion, so systematic had become the arrangements, that 18, 20, and once 24 sets (that is 1512 feet) were measured in one day, which is double what was effected on the Irish survey: this was chiefly attributable to the number and experience of the officers employed; whose names we must be allowed to record, as we observed them at their posts.

At the boning telescope,..	Lieut. Western, Engrs. with Lieut. Bridgman, Art.
First microscope,........	Mr. J. Taylor, astronomer at Madras.
Central microscopes, ..	Mr. Logan. Mr. T. Oliver. Mr. J. Peyton. Mr. M. Torrick. Mr. W. Rossenrode.
Last microscope,........	Lieut. R. Wilcox, Surveyor of the Brahmapûtra River.

The length of the BASE between tower and tower was nearly 34,000 feet, or 6.4 miles, being 539 sets of bars. The whole of this extensive line came within the limits of the Barrackpûr road, falling about 30 feet to the eastward of its centre at one place; and the greatest deviation from horizontality in the road was at about a mile from the south tower, to which point it sinks gradually about 5½ feet.

At the north tower, it was found beforehand that there would be about 3 feet to spare in excess of a certain number of bars. This, added to the possibility of the dot on the centre stone moving during the settling of the tower, induced Captain Everest to adopt the expedient of sinking a heavy stone of 3½ feet cube, into the ground, at the distance of one set of bars south of it: two brass plates were let into this, one to receive a dot at the exact distance of a set of bars from the tower, and one to receive the dot terminating the 538th set. By this arrangement the surplus interval could be measured at leisure, with the same accuracy employed throughout the remainder of the line.

The difference found on remeasuring eleven sets of bars was. 026, or one-fortieth of an inch on 700 feet—a surprisingly small quantity, and only one-third of what was experienced in the previous trial at Lord's cricket ground. To form a tangible idea of the error this might induce upon the result, it is sufficient to say, that it would amount to about 12 feet between Calcutta and Delhi, or 125 feet in the diameter of the great globe itself.

This, it must be remembered, is without applying any correction for temperature, though the two measures were taken in November and January: and it is a convincing proof how well the compensation had been adjusted in England.

The southern tower was found to have moved one-thirteenth of an inch to the south-east, which is not surprising, considering the light nature of the soil, and the height, 80 feet, to which the building was forced to be raised to place the theodolite within view of the other triangle stations.

Upon the conclusion of the great work, the bars were brought to Calcutta, to be recompared with the standard at the Surveyor General's office. But for the minute particulars of this and all the other processes we must wait for the public account that will doubtless be eventually given of the whole operation.

We hear that Lieutenant Western is now deputed to carry a meridional series of triangles southwards from the Parisnath meridian on the longitudinal arc, to Cuttack. After which the same meridian is to be prolonged northwards to the limits of our frontier. We presume, that the bars will shortly be transferred to the neighbourhood of Agra, where another base will be necessary for the primary meridian. Should an intermediate line be required, none could be found better suited to the purpose than the military road between Benares and Allahabad, which enjoys the same advantages of straightness, even level, and hard materials, with that of Barrackpûr, added to much greater openness of country.

2.—*Climate of Vera Cruz.*

Allusion was made in our last, to a meteorological register kept by Fray Juan, at Vera Cruz; as the tables whence the notice was derived are in manuscript, we think it will be interesting to publish the following abstract of them, drawn up for the purpose of elucidating the subject of the barometric tide.

Table of Observations on the Barometer and Thermometer, at Vera Cruz, by Fr. Juan, 1817, 1818.

Month.	*Thermometer.*			*Barometer at 32°.*		
	6 A. M.	Noon.	10 P. M.	6 A. M.	Noon.	10 P. M.
January,..	68.0	70.3	69.8	30.052	.069	.034
February, ...	69.0	71.5	70.7	.043	.050	.034
March, ...	72.1	75.6	74.7	.000	.002	.002
April, ...	76.8	80.7	79.7	29.879	.885	.871
May, ...	79.2	84.1	83.1	.860	.866	.855
June, ...	80.6	83.9	82.8	.828	.830	.825
July, ...	79.8	83.4	82.2	.955	.954	.957
August, ...	79.9	83.6	82.6	.890	.900	.897
September, ...	79.7	82.3	82.3	.897	.909	.909
October, ...	78.6	81.0	80.4	.907	.918	.928
November, ...	74.6	77.7	76.7	.965	.966	.964
December, ...	69.7	72.6	71.6	30.025	.044	.048
Means, ...	75.66	80.56	78.05	29.941	.950	943

3.—*Range of the Barometer at Berhampúr.*

We also alluded to the barometric observations made by the late Dr. Alexander Russell, at Berhampúr, in 1820—21: of these too, we take this opportunity of putting on record an useful summary made out by a friend, and reduced to the temperature of 32°, by applying the correction calculated from the thermometric register kept in Calcutta, for want of the local observations: the differences cannot be very great.

Month.	Sun-rise.	Maximum between 9 A. M. and noon.	Minimum between 4 P. M. and 6 P. M.	Diurnal Tide.	10 P. M.	*Rise* to sun-rise.
	inches.	inches.	inches.	dec.	inches.	dec.
January, ..	29.915	29.925	29.831	0.094	29.881	0.034
February, ..	.850	.874	.766	.108	.824	.026
March, ..	.762	.788	.699	.119	.693	.069
April,.. ..	.669	.686	.570	.116	.661	.008
May,.. ..	.553	.570	.466	.104	.533	.020
June, ...	.450	.453	.382	.071	.438	.012
July, ...	.450	.457	.401	.056	.450	.000
August, ..	.494	.501	.413	.088	.480	.014
September,	.615	.620	.563	.063	.604	.011
October, ..	.783	.803	.740	.063	.774	.009
November,	.837	.861	.781	.0 0	.828	.009
December,	.904	.922	.826	.096	.877	.027
Means,....	29.690	29.705	29.619	.086	29.670	.020
Range,....	.465	.472	.459		.443	

4.—*Hourly Observations of the Barometer in the Fortress of Cavite.*

The following notice, extracted from the Royal Institution Journal, No. IV. bears upon the same point; and from the blank left opposite to the second fall, we may conjecture, that in fact the existence of this fall or nocturnal tide was hardly borne out by the observations when corrected for temperature, although from being apparent before correction the words remained unerased.

These observations were made by the scientific men attached to Captain Kotzebue's expedition in the year 1823—1826, on the Island of Luzon (14° 34′ north lat. and 239° 9′ west of Greenwich), for ascertaining the periods of its regular falling and rising during twenty-four hours. The barometer was kept in a room six toises above the level of the sea, in which the temperature was nearly the same day and night, (about 25° Centigrade, or 77 Fahr.) and the observations were made on eleven different days between the 12th and 26th of December. The following are the general results deduced from the whole of the observations.

The barometer has a maximum of height at	9°	1′	1″	A. M.		
it then falls till	4	28	6	P. M.	on an average	1.04 line;
it rises again till	9	58	3	P. M.	„	0.687 „
and falls again till	4	30	0	A. M.		——
lastly, it rises again till	9	1	1	A. M.	on an average	0.445——

5.—*Dr. Wise's Ice Manufacture at Húglí.*

Dr. Wise hopes to maintain a constant supply of ice, in Calcutta, for the next two or three months. Last cold season, although apparently so favorable for its production, did not afford more than 15 nights in which ice would form; and of these, only three or four were really good nights. In consequence of this, instead of 3,000 *máns*, as expected, only 1,000 *máns* were secured; which, from the precautions taken, will, perhaps, answer for several months. Dr. W. has devised the following simple and effectual method of using the ice. The ice is contained in a stuffed bag, having two, three, or four holes in its under-part, with padded flaps to close them. The necks of the bottles to be cooled are thrust upwards through these holes; when not wanted, the bag is put into the upper part of a stuffed basket and wrapped round with a blanket.

VI.—*Proceedings of Societies.*

1.—Asiatic Society.—Physical Class.

Wednesday Evening, 8th February, 1832.

The Honorable Sir Edward Ryan, President, in the Chair.

The following Donations to the Museum were presented:

1. Specimens of the Limestone of the Sylhet quarries, from William Cracroft, Esq.

Impressions of *nummulites* abound in the limestone of the Chirra hill, west of the Sanatarium. *Turrilites* are less common, and impressions of bivalves, resembling *pectens*, are still more rare. The interior of the shells is filled with carbonate of lime, crystallized, of a brown colour.

No. 5. A granular limestone, stated, in Mr. Cracroft's list, to be "a poorer lime than the others in the kiln," proves to be a crystallized dolomite; and this circumstance accounts for the occasional mixture of magnesia in the Sylhet lime of the Calcutta market.

There are also specimens of *amygdaloid*, (containing worn crystals of *felspar*,) and of a fine plastic micacious clay, from below the sandstone of Chirra Púnjí.

2. A stuffed specimen of a species of Felis, native of the Midnapúr jungles, from Dr. J. Pearson.

It is classed and described in the following manner, by Doctor Pearson:

" TRIB.	*Digitigrades.*	Cuv.
FAM.	*Felinæ.*	
GEN.	*Felis.*	Lin.
SP.	*Kutas.*	Mihi.

Gen. Ch.—Incisors $\frac{6}{6}$; canines $\frac{1\,1}{1\,1}$; cheek teeth $\frac{4\,3}{4\,3}$: the fourth in the upper jaw transversely situated. Jaws short. Toes on the anterior extremities, five; on the posterior, four, armed with retractile claws.

Sp. Ch.—Ground colour, greyish brown, approaching to rufous at the sides of the abdomen, and neck, where it unites with the white of those parts; and marked with darker stripes and bands, which are more or less obscure. Inferior surface, chin, and throat, white. Ears, white within; externally rufous; with an irregular dark patch at their lower part, tipped with black, and slightly pencilled at the tips. Labial whiskers, some entirely white, and a few all black; whilst others are black for a very small space at the base, the remainder being white. Tail, short, grey, annulated with black, from the middle to the extremity. Legs, greyish, rufous above, and rufous below; with bands of dark-grey, which become on the inner side of the elbow and fore arm almost black. Tarsus, metatarsus, and toes, rufous, darker behind, and almost black at the heels; length from the tip of the nose to the insertion of the tail, two feet two inches; length of tail, ten inches. Height, at the shoulders, one foot two inches; posteriorly, one foot four inches. Caudal vertebræ, twenty.

The size of the Kutas is that of a large Chacal, though not so robust as that animal. The darker shades on the sides appear as though they had been less obscure in the youth of the animal, and gradually fading, become broken stripes and even spots, in their progress to a total obliteration; a circumstance which, as there is reason to believe, occurs in more than one species of this family. My specimen is a full grown, but not an old, male; the female, and the young, I have never seen.

I have looked through a list of the species described in the Monograph of the Felinæ, by Mr. Temminck, without being able to satisfy myself of that distinguished zoologist having met with the animal I now present to the notice of the Society: nor can I discover it in the Synopsis, appended to Griffith's translation of the Règne Animal; and therefore I have ventured to designate it by the name which is given to it by the natives of Midnapúr. The Felis Chaus, Bruce's booted Lynx, would appear to differ in colour, and length of tail; and the Kutas is destitute of the black at the hinder part of the leg, which forms so distinguished a feature in that animal, having merely an approach to it, in a dark shade of rufous brown. The Bengal Carocal, of Edwards, differs still more in colour and length of tail. Should, however, the Kutas prove to be identical with any known species of Lynx, my name can readily be dropped."

3. A series of the land and fresh water shells of the Doab, and of the Gangetic provinces, presented by W. B. Benson, Esq., C. S.

Land Shells.

1. *Helix*——, from banks of Ganges, in Behar, and of the Betwa, in Bundelkhand.

2. *H*———, Lamarcke—Bundelkhand and Behar. The exuviæ plentiful above Húglí.

H.—Macrochlamys Indicus (Benson), separated from Helix, on account of the difference of character in the animal.

3. *Pupa*—Bundelkhand and Doab.

4. *Bulimus*—allied to *B. Bengalensis*, Lam.—Bundelkhand and Doab.

5. *Bulimulus*—under stones and pots, and among grass—Doab and Bundelkhand.

6. *Succinea*—sides of ravines—Etaweh.

7. *Carocolla reversa*—a variety from banks of Jellingí and Sikhrigali.

8. *Cyclostoma Beharicum*—Benson—Pathargháta.

9. Ditto ditto, variety.

10. Ditto young of ditto.

11. Ditto *granulata*—Bundelkhand and Doab.

Fresh-water Shells.

12. *Planorbis*—Jhíls in the Gangetic provinces.

13. *Lymnæa*—Jhíls near the Sinde, Bundelkhand.

14. Ditto—Bhagea nala, near Kalinjar.

15. *Melania*—From the Gúmtí: observed the exuviæ of this hill in Jellingí, at Kishennagar.

16. Ditto—Ganges, its branches, and Salt-water lake near Calcutta.

17. Ditto—Gúmtí and Gogra.

18. *Paludina Bengalensis*—Jhíls of Gangetic provinces.

19. Ditto *ceramcopoma*—ditto and adhering to rocks in the river Kén.

20. *Ampullaria*—from Jhíls in Bundelkhand.

Fresh-water Bivalves.

21. *Cyrena*—Ganges and its branches.

22. *Unio*—Gúmtí and Gogra.

23. Ditto—Ganges and its branches.

24. Ditto—Jumna and Ganges.

25. Ditto—Ganges and branches.

26. *Novaculina Gangetica*—Benson—Jumna.

Mr. Benson has further obliged the Society by classifying the shells formerly received from Dr. Pearson of Midnapúr; they consist of the following:

FRESH-WATER SHELLS.

1. *Planorbis.*
2. *Melania.*
3. *Paludina Bengalensis.*
4. *Ampullaria.*

LAND SHELLS.

5. *Helix.*
6. *Carocolla.*
7. *Bulimus Bengalensis,*—a variety with three lower bands on the whorl.
8. *Cyclostoma.*

To these catalogues, for the sake of reference, the following list of American shells presented in the name of Mr. Lea, at a former meeting, is subjoined.

24 varieties of the *Unio*, chiefly from the Ohio river.

U. tuberculatus, Barnes.
U. ovatus, Say.
U. plicatus, Lesueur.
U. securis, Lea.
U. nasutus, Say. *Schuylkill.*
U. torsus, Rafin.
U. occidens, Lea.
U. mytiloides, Rafin.
U. æsopus, Green.
U. metanever, Rafin.
U. ellipsis, Lea.
U. pustulosus, ditto.
U. complanatus [*purpureus*.]
U. irroratus, Lea.
U. siliquideus, Barnes.
U. cuneatus, ditto.
U. perplexus, Lea.
U. zigzag, ditto.
U. undulatus, Barnes.
U. foliatus, Hildreth.
U. gibbosus, Barnes.
U. cariosus, Say, Sch.
U. rectus, Lane.
U. circulus, Lea.

Venus, Mercatoria, N. Jersey.
Symphynota alata, Lea, Ohio.
ochracea, Sch.
Solen ensis, Lam. N. Jersey.
Achatine vexillum, do. Cuba.
Alasmadonta undulata, Say, Sch.
Murex capillis, Massts.
Spirula peronia, Florida.
Petricola fornicata, Say, N. Jersey.
Melania Virginica, Say, Sch.
conica, ditto, Ohio.
canaliculata, ditto, ditto.
multilineata, ditto, Sch.
armigera, ditto, Ohio.
Helix, *albolabris*, Say, ditto.
thyroides, ditto, ditto.
anculosa preciosa, ditto.
Turbo, *irroratus*, New Jersey.
muricata, Cuba.

Mr. Benson, on departing for Europe, begged the Society's acceptance of his copy of Lamarcke's "*Histoire Naturelle des Animaux sans vertèbres*," the five first volumes.

4. A letter was read from Dr. Royle, late Superintendent of the H. C. Botanical Garden at Seharánpúr, presenting to the Society—

1. A plan and description of the Botanic Garden at Seharánpúr, with catalogues of the contents of the Garden and of the Herbarium. [Printed in the present number.]

2. Drawing of the Alpine Hare, or *Pika* of Buffon, of the natural size, from the Chúr mountains, at eleven thousand five hundred feet of elevation.

3. Specimen of a rich iron ore, (Magnetic,) from the Phagúní mine, on one of the branches of the Chúr mountain.

4. Specimen of the Trap Rock, or Dyke, discovered near Masúrí, by Lieutenant Cautley, from Dr. Falconer.

5. Specimen of the *Bijlí ke-hár*, alluded to in Captain Herbert's paper.—[Gleanings III. 269.]

A note by the Secretary pointed out, that the substance of these bones has not undergone mineralization, as supposed by Captain Herbert, excepting in so far as they are impregnated with iron. The animal matter of the bones takes fire at a red heat, and the bone, on cooling, is of a fine blue colour, resembling the *Odontolite*, or *Bone Turquoise*, of Johns. The composition, on a hasty analysis, was found to be—

Animal matter, ...	12.
Phosphates of lime and magnesia, ...	70.
Carbonate of lime, ...	14.
Oxide of iron, ...	2.

The interior of the bones is filled with calcareous crystals.

Mr. B. H. Hodgson's paper on the Mammalia of Nipál was then read.

Also, Dr. Royle's description of the Garden at Seharánpúr.

The thanks of the Society were voted for the above contributions.

2.—Medical and Physical Society.

4th February, 1832.

Dr. Madden was elected a Member of the Society: and Dr. William Chalmers, of Croydon; Mr. O. Walter, Surgeon, of Dover; and Senor Don Francisco Xavier Lazo, M. D. Secretary of the Medico-chirurgical Society of Cadiz; were elected corresponding Members. Hugh Guthrie, Esq. Assistant Surgeon, Bengal Service, requested to return to the Society, and have his name replaced on the list of Members, agreeable to the resolution passed on the 4th April, 1829, which was complied with accordingly. Several communications were then laid before the Society.

1.—A letter from Dr. J. N. Casanova, a corresponding member, stating that, as he had resolved to reside permanently in Calcutta, he was desirous of being admitted a resident member of the Society, for the purpose of contributing his subscriptions, and assisting at the meetings; he was therefore proposed as a member of the Society, by Mr. Egerton and Mr. Twining.

2.—A letter from Dr. Milne, of Bombay, enclosing his third communication on Dracunculus, with three reports, numbered 4, 5, and 6, in support of his opinions on that subject.

3.—A communication from Brigadier O'Halloran to the Secretary, accompanied with the root of a plant similar to that presented at the last Meeting from Dr. Robert Tytler, and said to possess the property of preventing the scorpion from stinging.

4.—A statement from Mr. Boswell, relative to the benefits he had seen follow the employment of venesection in the cold-stage of Intermittent Fevers, while he was employed with the Artillery at Dum-Dum, where he had employed this treatment in obstinate agues, with invariable success, and only in one instance was obliged to repeat the bleeding in the cold stage.

5.—A letter from H. Guthrie, Esq. with remarks on a native prescription for ring-worm.

6.—A letter from J. L. Geddes, Esq. Assistant Surgeon, Madras Service; with the statement of a case in which the Madar had proved remarkably successful in the cure of an obstinate ulcer.

7.—A letter from Dr. D. Stewart, of Howrah, stating, that during an excursion to Shikarpúr, he had been consulted by a native young man, who had suffered for five years from nasal polypi; whereby his health had become much impaired, and in fact, the patient was reduced to a skeleton. The disease had acquired an enormous bulk, pressing down into the posterior fauces and pharynx, so as to prevent the deglutition of any solid food, and to embarrass the respiration exceedingly; and probably also to affect the circulation, as the patient suffered from distressing headaches. The disease was effectually removed by ligature and torsion.

Dr. Smyttan's Treatise on the varieties of East Indian Opium was read and discussed by the Meeting. Dr. S. observes, that the varieties of East Indian Opium seem to be little known or recognised in Europe, and that good Turkey Opium is said to contain nearly three times the quantity of morphine, or narcotic principle, that is found to be procurable from the product of the Bengal provinces. The best produce of the Malwa districts is said to differ from Bengal Opium, both in appearance and quality, quite as much as the Turkey Opium does. Dr. Smyttan's opinions are formed from extensive observations made while he was Inspector of Opium at Bombay, compared with the records of that office; and with the experiments made at Calcutta by the late Dr. Jameison in 1821, which are given with a table in the Appendix: to which is annexed a table of experiments made at Bombay by Dr. Maxwell. The whole of these appear to have been conducted with great care and attention. The general results of a series of experiments conducted by the author are corroborative of the accuracy of the tables alluded to in this paper.

At the conclusion of the Meeting, some splendid drawings of Medicinal Plants were placed on the table by Mr. Royle.

3.—SOCIETE D' HISTOIRE NATURELLE of the Mauritius.

8th March and 12th April, 1831.

The Secretary presented to the Society, the Baron Cuvier's *Analyses des Travaux de l'Académie des Sciences de Paris,* for 1822, 25, 26, 27—in the name of the illustrious author.

M. Rob. Lyell, M. D. read a note on the subject of the astronomical observations made by him at *Tannanarivou,* capital of the kingdom of the Ovas, in Madagascar, whence the latitude of the place was found to be 18° 56′ 20″ S. and the longitude 47° 57′ 46″ E. of Greenwich.

The same member also described two plants, met with in Madagascar by M. W. Bojer. One is the *Euphorbia splendens,* BOJ. now become common in the gardens of the Mauritius, but of which Dr. L. made known a variety with a yellow flower. The other is the *Poinciana Regia,* BOJ. now also naturalized in the island. Both are figured in the last numbers published by Professor Hooker of Glasgow, a corresponding member of the Society.

M. Liénard Pére read an account of a fish of this island, belonging to the genus *Pleuronecte,* and remarkable for certain rays on the pectoral fins, extending the whole length of the animal; a drawing accompanied. The islanders rank this fish among the soles.

M. J. Desjardins continued his analysis of *Zoologie du Voyage de l' Uranie,* chiefly adverting to the Polypi, which play so important a part in the natural history of the island.

The Secretary also described the hail, which fell in the storm of 8th February, at the *Camp de Masque,* as of the size of small peas, proving destructive to tender plants.

Many letters of correspondents were communicated. One from M. Quoy, of Paris, stated, that M. le Baron G. Cuvier had yielded to the desire of the Society, to become possessed of his bust. The following paragraph added weight to M. Desjardin's observations. "Detruisez donc cette opinion populaire *du corail qui entre en fleur,* vous insulaires, vous aurez pour cela plus de facilité et de prépondérance que nous autres qui ne faisons que passer."

A letter from Dr. Smith, of Algoa Bay, announced his intention of publishing the Society's proceedings in the South African Quarterly Journal.

M. Mn. Sauzier, of Bourbon, wrote that the volcano of that island had several violent eruptions in November, December, and January, from two distinct craters. There was no flow of lava, as had been reported at St. Dennis.

The president communicated the notes of M. J. Cameron, of Madagascar, relative to some minerals, particularly to an aerolite which fell on the Mozambique coast. Mr. C. announced that the Queen of the Ovas, Ranavalon Manzaka, had bestowed an annual donation of £60 towards the expence of a practical course of chemical lectures, which many of her subjects are already sufficiently educated to understand and appreciate.

M. Bernard, Proviseur du Collége Royal, and M. J. N. Casanova, D. C. M. were admitted honorary members of the Society. The latter presented his work entitled "Examen de las Aguas minerals de San Pedro, &c. 1827."

Meteorological Register, kept at the Surveyor General's Office, Calcutta, for the Month of February, 1832.

Days of the Month.	Minimum Temperature observed at sunrise.					Maximum Pressure observed at 9h. 50m.					Observations made at Apparent Noon.					Max. Temp. and Dryness observed at 2h. 40m.					Minimum Pressure observed at 4h. 0m.					Observations made at Sunset.					Rain Gauge, No. 1.	Rain Gauge, No. 2.
	Barometer reduced to 32°.	Temper. of the air.	Depres. of M. B. Ther.	Wind.	Aspect of the sky.	Barom. red. to 32°.	Temper. of the air.	Depres. of M. B. Ther.	Wind.	Aspect of the sky.	Barom. red. to 32°.	Temper. of the air.	Depres. of M. B. Ther.	Wind.	Aspect of the sky.	Barom. red. to 32°.	Temper. of the air.	Depres. of M. B. Ther.	Wind.	Aspect. of the sky.	Barom. red. to 32°.	Temper. of the air.	Depres. of M. B. Ther.	Wind.	Aspect of the sky.	Barom. red. to 32°.	Temper. of the air.	Depres. of M. B. Ther.	Wind.	Aspect of the sky.		
1	30,032	52,7	1,2	cu.	ci.	,085	67,	12,1	n. w.	ci.	,025	74,3	17,1	n. w.	ci.	,973	77,8	18,3	w.	cl.	,967	77,	18,1	w.	cl.	,975	70,	10,1	cm.	ci.		
2	,045	54,3	1,1	do.	cl.	,091	69,5	6,6	do.	do.	,036	75,3	17,3	do.	do.	,996	78,	19,3	n. w.	ci.	,993	77,3	19,4	n. w.	ci.	,009	72,	13,3	n. w.	do.		
3	,089	52,3	1,8	do.	do.	,130	69,	10,3	cm.	cl.	,083	75,	17,5	do.	cl.	,012	76,8	20,3	do.	cl.	,998	76,	19,5	do.	cl.	,002	69,7	10,2	cm.	cl.		
4	,038	52,3	1,1	do.	do.	,086	70,3	11,6	n. w.	do.	,997	75,	16,1	do.	do.	,973	79,5	20,3	do.	do	,963	78,	17,3	do.	do.	,971	72,	12,3	do.	do.		
5	,015	55,5	1,	do.	do.	,046	71,	4,8	n. e.	cu.	,008	75,7	7,2	n. e.	cu.	,915	78,7	9,8	w.	cu.	,009	78,3	10,3	w.	cu.	,919	74,5	7,	do.	do.		
6	29,967	53,5	4,7	n.	cis.	,022	69,7	12,5	n.	do.	,989	76,7	17,8	n.	do.	,935	80,5	16,6	n. e.	ci.	,926	79,5	14,3	n. e.	ci.	,936	72,3	6,4	do.	ci.		
7	30,020	57,7	5,7	do.	ci.	,067	69,7	12,8	n. e.	cl.	,046	77,3	15,6	n. e.	ci.	,969	79,	17,1	n.	do.	,958	78,7	17,	n.	do.	,973	72,	8,3	do.	cl.		
8	,039	55,6	5,1	n. e.	do.	,081	69,	13,5	do.	ci.	,045	77,	18,1	do.	cl.	,976	78,	17,9	n. e.	cl.	,966	77,	14,5	n. e.	cl.	,963	72,	8,3	do.	do.		
9	,032	57,3	2,6	cm.	do.	,081	69,8	8,8	n. w.	do.	,043	77,7	12,5	n. w.	ci.	,971	80,3	12,6	n. w.	cu.	,969	77,5	11,3	n. w.	cis.	,975	73,	4,8	do.	cis.		
10	,015	63,5	1,6	do.	fg.	,040	70,7	2,5	s. w.	cu.	,071	80,5	8,8	s. w.	cu.	,919	83,6	14.1	s. w.	do.	,912	83,	13,1	s. w.	cu.	,911	78,5	7,3	do.	cl.		
11	29,954	67,5	1,3	do.	do.	,988	75,	5,1	do.	do.	,958	82,3	10,6	do.	do.	,857	83,3	11,4	do.	do.	,856	82,7	11,2	do.	do.	,864	78,3	8,1	s. w.	cus		
12	,907	63,3	1,6	do.	ci.	,951	77,3	11,6	do.	do.	,898	81,	14,8	do.	do.	,806	86,5	17,5	do.	cl.	,800	84,5	17,	do.	do.	,810	80,	9,3	cm.	cl.		
13	,912	66,3	3,6	n. e.	cus.	,944	73,5	6,8	w.	do.	,871	80,5	9,6	w.	do.	,797	83,	12,8	w.	cis.	,797	82,5	14,8	w.	cis.	,805	79,5	12,8	w.	cis.		
14	,875	69,5	1,3	s. w.	cy.	,935	77,	5,3	s. w.	do.	,892	81,	8,3	s. w.	do.	,806	85,	13,8	s. w.	cu.	,776	84,5	12,3	s. w.	cu.	,819	71,3	4,1	n. e.	cl.		
15	,900	67,5	1,8	cm.	cis.	,941	71,	3,8	cm.	cis.	,935	73,	3,8	w.	n.	,924	69,5	3,6	w.	n.	,923	69,	4,1	w.	n.	,934	67,5	3,6	n. w.	n.		
16	,956	62,3	2,1	n.	n.	,007	62,5	1,	n. e.	rn.	,985	62,3	1,4	n. e.	rn.	,921	63,3	1,5	n. e.	do.	,886	63,	1,8	n. e.	do.	,886	62,7	1,2	n. e.	cus.		
17	,955	62,5	1,6	cm.	cus.	,036	67,3	3,4	do.	cu.	,016	70,7	6,2	do.	cu.	,962	75,	9,	n. w.	cu.	,963	74,7	8,5	n. w.	cu.	,980	71,	5,8	cm.	cl.	1,65	1,50
18	30,055	61,3	1,1	n.	cu.	,108	69,7	5,9	n.	do.	,070	76,	10,1	do.	do.	,013	76,3	10,4	n. e.	cis.	,007	76,	11,2	n. e.	cis.	,017	72,	6,3	do.	cis.		
19	,019	64,7	1,2	cm.	cis.	,073	72,7	7,8	n. e.	do.	,051	75,5	9,8	do.	do.	,945	79,5	13,3	do.	cu.	,944	78,7	11,8	do.	cu.	,955	75,	9,3	do.	ci.		
20	29,994	59,5	3,3	do.	cl.	,037	70,7	10,	do.	cl.	,989	78,	12,8	do.	ci.	,929	78,	14,3	n.	cis.	,924	76,3	12,1	n.	cis.	,925	73,7	10,5	n.	cis.		
21	,951	64,5	6,	n.	cis.	,018	69,5	11,	n.	ci.	,976	72,8	13,3	do.	cu.	,907	76,3	10,4	cm.	do.	,895	75,	10,1	cm.	do.	,904	73,	8,2	cm.	do.		
22	,906	62,5	1,3	cm.	ci.	,932	70,5	5,6	w.	cu.	,893	77,	9,3	w.	do.	,817	80,7	12,	w.	cu.	,779	80,	14,3	w.	cu.	,785	76,5	8,8	do.	cl.		
23	,818	62,7	1,5	do.	cl.	,869	71,5	9,8	s. w.	cl.	,833	78,	13,3	s. w.	cl.	,758	82,	16,1	do.	do.	,742	81,3	16,6	do.	do.	,755	77,3	12,6	w.	do.		
24	,820	67,	6,3	n.	cis.	,871	70,5	10,	cm.	cus.	,815	76,	9,8	n. w.	cus.	,738	77,	10,5	n. w.	cus.	,715	76,3	8,3	n. w.	cus.	,730	74,5	5,8	cm.	cus.		
25	,726	64,5	1,7	cm.	cl.	,781	69,8	4,9	n.	cu.	,764	72,5	6,	cm.	do.	,698	76,7	9,5	n.	cu.	,698	75,	8,1	n.	cu.	,720	73,5	6,6	do.	cl.		
26	,784	66,	1,3	n. w	cu.	,848	76,	11,5	n. w.	cl.	,821	79,7	15,5	n. w.	cl.	,737	81,3	17,6	w.	do.	,729	80,	17,1	w.	do.	,761	76,	13,5	do.	cu.		
27	,835	65,	7,5	cm.	do.	,891	71,	15,3	do.	do.	,857	75,7	18,7	do.	do.	,782	79,5	19,9	n. w.	cl.	,772	78,5	20,	n. w	cl.	,783	73,	14,2	n. w.	cl.		
28	,841	56,5	2,4	do.	cl.	,911	71,	13,3	do.	do.	,888	76,5	18,3	w.	do.	,818	79,	23,3	w.	do.	,809	77,3	21,	w.	do.	,828	72,5	14,	cm.	do.		
29	,851	57,	6,3	w.	do.	,899	74,5	16,8	w.	do.	,871	78,3	12,1	do.	do.	,799	82,3	23,8	do.	do.	,788	81,3	21,8	do.	do.	,794	75,	8,5	do.	do.		
Mean,	29,943	61,2	2,7			,992	70,9	8,8			,953	76,3	12,5			,885	78,8	14,4			,878	77,9	13,7			,886	73,4	8,7			1,65	1,50

Abbreviations. In the column " wind," small letters have been used instead of capitals; *cm.* means *calm.* In the column " aspect of the sky," *cy.* is *cloudy; ci. clear; rn. rain; ci. cirrus; cu. cumulus; cs. cirro-stratus; cus. cumulo-stratus; cc. cirro-cumulus; n. nimbus.*

JOURNAL

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1.—*Analysis of the Puránas.* *By* H. H. Wilson, *Sec. As. Soc.*

[Read at the Meetings of the Asiatic Society.]

1.—*The Agni Purána.*

The *Agni Purána,* or more correctly, in a derivative form, the *Agneya Purána,* is one of the eighteen principal *Puránas.* Although, in common with the other compositions so termed, it is attributed to *Vyása,* it is narrated as usual by his disciple *Súta,* and was received by him from the *Muni Vasishtha,* to whom it was communicated by *Agni,* whence its denomination.

According to the assertion of its own text, the *Agneya Purána* contains fourteen thousand stanzas; the *Bhágavat* and other authorities give it 15,000 or 16,000. The copy to which this account refers, has about the former number.

The text is divided into a number of small sections, according to the subject, but without any enumeration: the number of them in the present instance amounted to 332. Colonel Wilford speaks of a supplement, and of a chapter, apparently the same, which he calls the 63rd, or last. The supplement, however, from which he derives his account of the modern princes of India up to the *Mohammedan* invasion, is no part of the work to which the name of *Agneya Purána* is applied. It is clearly a distinct and subsequent composition.

The *Agneya Purána* is interesting from the variety of the subjects of which it treats, and in which it deviates very materially from the definition given by its own reputed author of the contents of a *Purána.* These *Agni* declares to be five: primitive creation; subsequent creations; the genealogies of demigods and kings; the reigns of the Menus, and the histories of royal dynasties. These, however, occur but imperfectly in the body of this work, and the far greater portion of its contents is of a widely different character.

After the usual opening, the *Agneya Purána* describes the ten *Avatáras*, and in the relation of those of *Rámachandra* and *Krishna*, follows *avowedly* the *Rámáyana* and *Mahábhárat*, being consequently posterior to those works.

The ensuing chapters relate to the worship of *Krishna*, as *Náráyana* or *Vishnú;* this *Purána* being of the *Vaishnava* class: at the same time it leans very favourably to the worship of *Siva*, as the *Linga*, and is full of *Tántrika* ceremonies in honor of that form of the deity. It was compiled therefore probably anterior to any wide separation between the *Saiva* and *Vaishanava* sects, and it was undoubtedly prior to that modification of the *Vaishnava* faith, which pays such infinite veneration to *Krishna* as *Gopála*, or *Govinda*, or *Bála Gopála*, the cowherd or the infant god; no allusion to whose worship has been found, nor has the name of his favourite mistress *Rádhá* once been encountered.

The ritual, including the ceremonies of the *Homa*, or burnt offering; the *Mantras*, or mystical formulæ; the *Mandalas*, or mystical diagrams; the *Pavitra*, or purificatory thread; the erection and consecration of temples, images, tanks, gardens, flags, jars, &c. extends through a number of chapters; it is in its general purport *Vaishnava*, but the *Linga* and several of the *Tántrika* forms of *Durgá* are also especially reverenced; *Mantras* are abundantly introduced, as are the acts and gesticulations with which they are muttered or recited. The style in which they are narrated is however abrupt and obscure, and the ceremonial so confusedly and indistinctly laid down, that the whole has the appearance of a string of garbled extracts, rather than of a systematic detail. There is a general correspondence between these chapters with those of the *Sáreda Tilaka* and *Mantra Mahódadhi*, but it does not appear that they are identically the same.

This chapter is followed by the *Bhuvana Kosha*, (the description of the universe,) which corresponds generally with the same in other *Puránas*, but is much less explicit than in some of them. This chapter comprises the *Tirthas*, or places of pilgrimage, of which however it enumerates very few, and those but briefly. It is worthy of notice, that the *Nermadá* and *Sri Saila* are especially noticed, whilst the northern mountains are not mentioned, and also that Benares is called *Avimukta* in its religious character; whence it may be inferred, that the chief shrine was that of *Siva*, as *Avimūkteswara, not Viswesara*, the form that has been most popular for some centuries at least. The site of Benares was the same as at present, or between the *Varana* and the *Asi* rivulets.

The *Máhátmyas*, or legends of the few *Tirthas* noticed, are very brief, except that of *Gayá*, which is so very minute, that it may be suspected to be an interpolation, as it is not in keeping with the rest, nor with the manner in which all such subjects are usually disposed of in a Puránic miscellany. Such interpolations or rather appendages are not at all uncommon, although the legends are more frequently attached to some of the other *Puránas*, as the *Brahmánda* and *Skánda.* We have, however, a case in point with the *Agni Purána*; there being current in the South of India a work called the *Káverí Máhátmyam* of the *Agni Purána*, which is never found in the copies of the *Purána* itself, and which indeed is very nearly as extensive as the whole work of which it is called a section.

The *Tirthas* are followed by the description of the Indian continent, and other portions of the world; also the distances and dimensions of the regions below and above it. The whole of this chapter has not been compared with other works, but in some passages, particularly the description of the sun's car, it is word for word the same with the text of the *Vishnú Purána:* being in other respects, however, much less full and satisfactory than that work.

The description of the sun and planets leads to the astronomical or astrological section, and that to magical rites and formulæ; from these the work proceeds rather abruptly to the periods of the *Manwantaras*, and then to the civil institutes of the *Hindú* caste, as birth, investiture, marriage, death, &c. the duties of the religious orders, and the contemplation of the deity, conformably to the tenets of the *Vedanta:* a long string of *Vratas* or religious obligations, both special and occasional, follows. The next subject discussed is, that of gifts as religious duties, and this branch of the work finally closes with the description of corporeal austerities of a meritorious and pious complexion.

The next portion of the *Agneya Purána* treats at considerable length, and with many interesting particulars, of the duties of princes, beginning with the ceremonies of their coronation, and comprehending their civil and military obligations; it forms what constituted the *Nití* of *Hindú* writers, (Polity or the art of government,) and is of a character with which *Hindú* ideas have long ceased to be familiar. Some of the details correspond accurately enough with those that occur in a passage of the *Dása Kumára*, and both are probably indebted to a common source, possibly the work ascribed to *Chánakya*, cited by the author of the *Dása Kumára.* As the system is wholly unmixed with foreign notions, and is purely *Hindú*, it can only relate to a state of things anterior to the *Mohammedan* invasion; it is not a necessary consequence, it is true, that the *Agneya Purána* should bear a similar date, but it is an argument rather in favour of such a belief, and contributes with other grounds to authorize such a conclusion, if not for the whole work, for a very extensive portion.

The like genuine *Hindú* character belongs to the sections that follow on the shape of weapons and archery, the phraseology and practice of which are no longer known. These sections of the *Agneya Purána* are indeed particularly valuable, as they preserve almost, if not quite, singly, the memory of former regal and martial usages.

The chapters on the subject of judicature and law are so far curious, that they are literally the same as the text of the *Mitákshara*, ascribed to the *Muní Yajnyáwalkya.* The antiquity of that text is, in the estimation of the *Hindús*, extravagantly remote; but without reference to their belief, it is certainly not very modern, as passages have been found on inscriptions in every part of India, dated in the tenth and eleventh centuries. To have been so widely diffused, and to have then attained a general character as an authority, a considerable time must have elapsed, and the work must date therefore long prior to those inscriptions; at the same time, this throws little light on the period at which the *Purána* was complied, the author of which might in any day transcribe the code of *Yajnyáwalkya*, although it is possible, that so undisguised a transfer may have preceded the time at which the legislative code was in general and extended circulation.

The chapters on law are followed by a rather miscellaneous series regarding the perusal of the *Vedas*, the averting of threatened ill-fortune, burnt-offerings, and the worship of various deities. We have then a short but curious chapter on the branches of the *Vedas*, and speaking of the *Puránas*, the following remarkable passage occurs: "six persons received the *Puránas* from *Vyása*, and were his pupils; their names are *Súta*, *Lomahersha*, *Sumati*, *Maitreya*, *Sinsapáyana*, and *Suvarni*." These, therefore, are probably the real authors of most if not of all the *Puránas*. It is said also, that *Sinsapáyana* and others compiled a *Sanhitá*, or epitome of all the *Puránas*.

The next chapter on gifts to be made, when the *Puránas* are read, contains the list of the *Puránas* and the enumeration of the stanzas they contain. In this respect many differences occur from similar enumerations in other *Puránas*, and the *Siva Purána* is altogether omitted. With regard to the narrators and the chief subjects at least, in some cases, this detail varies from the text of the works as now found;

these variations will be best noticed when we come to the respective *Puránas* to which they relate.

The list of the *Puránas* is followed by the genealogical chapters detailing the families of the Sun and Moon, but more particularly the latter, and especially the houses of *Yádu* and *Puru* to the time of *Krishna* and the *Pándávas.* These chapters agree generally with the dynasties usually detailed, but the lists are for the greater part very dry and abrupt, whilst few of the ordinary legends are preserved, and those so concisely as to be very obscure. There are some details relating to *Krishna* of a rather remarkable character. The time at which these chapters close leaves us no inference regarding the age of the compilation.

The next subject is medicine, taken avowedly from the instruction given by *Dhanwantari* to *Susruta*, or from the medical work attributed to the latter; the extracts are, however, very injudiciously made, with an utter disregard of method; and with a perverse selection of every thing least important: it also alludes to the classification of medicaments as hot and cold, and although it does not attach the same importance to the system as is given to it in *Mohammedan* medicine, yet its introduction at all, is rather in favour of its being derived from such a source, for it is not certain that the ancient writers *Charaka* and *Susruta* laid any greater stress upon these particular properties, than they are entitled to, without reference to a theoretical system. The part of the *Purána* likewise includes much mystic medicine or curing by charms.

Another set of chapters on mystic rites and formulæ follows, and on the worship of different forms of *Siva* and *Devi.* The whole so incompatible with a *Vaishnáva* work that it is difficult not to suppose them additions by other and perhaps later hands.

Poetry and rhetoric form the next subjects, and conform to the systems usually received: the authority of *Pingula* is specified. The work concludes with a grammar, omitting the verbs: the system is that of *Panini* and *Kátyáyana:* the commentator on *Panini* is cited by name. The compilation is therefore posterior to the existence of the great body of *Hindú* poetical compositions, and to the consummation of the grammatical construction of the Sanscrit language.

From this general sketch of the *Agneya Purána*, it is evident that it is a compilation from various works; that consequently it has no claim in itself to any great antiquity, although from the absence of any exotic materials, it might be pronounced earlier, with perhaps a few exceptions, than the *Mohammedan* invasion. From the absence also of a controversial or sectarial spirit, it is probably anterior to the struggles that took place in the 8th and 9th centuries of our era, between the followers of *Siva* and *Vishnú*. As a mere compilation, however, its date is of little importance, except as furnishing a testimony to that of the materials of which it is composed. Many of these may pretend no doubt to considerable antiquity, particularly the legendary accounts of the *Avatáras*, the section on regal polity and judicature, and the genealogical chapters: how far the rest may be ancient, is perhaps questionable, for there can be little doubt that the *Purána* as it now exists, differing from its own definition of *Purána*, and comprehending such incongruous admixtures, is not the entire work as it at first stood. It is not unlikely that many chapters were arbitrarily supplied about 8 or 9 centuries ago, and a few perhaps even later; to fill up the chasms which time and accident had made in the orginal *Agneya Purána*.

II.—*On the Poetry of Madagascar.* *By the* Rev. Mr. Baker.

[Communicated by C. Telfair, Esq. President of the Mauritius Nat. Hist. Soc.]

The most prominent characteristic of the Malagasy language, in reference to Poetry, is a total averseness to rhyme. Whilst it is admitted that the same identical sound is not legitimate rhyme, the extreme paucity of the language in terminations will ever preclude the introduction of rhyming verses. At least nineteen-twentieths of the whole vocabulary of words terminate in *a* or *y*, and an immense proportion of these in *na* and *ny*:—all other words terminate in *e*, or *o*, or the diphthongs *ay* and *ao*; and even these are exceedingly monotonous in the consonants of their penultimate and ultimate syllables. The best couplet I recollect to have heard has the rhyme of hoē and mē, answering exactly to the English words, way and may, and the jingle of such a rhyme has in the Malagasy language an unnatural and harsh effect. In the genuine native verses I have not met with any such instance as the one specified, but have observed that rhyme of every description seems naturally from the true genius of the language, and intentionally from the uncouthness of its effect, inadmissible.

So far I have ventured to assert with confidence, and without any apprehension of future observation disproving my opinions:—but when the question arises, what then constitutes poetry or versification in Malagasy? I am conscious that uncertainty and error may very possibly attach to the opinions I shall present in reply. Future observation, combined with a more adequate knowledge of the subject, may disprove my present opinion, and substantiate what I at present reject as destitute of proof. I make these remarks as introductory to the opinion that *quantity* (except so far as quantity and the number of syllables and accents may be regarded as necessarily synonimous) furnishes no rule for measuring Malagasy verses. No examples have come to my knowledge of lines having a credible claim to correctness, in which two apparently short syllables of one line are put to correspond with one long syllable of an equivalent line; but, where the number of syllables in a line exceeds those of a corresponding line, the metre is preserved by cutting off some syllables; and thence gliding two into one reading, and by lengthening the half syllables of verbal terminations into perfect syllables.

Every word in the language is strongly marked by one accent or more, corresponding in this respect with English. But in English it is observable, that the accent, falling on the vowel, leaves the syllable always long, and falling on the consonant, leaves the syllable short. I do not observe any similar distinction in Malagasy, excepting that there are a few words terminating in ē long, and thence carrying the accent. Probably in Malagasy the accented syllable is universally long, and the long syllable universally accented.

Granting the Malagasy verses to be divisible into feet and capable of being scanned, there is perhaps no instance to be found of a line corresponding with a line in Latin. In Latin, the number of syllables varies, and the last is deemed long; the reverse of these two cases is the fact with regard to Malagasy. Moreover the feet, constituting a line, seem to have no correspondence with the purest metres in Latin. Thus the most harmonious lines in Malagasy coincide syllable for syllable and accent for accent with the following:

" Tsy̆ hītă nāo vă ny̆ māty̆	Dost thou not see the dead
Mărāină tsȳ mbă mămindrŏ."	Morning not warm at the fireside.

Consisting of an amphibrach, trochee, and amphibrach. These the natives regard as the most harmonious lines; yet there are in the same ode lines quite different in respect to the situation of the accented syllables; as in the following couplet:

" Tsy̆ măhālālă hāvăn kŏ tōngă	Not knowing what kindred shall come
Aīză ny̆ ōlŏnă ĭrēny̆."	Where are people *as* these?

Lines which, notwithstanding their diversity, do not appear essentially destitute of harmony.

These lines have more similarity to English, so far as that a certain uniformity of syllables and accent is essential in both languages; and the harmony of the verse arises from the accentuation and the cæsura. The latter seems plainly discernible in Malagasy, as in this line:

> "Văvăhädy̆ hĭdĭrănă—mīsy̆ hiāny̆,"
> (A door of entrance—that there is.)

Yet the verses are unlike to English in respect to their being destitute of rhyme, unaccented on the last syllable of a line, and scarcely if ever permitting one line to run on in a continuous sense into another.

The characters peculiarly essential to Malagasy versification seem to be chiefly the following:

1. Harmony of syllables and accentuation; a deviation from which rule produces a precisely similar harsh discordant effect on the ear as in English.

2. The expression must be diversified, and the words transposed, as in other languages.

3. Every line must be in some degree an independent sentiment; or at least a clause of a sentence, bearing a natural division in the sense, and thence a pause of the voice in reading or singing. Hence the sense is often strikingly abrupt and laconic, as will be seen in the examples of literal translation.

The language abounds much in polysyllables; there are exceedingly few monosyllables, and perhaps the greatest proportion of the words are of five syllables. Hence a line of eight syllables generally contains from two to five words, and a line of twelve is frequently comprised in four words. On this account a sentiment is rarely attempted to be set off with superfluous ornaments of language, but stands entirely on the merit of the figure under which it is conveyed. Of poetical adjectives, so often highly convenient in English for filling up the metre or adorning a graceless noun, scarcely an instance occurs in an entire song. Yet the language, thought, and style of the poetry is quite of a different cast from prose. Abounding in the boldest figures, and the sense left to connect itself by the chain of thought, it commends itself to the mind as the rude and unpolished offspring of poetical genius.

It is evident, that in a language so exceedingly different from English, combined with a state of society equally different, it is impossible, on the one hand, to give an intelligible literal translation, leaving the reader's imagination to fill up the images; and on the other hand, it is difficult to give a vivid imitation of the original. For myself, I pretend not to any talent in poetical composition, and am induced to make the attempt merely by the novelty of the subject, until some more able pen shall display in language more worthy of its subject the gleannings of orally preserved versification to be found in Madagascar. In the mean time, I have only to plead for all deficiencies, that I am not setting forth myself as an author, but only as a translator, and that from a language wherein nothing can be looked for rising above mediocrity in the estimation of cultivated minds. I shall be abundantly requited for my trouble, should these contributions tend in any measure towards evincing that the native inhabitants of Madagascar, degraded as they actually appear, especially when contrasted with the enlightened population of civilized Europe, are nevertheless not destitute of natural genius, nor by any means insensible to the finer feelings and passions of human nature.

I ought not to conclude without observing, that there is a kind of composition very prevalent in the language which is neither perfect prose or poetry, but seems to form a connecting link between the two, being both in sentiment and expression more pithy, figurative, and smart than the former, and yet destitute of the metre, cadence, &c. of the latter. These pieces may be called poetical prose. A prose translation of such fugitive examples as have fallen into my hands would be dull and unstriking, and a *literal* rhyming translation impossible; so I have chosen in the accompanying example "on courtship," a translation pretty free in expression, but I believe perfectly correct, though somewhat paraphrased, in thought*.

It appears, as far as I have discovered, that all compositions, in Malagasy, of a poetical turn of thought, are written in this style, except songs; the latter being the only compositions I have yet met with evidently written in regular metre.

The following, as well as several suceeeding songs, are by a man called Razafiláhy, who happening to be a cripple, and unable to work, turned his attention to song-making, by which it is said he obtains a tolerable livelihood. He is a stoutish man, rides out on the back of a male slave, and has as buxom and merry looking a face as any to be seen in Madagascar†.

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* We are inclined to differ in opinion with our author on this subject, and to think that a mere literal translation with explanatory notes, would have better illustrated the peculiarities of thought and idiom in the Malagasy language, than even the best versified imitation.

† As more convenient for the generality of our readers, whom we may safely presume to be unacquainted with the Malagasy language, we have arranged the original text at the foot of the page, leaving the English version uninterrupted.—Ed.

I.—*Literal translation of an Ode in praise of the Prince Rabódo. By* Razafiláhy.

Long, long, may live
Rabódonandríanampóina:
To the South is Ambátondrafándana*,
To the North Ambóhimitsimbina*,
To the West Ambóhimiándra*,
To the East Ambóhijanaháry*;
[He is] The full moon shining in the west,
The rising sun rising in the east.
Long live Rabódo,
Yea Rambóasaláma,
And Rakótosehéno na Radáma,
And his relations all,
Innumerable they;
The portions of land shall then be dollars,
The corners of the houses guns;
Endréhinantsíva is his portioned land,
Endréhinantsiva his house;
Possessing much, yet not haughty.
Orphans shall then be plump [with health],
Their mother living, then they well fed.
Yonder is the defence of rock,
Yonder the clothing of wood,
A fence of spears, yea second fence of men,
Long live Rabodonandrianampóina.
A single tree in a lake—
It is not "how many reign?"
For *there* is our only master.

I. *Ode in praise of Prince Rabódo.*

Hono re ny veloma
Rabodon and rianampoina
Atsimo n' Ambatondrafandana
Avaratry ny Ambohimitsimbina
Andrefana Ambohimiandra
Atsinanana Ambohijanahary
Volana tsinana ny avy andrefana
Feno manana ny avy atsinanana
Veloma Rabodo
Sy Ramboasalama
Sy Rakotoseheno na Radama
Sy ny havany tontonlo
Tsy tambo isaina,
Ny tokotany dia farantsa
Ny zoro n'trano dia basy
Endréhinantsiva ny tokotany ny
Endrehinantsiva ny trano ny
Manambe tsy'mba miavona
Kamboty, dia dongadonga
Velon'dreny dia botrabotra
Ao ny miaketso vato
Ao ny miakanjo hazo
Rova lefona ka temitr' olona oindray
Veloma Rabodonandrianampoina
Hazo tokana an-ory
Tsy firy no mandidy
Ka tompo nay any ao.

---

* Name of a village, which like all others in Imerina, standing on a hill, is a poetical object. These villages being conspicuous objects, lying to the North, South, &c. of Tananarivo, the prince's residence.

The following is the translation of another Ode by the same author.

II. *The Great River.*

Yonder Ambaniála's[*] streams go forth,
Ambóhidrapéto[†] to the north extends,
To the northward also Ambóhitrimanjáka;
[‡] "Guide well thy winding course,
Nor kill the people's sons with heedless might.
Too full, thou'rt like an ill-cut cloak,
Smothering the head it should set off.
Dried up, thou'rt like an insufficient dress,
Leaving the breast and arms naked.
And thus from day to day
Thou rollest onwards continually.
Soon at Iki'opa are thy waters found;
Iki'opa renowned through the world,
Devouring all, yet still unsatiated[||],
Lab'ring ever, and still thy work unaccomplished;
Ambohiboánjo from thy bank not far,
And southward Soavinimérina;
Behold Antânta abounding in eels,
[§] From whence murmuring sounds are heard;
The soldier here casts round his wandering eye
Thinking of distant friends.
Here thou art in jeopardy, new-wedded bride,
Should a dispute arise towards the evening;
For caprice controls the unsettled heart.
Discarded, thou wilt soon retrace thy steps!
But we again pursue the river's course

II. *Anonibe.*

Indro ny rano Ambaniala
Avaratr' Ambohidrapeto
Avaratr' Ambohitrimanjaka
Mahaiza mandeha
Mahaiza mizotra
Aza mamono zana' bahoaka
Tondraka, toa misaron' doha
Ritra, toa manao sikimbalaka
Ka ny azy re toetr' andro ny
Ka mivalambalan' indray
Koa man kany Ikiopa
Ikiopa rano malaza
Homambe fa tsy voky
Mivalambalan' indray
Mivalana dia any Ambohiboanjo
Any atsimo ny Soavinimerina
Indro koa re any Antonta
Ka migodongodom' piteny
Mahita anay lavi'kavana
Miady, mena masoandro
Ka tsy fantatr' ompanavao
Tsy vatra n'olona tsy honina

[*] This and others are names of villages lying far above the banks of the river.

[†] The whole beauty of the poem lies in a hidden allusion running through it to the kingdom; here perhaps is an admonition to the sovereign.

[‡] All other streams run into Ikiopa.

[§] That is, the sound of the distant waterfall, and by allusion, the repining of the soldiers going to war.

At Farahántsana next abide :
The people there with noisy long guns fire,*
And cannons, longer, and still more noisy :
Spitting the frothy foam and rising phlegm
Writhing in restless agony and pain†
Let each unwept forsake his best beloved!
For all partake the bitter curse.‡

◆

III. *Paraphrase of a poem called Ny Momba, or the Barren.* By the same Author.

1 To thee who dost all childless live,
Thou barren, this advice I give ;
' In place secure thy wealth with foresight lay ;'
For then a thousand tongues thou'lt find to say,
" Kind father, dearest mother, thou to me :"
No space their coming stays,
No rugged road delays.
But if thou pine in wretched poverty ;
Not thine gay robes to wear,
No flattery soothes thine ear,
No prattling babes entwine,
No equal portion thine.

Izahay re dia handeha
Ka tonga tany Ifarahantsana
Ka ny ao mepoa' basy lava
Ny ao mipoa' tafondro lava
Mitsipidrora mivalana
Mamoiza ny mana' malala
Fa samy efa nozoi'ny.

III. *Ny Momba.*

1 Izany Rakala momba,
Tehirizo trara ny harena ;
Fa raha misy ireny,
Atao ny hoe, ikiaky nao, ineny ;
Tsy mahalavitra ny tany,
Tsy mahasasa' mandeha,
Fa raha tsy manana ireny,
Lany haingio,
Lany laingia,
Lany zanaka.
Lany zara.

2 Momla lany havena,
Ny maso no apitrapitra ;
Tsy misy havan' kamangy,
Tsy misy zaza hitomany.
Noana, tsy manan' kangatahana ;
Voky, tsy manan' kotolorana ;
Marary, tsy manan' kitsabo,
Sasatra, tsy manan' kitsetra.
Eny Ramomba,
Maty, tsy manan' kitomany.

* Literally true of the Sakalava enemy, and figuratively of the water-fall, Ifarahantsana.

† Under the figure of the dashing of the water, alluding to the death of soldiers through war, fever, and famine.

‡ Every family has lost some relations in the devastating wars, and all must submit without repining.

2 The barren destitute of wealthy store,
Extends her wandering eyes the wide world o'er.
No loving friend to visit her is found,
No children, prattling all their wants, surround.
If hungry, none a scanty dole shall mete;
If satiate, none the falling crumbs shall eat;
By none thy sufferings are allayed;
If weary none shall give thee aid;
And, hapless, even when thou'rt dead,
No tears shall weep o'er thy last bed.

3 Thy shroud not half a dollar buys,
Nor sixpence sheep for sacrifice,
A penny pays for grease to light
Instead of taper thy sad ghost;
No friends shall watch the dreary night
To shallow grave shalt thou be hurried,
And with regardless haste be buried,
A farthing all thy funeral cost.
" Ah! mother, life is misery."
Yea barren, such thy fate must be.
Thou'lt fain the locust* catch, for whom?—
For children of a luckier womb,
Yea such, ill-fated barren, is thy doom.

4 Now barren, view thy husband dead,
And thou from parent's distant bed;
From head to foot sorrow's own image thou,
Unheard by all, thy sad bewailings now.
Ah! barren, thou in former days,
A father living,
A mother giving,
Couldst bathe in water fetch'd by slaves,
Caressed and blest in all thy ways.
Ah barren, now how chang'd thy state,
Thy father's life-dream o'er,
Thy mother now no more,
To bathe in tears thy wretched fate,
All cloth'd in rags, thou once mightst hate.

---

3 Vitan' damban' doso,
Vitan' ondryn' tsikiajy;
Vitan' tsabora mila voamena,
Atao ny lavenan' tandrevaka.
Tsy misy mpiaritory,
Ialany ny olo kajia;
Maty re aho raneny;
Izany Rakala momba
Misambo' balala
Ho an' janak' olona;
Eny Ramomba

4 Rakala momba, momba ka maty vady;
Ka lavi' dray aman' dreny;
Sady an-dolia no an-tongotra.
Miantso ka tsy fanta' ny,
Ray bado, ray bado;
Fahavelon' dro ray ney,
Fahavelon' dro reny;
Mandro rano autsakaina;
Raha mivoaka, tambatambazana;

* The poor among the people eat the locusts, and feed their children with them.

Link'd to some churl, I see in piteous plight
Thee pinch'd and waken'd at the morning light;
Expelled the cheering hearth, thy wedded right,—
“Ah, mother, life is misery;
Would I had died in infancy!”

5 I travelled eastward succour to obtain;
My father's kindred live hard by.
Alas! I'm chang'd; they know me not again;
Ah mother! like the dead am I.
I turn'd my steps into the northern way;
My mother's kindred live hard by.
Alas! I'm chang'd; thou'rt not the same, they say;
Ah mother! like the dead am I.
I turn'd me back again, and southward ranged;
My father's sister lives hard by.
But she like all my relatives is changed.
Ah mother; worse than dead am I.
I turn'd again a westward course to tread;
Tis there my mother's sisters live.
Their dead relation's awful blame they dread,
So careless pitch the boon they give!

◆

IV. *Paraphrase of an Eclogue in Poetical Prose.*—Author unknown.

On Courtship.

She. Pray tell me, since you oft profess
Your fervent love to me;
To what, if we may give a guess,
Your love may liken'd be.
He. Rice which affords our daily food,
And constant life supplies,
Is the best emblem of my love,
Which never never dies.
She. Ah no! not so thy love to me,
For that, thou deemest sweet,
Only when hunger presses thee
To take the proffer'd meat.
Then tell me, since you oft profess
Your, &c. (as in the first verse.)

Ray bado, ray bado;
Raha maty ro ray ny,
Raha maty ro reny;
Mandro rano maso
Mitafy lamba tseroka,
Mitoetra amy ny olona ny bado,
Mandry maraina, rongadrongati' ny,
Mamindro, atositosi' ny ny sasany.
Maty aho ry neny,
Tsy maty fony kely.
5 No ny nankaroa atrinanana aho;
Havan'dry kiaky no ao.
Nodiány ny olona tsy fantatra aho,
Maty aho ry neny
Nony nankao avaratr' aho;
Havan' dry neny no ao.
Nova'ny ny olon' kafa;
Maty aho rey neny
Noney nankao atrimo aho;
Zanak' olomianadahy no ao.
Novany fahatelo be;
Maty aho rey neny.
Nony nankao andrefan' aho,
Zanak' olona mirahavavy no ao:
Ny tao no manipy kely,
Fa matahotra ny tsiny ny maty.

He. I love you as the fountain pure,
Which yields a sure supply
Of that, without whose aid secure
My frame would quickly die.
She. Ah no! not so thy love to me,
For that, when dirt adheres
Which others scornfully may see,
Desirable appears.
Then tell me, &c.
He. The lamba* which around I fold
To guard life's vital flame,
Is that, which, next to thee I hold
Most needful to my frame.
She. Ah no! for that when older grown,
Disdain'd, thou wilt reject;
And ne'er again will it be known,
But lie in long neglect.
Then tell me, &c.
He. I love thee like the luscious taste
Of a new honey-comb,
Whose precious fruit is seized with haste,
And borne in triumph home.
She. Ah no! for there amidst the sweets,
Though luscious they be found;
The goodness not unmingled meets,
But dregs impure abound.
Then tell me, &c.
He. I love thee as the sov'reign king
Of this our native land;
Whose endless praises all can sing,
Whose word moves every hand.
She. To this, in truth, thy love compare,
Whose merely passing by,
Rebuking every vulgar stare,
Abashes every eye.

IV. *On Courtship.*

Tia nao tahaky n'inona angaha aho? Tia ko tahaky ny vany hianao.—Tsy tia nao aho izany, fa atao nao famoujy fo raha noana. Tia nao tahaky n'inena angaha aho?—Tia ko tahaky ny rano hianao.—Tsy tia nao izany aho fa atao nao fitia momba tseroka. Tia nao tahaky n'inona ary aho? Tia ko tahaky ny lamba hianao.—Tsy tia nao aho izany fa raha tonta afindra nao ka tsy tsaroa 'nao intsony. Tia nao tahaky n'inona angaha aho? Tia ko tahaky ny tantely hianao. Tsy nia nao aho izany, fa misy faikana. Tia nao tahaky n'inona angaha aho? Tia ko tahaky ny Andriamanjaka hianao. Tia nao tokoa aho izany, mandalo, mahamena' maso mijery, mahamenatra:—Tia nao takoa aho izany, fa tapi'java' nirina aho, tapi' java' naleha.—Tia ko tahaky ny kiaky sy neny hianao: velena, iray trano;—maty, iray hazo.

* The garment which a Malagasy wraps round his body, and which constitutes his only clothing, except what is wrapped round the loins; and without which he is called naked.

To him, indeed, thy love compare,
  Whose briefest, transient gaze,
With shame o'erwhelms, and deep despair,—
  Or drooping hearts can raise.
To this, indeed, thy love compare,
  I, of desire the end
And goal; wherever you repair,
  Still towards me you tend.
And I, my love to thee will prove,
  In all good faith and truth,
A filial daughter's tender love
  To parents of her youth.
Enjoying life, while life shall last
  One house our common home;
And when the mortal scene is past
  United in one tomb!

III.—*Extracts from Dr. Royle's Explanatory Address on the Exhibition of his Collections in Natural History, at the Meeting of the Asiatic Society, on the 7th March.*

Geology of the Dehra Dún.

The low range of hills skirting the Himalaya has a strip of jungle along its south-west base, and the valley of Dehra on the north-east. The highest peaks of this range are probably 3000 feet above the level of the sea, and its outline presents a serrated appearance. The lower strata are composed of a loose-grained sandstone, above which are layers of clay, and gravel-rolled stones are found on the highest peaks; the clay gravel and sandstones are all regularly stratified with the strata dipping to the N. N. E. at an angle of about 30°. From many of the rolled stones being found with their flat sides and long ends parallel to each other, though in different strata, and yet inclined at a considerable angle towards the horizon, it is evident, that they must originally have been deposited in horizontal strata, whence they have been raised into their present inclined position by some subsequent convulsion of nature.

The whole of this range, like the greater part of the plains of India, is impregnated with carbonate of lime; for frequently where the water percolates through the rock, and a favorable situation offers, stalactites are formed, as well as tufaceous limestone, and it is more than probable that the *kankar* of the plains is similarly formed. Lignite was discovered in this range by Captain Herbert, and by Lieutenant Cautley, of which an account has been given by the above two gentlemen. A writer in the *Bulletin des Sciences Naturelles* concluded, that this range was analogous in formation to the *Molasse* of the Alps. My friend and successor Dr. Falconer, without any knowledge of the opinions of this author, determined on his first visit to the *Kherí Ghát*, that this range was analogous to the *Nagelfluhe*, or *Molasse*, which is equivalent in age to the oldest of the tertiary series of English formations, or plastic clay, together with the London and Paris basons.

The valley of Dehra is elevated 2000 feet above the level of the sea, and is filled up with diluvial debris from at least 220 feet depth below the surface, as is indicated in the particulars of the strata discovered in the sinking of a well shaft by the Honourable Mr. Shore, detailed in the GLEANINGS OF SCIENCE, I. 164.

Discovery of Fossil Bones.

Dr. Falconer, in a letter received only a few days since, informs me, that he accomplished the tour alone, which we projected to have made together, for the purpose of visiting the place where the *lignite* is found in largest quantities. He communicates the very interesting and important discovery of fossil bones at that place: "I returned loaded, not only with lignite, but with *noble fossils of the monsters of the deep! bones of crocodilidæ, fragments of the skull of large turtles, and a fragment of a bivalve shell as large as an oyster.*" The identification of the range will therefore be certain, and we may expect an interesting paper on the subject from Dr. Falconer. It will be most curious to ascertain whether this deposit of organic remains is identical with the sources of the *bijli ke hár* to the north of the great chain of mountains, separated by the up-heaving of the latter; and, moreover, whether both formations are not connected with those of the Irawadí, so productive in magnificent specimens of organic reliquiæ.

Hour of Maximum Temperature in the Hills.

One peculiarity in the hill climate is the early period of the day at which the maximum of heat is attained. In the plains we know, that if horary observations are taken, we find the temperature of the air goes on increasing until 2 or 3 P. M. In the hills, on the contrary, if the same kind of hourly observations be taken, and a fine clear day be chosen, the thermometer will be found to rise rapidly from sun-rise until 10 A. M. when it nearly attains the maximum; the increase after that hour does not amount to more than a degree or so. As the latitude is nearly the same as that of Seháranpúr, the power of the sun's rays and the quantity of heat communicated in a given time, must be nearly the same: but in the plains it is allowed to accumulate; in the hills, on the contrary, some power must exist which carries off a portion of the heat as rapidly as it is communicated: this power is the breeze which is found daily to set in from the plains towards the hills, which commences about 10 A. M., (the very time after which so little increase takes place in the temperature,) and passing over the top of the range prevents the accumulation of any heat. It might appear, however, that as the atmosphere is heated to so high a degree in the subjacent plains, the effect of a breeze setting in that direction would be rather of a heating than that of a cooling nature; and it would be so, but the air as it ascends becomes less dense, and in proportion to this diminution of density is its capacity for heat increased, so that it is enabled to absorb all that which was sensible to the feelings, or was observed by a thermometer, in the plains; and thus, when it arrives at the top of the range, it feels cool and refreshing. At night a similar but more gentle breeze sets in from the hills towards the plains, and the two may with the strictest justice be compared to the land and sea breezes of the coast.

Vegetable Impressions of the Coal Strata.

On my way to Calcutta by dāk, I visited the coal mines of *Chinakúrí* and *Rániganj*, and procured a large collection of vegetable impressions, but I have not yet had time to ascertain whether there be any thing new among the number, though I am inclined to think, that the straight and striated unjointed reed was not among the specimens I saw with Dr. Falconer or the Rev. Mr. Everest. In travelling along the road after collecting these impressions, it struck me, that as the theory of the formation of coal supposes the existence of vegetables in swamps or *jhils* of a former period of the world, at which time many phenomena indicate a high degree of temperature, considerable assistance might be derived in confirmation or refutation of this theory, by examining the plants which now exist in the *jhils* of India, and comparing them with the vegetable impressions which distinguish the coal bason. The subject would lead me into too much detail now, but I hope to be able to follow it up at some future period. It may be cursorily remarked, that all the peculiarities stated by Mr. Conybeare as marking the vegetation of coal fields, may I think, be observed in the vegetation which now floats on the surface of the *jhils* round Calcutta. Their peculiarities are, 1, great length of stem; 2, deficiency of bark; 3, want of consistence in the woody fibre; 4, striated appearance of stem; 5, its frequently jointed nature, with great inequality in the length of the joints; and 6, the absence or smallness of roots. The *Mentha verticillata* displays itself many of these peculiarities: a resemblance to the vegetable impressions now on the table may be observed, in the small collection of specimens of plants from the *jhils* of the neighbourhood, in my herbarium.

Contents of Natural History Collection.

The packages I am taking home, contain skins of most of the animals of the Upper Provinces and of the hills. The Alpine hare, *Pica* of Buffon, now formed into the sub-genus *Lagomys*, is perhaps the only novelty, as I do not recollect its being enumerated as occurring in the Himalaya in Griffith's Animal Kingdom, the latest systematic work on the subject. The hill fox is nearly twice as large as that of the plains, and in colour and general appearance bears considerable resemblance to the English fox. The drawings of the *Rokar*, or barking deer, and *Dúdhú*, as well as of the Cashmerian goat, may be interesting.

Of the specimens of birds, it may be sufficient to indicate the number of species comprized in the collection.

Of the Accipitrine tribe,.............	29	species.
Passerine,........................	115	
Scansores or climbers,................	35	
Gallinaceous birds,...................	26	
Grallæ,............................	36	
Anseres,...........................	21	
In all	233	species.

The pheasants, wood-peckers, jays, shrikes, cuckoos, and the falcon tribe, are most numerous in species; the waders and anseres are incomplete, from the difficulty of procuring specimens.

Among the insects of the hills, many genera correspond with those of Europe. The species and genera of shells agree entirely with those described by Mr. Benson, at a late meeting. The above are only a few indications of the Natural History of the northern provinces of India; much remains to be done to get any thing approaching even to a correct Natural History of any of the provinces of India, and it is to be hoped, that many are employed in collecting materials towards the completion of this very desirable object.

Vegetable Philology.

Lycium.—From the roots of different species of barberry, an extract is prepared, which is well known throughout India by the name of *rasót.* In the Persian works on materia medica, *lúfion* is given as the Greek name of *rasót.* This is no doubt intended for the λυκιον of Dioscorides, I. 133, as the Persian account is a pretty literal translation of the Greek one, and Dioscorides moreover describes the mode of making the extract and the plant from which the Indian λυκιον is manufactured. Sir J. Smith, in Rees' Cyclopædia, mentions that *Rhamnus infectorius* (Turkey-berry, Buckthorn) is justly considered by Dr. Sibthorp, as the λυκιον, *lycium*, of Dioscorides. Under the head of *lycium* however he says, 'the description given by that author does not accord entirely with any known species of *lycium* :' that it was not always so, I conclude from finding that *Lycium Creticum* of Prosper Alpinus is a synonyme of *Berberis Cretica*, which is the Cretan or box-leaved Barberry. Considering, therefore, that a species of barberry was formerly called *Lycium*, and that an extract is now prepared from a species of barberry, to which the Greek name *lúfyon* is applied by the Persian writers, and that the Persian *f* (ف) may with the greatest ease be substituted for *k* (ق) through the inadvertence of transcribers in writing a foreign word, I think it may safely be assumed that for لوفیون *lúfyon*, we should read لوقیون *lukyon*, and that consequently the λυκιον of Dioscorides is the *rasót* of India, and that the extract was then, as it is now, prepared from a species of barberry.

Peganum Harmala.—This plant is called *húrmal* by the native hakims, and commonly *isband Lahorí*, on account of its being brought from Lahore. It is remarkable, that Dioscorides gives ἁρμαλα, Harmala, as one of the synonymes, and μολυ, Moly, as another. In the Persian works, *hurmal* is said to be the Syrian name, and *moly* the Greek. The plant is now common about Agra, having probably been introduced from the northward.

IV.—*On the Utility of Cess-pools in Calcutta.*

The accompanying memoranda of observations have been made at different towns and places, on experimental Cess-pools, or receptacles for filth, in use since last hot-weather.

The subject is not one of an attractive nature; there are, however, some circumstances stated which may induce you to give the papers a place in your journal.

The wells that are spoken of in the papers were of perfectly simple and firm construction. They were dug to the greatest depth that the common well-diggers of the country could easily reach, and generally of the greatest breadth, for which *paats* or earthen-ware hoops can be made, viz. 4 feet 6 inches. A parapet of masonry was raised to the height of 4 or more feet, having the same cylinder as the wells, to obviate inconvenience from their overflowing. They have been dug either in the godowns, where conveniences on the old plan already existed, or in open spots, where they have been properly inclosed and covered. The average expense of constructing the largest sized wells is Rs. 50, small ones can be completed for 15 or 20 Rs.

The well in No. 2, Hare-street, affords a good example of the utility of the plan. It was constructed to receive the washings of the cook-room. For 9 months it has perfectly succeeded, not the slightest smell having ever been perceptible from it; the water in it has stood a few inches only above the water in a neighbouring well of pure water, and the nuisance created by a stream of black fluid, that used to issue from the aperture of the cook-room, and travel, or attempt to travel, some hundred feet through the compound into the public surface drain, has been completely removed.

This is an experiment which may perhaps attract attention; by the same means the occupants of large premises may provide a remedy for a serious inconvenience, that the best conceivable plan of general drainage would very imperfectly reach. The expense of the well was only 19 Rs. Besides the wells adverted to in the annexed papers, there are many others that have long been used in private houses, both in the town and suburbs, with advantage.

In Fort William, and at Chinsurah, they have been greatly approved of, and are in constant use; the state of all has been carefully examined from time to time.

There are in the House of Correction two wells, one used by about 8 European prisoners, the other by about 100 natives. Not the slightest smell is perceivable from either of the wells themselves. The native one was also used as a receptacle for the filth accumulated in the prisoners' cells at night. This was too much for it. About the end of the rains it was nearly filled, and had to be shut up; the fluid in it gradually decreased, and has fallen up to this time to a level of 5 feet below the top; and about 3½ feet higher than that used by the small number of Europeans. A candle has been burnt in it without being in any manner affected.

In the Police Office, there are three wells; these have never been in any way offensive, and the light of a candle burnt in them has not been affected. The following is a report on the subject from Mr. McCann.

"I examined the cess-pools in the Police compound yesterday. The smell complained of, I found owing to an accumulation of filth in the corner, between the raised cylinder of the well and the walls of the godown, in which it (the large one) is placed. I found, on standing over the well itself, that no smell whatever proceeded from it.

"The depth of space free of water or filth in the well, No. 1, was about 3 feet; No. 2, 4 feet; and No. 3, 4½ or 5 feet, on the above date.

"I tried a candle in No. 1, it burned perfectly bright without any explosion."

In Mírjaní Galí, there are three of the same nature; these have been complained of by the division overseer, who thought they had not originally been dug of sufficient depth, but care must of course be taken that the platforms are kept carefully cleaned and washed.

On the 26th of September, 1831, the well in the cook-room of No. 2, Hare-street, raised 3½ feet above the surface, and having a small opening at top, for the passage of water, secured by a copper strainer, and in use from April, was examined.

There was not the slightest smell to be perceived from it, a candle was let down to the surface of the water without the flame being affected in the slightest degree; it burned as in a common atmosphere. The only effect it seemed to produce was the forcing out by rarefaction of a small quantity of the air in the well, which smelt offensively, but not very much so. The height of the water or filth was precisely the same as in another common well quite close to it.

The liquid at the surface of the water of the well appeared of the blackest and most filthy description; there were creatures like cockroaches seen swimming among the bubbles, when they were disturbed by the iron to which the candle was affixed.

The following interesting account is given of certain phenomena observed in a kitchen cess-pool at Bytházkkhaneh.

Ignis Fatuus.—On the 3rd of June, 1831, I caused a well to be dug at my garden, at the Bythákkhaneh, for the purpose of receiving the refuse water of my kitchen and bottlekhaneh, about twelve feet deep, (at which depth water was discovered,) and three feet broad.

The well was surrounded with the circular earthen *paats* commonly used in the construction of wells in Bengal, and a pucka circular wall about two feet in height, built above the level of the earth, and the mouth of the well covered in with tile work and khoah, the same as a terrace, leaving an aperture to admit the refuse water about nine inches in diameter, closed by a copper strainer, to prevent particles of meat, rice, &c. falling into the well; but not fixed in the masonry, to allow the well to be inspected at pleasure.

The well was in constant use, for the before specified purposes, and the water in it has risen to nearly the level of the earth, in consequence of the rainy season, (when most wells in the vicinity of the Bythákkhaneh rise to within a few feet of that level,) and the quantity of refuse daily thrown into it.

On Tuesday evening, the 30th August, a little before gun-fire, the copper strainer of the well was blown off, and a blaze issued from the aperture, (which several of my servants who were close to the well described as resembling flame produced by brimstone,) and covered both sides of the wall which separates the cook-room premises from those of the bottlekhaneh, and crosses with an arch over the well; it rose up in a sheet of flame to the top of the wall, and glided gently towards the door of the cook-room, and there vanished.

The servants, filled with dismay, came running to me, and reported what they had seen, on which I ordered a light to be introduced into the aperture of the well, which being done, it was instantly blown out, and a small blaze observed in the well near the aperture; but this effect did not take place on applying the light a second time. Next morning, on examining the well, it was found very offensive, in consequence, I believe, of my servants having contrary to my orders occasionally removed the strainer, and suffered rice and filth to enter the well, which was then in a state of fermentation, with rice visible on the surface. On examining the strainer, it had the appearance of having been scorched by fire.

After the alarm had subsided, a chokídar came forward, and stated that about fifteen nights previous to the event, he was on watch at the door of the bottlekhaneh at about mid-night, when he was alarmed by a similar appearance, which he did not mention, fearing he should not be believed.

I have since procured five pounds of chloride of lime, and mixed it with ten gallons of water, and poured the mixture into the well, which has nearly taken away every particle of offensive smell, and the well is now used as a receptacle for the refuse water of the bottlekhaneh.

A cess-pool in the yard of a very respectable coach building establishment in the town, seems to have shewn nearly similar phenomena to those reported of the cook-room cess-pool at Bytházkkhaneh.

It is of considerable depth, built in the form of a well, and continued about 5 feet above the surface of the ground. One day a candle was let down, to see what effect the foul air would have on the flame, and whether it would continue to burn: it reached about 3 or 4 feet, before there was any perceptible change in the light; it was then with a sort of flash surrounded with a blue flame about a foot in diameter, but this rapidly diminished till it disappeared altogether. The candle was now gradually lowered, and as it descended it burned more and more feebly, and had it not been drawn rapidly up it would have been quite extinguished. As the candle was drawn nearer the mouth of the cess-pool, it again revived and burned perfectly bright, about 4 feet from the top.

The gas which had caused the blue flame seemed now all exhausted, as there was not the slightest appearance of the halo which surrounded the candle on its being first let down. The candle was again lowered, but had no sooner reached the surface of the soil below than it was extinguished.

The appearances above described are readily explained from the formation of carburetted and phosphuretted hydrogen from the decomposition of the vegetable and animal matter deposited in the wells: the heavy gas at the bottom was doubtless carbonic acid, formed by the combustion of the inflammable gases. The object of bringing the above facts to the notice of the public is to prove the great utility of the well system in a town situated like Calcutta, on a flat, and necessarily unprovided with common sewers. The experiment has been tried with success also in the barracks at Chinsurah and in Fort William, and in both the decomposition of the deposited matter is so rapid from the combined influence of the temperature and water, and from the multitude of living creatures which swarm within the wells, that there would, in ordinary circumstances or where the number of people resorting to them is moderate, seldom if ever be occasion to clean them out.

M.

V.—*On the Temperature and Saltness of the River Húglí, from Calcutta to the Sea. By* G. A. Prinsep, Esq.

Having had occasion to make frequent visits to Saugor Island, during the last four years, I usually availed myself of the spring tides, for greatei expedition, and it was my practice to register the temperature and specific gravity of the river surface (the latter tried with a very sensible hydrometer) as I passed the Fort, Budge Budge, Fultah, and other principal stations both in going and returning, and especially to note the degree of saltness existing at the change of tide in whatever part of the river I happened to be. In this manner I have accumulated above 350 observations of temperature, and nearly as many of specific gravity, embracing all seasons of the year, but least copious in the rainy months. They may perhaps be worth recording, to assist the researches of some speculator in meteorological subjects, and to facilitate comparison with other rivers.

The following table contains a summary of the temperatures observed: the blanks of July have been filled up by estimate, in order to obtain a general mean.

TABLE 1.—*Temperature of the River Húglí, from Calcutta to the Sea, through Channel Creek.*

	Above Diamond Harbour.				At and below Diamond Harbour.				In Channel Creek.				Total No. of obs.	General mean.
	No. of obs.	hight.	lowest.	mean.	No. of obs.	hight.	lowest.	mean.	No. of obs.	hight.	lowest.	mean.		
January, 1830 and 1831, ...	7	71.	68.5	69.75	9	70.	68.	69.	6	72.	70. Md.Pd. 68.	70.	22	69.58
February, 1829, 1830, 1831, and 1832, ...	29	79.7	67.5	73.6	25	80.	68.	74.	27	82.	69.	75.5	81	74.37
March, 1829, 1831 and 1832,....	10	83.5	69.	76.25	15	83.	69.	76.	12	84.5	72.*	78.25	37	76.83
April, 1830 and 1831,....	17	88.	82.	85.	8	84.5	81.	82.75	5	85.5	83.	84.25	30	84.
May, 1829, 1830, and 1831, ...	19	90.	84.	87.	12	89.5	86.	87.75	11	89.5	86.	87.75	42	87.5
†June, 1822, 1830, and 1831	13	91.‡	84.7	87.85	8	86.	84.5	85.25	2	84.5	84.	84.25	23	85.78
July, 1830,....................	6	88.	87.	87.5	0	88.	85.	86.5	0§	88.	84.	86.	6	86.67
August, 1831, (*30th and* 31*st*.)..	5	85.5	85.25	85.38	2	85.25	84.75	85.	5	85.	84.75	84.87	12	85.08
September, 1829, 1830, and 1831,	5	89.	84.5	86.75	7	89.	86.	87.5	5	88.5	86.	87.25	17	87.17
October, 1829, 1830, and 1831, ..	11	91.5	86.	88.75	7	90.5	85.	87.75	16	89.5	84.	86.75	34	87.75
‖November, 1829, 1830, and 1831,	10	84.5	76.5	80.5	8	82.5	78.	80.25	10	84.	78.	81.	28	80.58
December, 1829 and 1830, ...	9	74.5	70.	72.25	9	74.5	71.5	73.	6	76.7	72.	74.35	24	73.2
	141	84.68	80.47	81.71	110	83.55	78.9	81.23	105	84.14	79.23	81.68	356	81.54

* 28th February, 1831.—This is included, because, having quitted the Creek that day, I had no observations there in March, 1831, till the end of the month, when the lowest temperature was 81½.

† The observations of June, at and below Diamond Harbour, were limited to the 26th, 27th, and 28th June, 1831, to which may be added one made at Kedgeree at 9 A.M. on the 10th June, 1822, after a violent storm, when the temperature of the river was 83½ at low water.

‡ At the Ferry off Paltáh Ghat, 20th June, 1822, at 7½ A. M. half ebb.

§ The temperatures of this month, at and below Diamond Harbour, are filled up by estimate.

‖ All the observations of November were made between the 1st and 9th, inclusive.

Hence it would seem that the mean temperature of the surface water exceeds 81° Fahr. every where between Calcutta and the sea. The absence of observations during stormy weather, may have given some trifling excess to the apparent result; but as the mean of each month is taken from the extremes, and I was upon the river immediately after several violent storms and during many north-westers, and registered the temperature at sun-rise, as well as during the day, I do not think the true mean temperature is lower than 81. Indeed I should rather apprehend an error in the opposite direction; for in tropical countries I have remarked that the high temperatures, whether of the day, the month, or the season, are of longer duration than the low. A violent storm from the north has been known to depress the temperature to 50° Fahr. in January, at Vera Cruz (Lat. 19°11); but in a few hours it rises again above 60: whereas for months together the temperature there exceeds 80°; but, except on very rare occasions, never passes 90°. The mean of the extremes of the year would thus give a temperature of only 70° for Vera Cruz, while the true mean, according to different observers, is between 79 and 81. In the climate of Calcutta, if we take the extremes at 50 and 100, we obtain a mean of 75 instead of the true mean 78; and in the preceding table, the extremes of the year, (91 and 68) give a mean 79.5, two degrees lower than that of the months duly cast out. I have observed also, that, although a thin surface of water may occasionally be brought to the freezing point by radiation in the still clear nights of winter, the hottest sun will not raise it to 110; which gives a mean of only 71.

It may seem extraordinary, that the temperature of a river should exceed that of the climate of the country through which it flows. I believe the reverse is generally supposed, on account of the cooling influence of evaporation, and I should take it to be so with the rivers of England. In tropical rivers, however, especially the Ganges, there is this peculiarity, that the whole, or nearly the whole supply is obtained at that season when the power of the sun is the greatest, and when the evaporation is very much reduced by the saturated state of the atmosphere. Hence the mass of waters has not time to cool very considerably, before the short winter is over; and when the sun begins again to act with power, their depth is at its minimum, and the sun's influence rapid in proportion. This difference of 2 or 2½ degrees is, however, not much more than Humboldt remarked within the tropics upon the ocean, which, except where influenced by currents, he always found to be warmer than the air immediately above it. We have an example of the same fact in the Bay of Bengal, which, at a short distance to the southward, preserves a temperature above 80° throughout the year, sometimes reaching 85° and 86°. I found the surface of the sea off Point de Galle 83° on the 22nd December, and 90° in May; the mean of these is far above the medium temperature of the climate. Other examples I could cite to the same purport. The rivers of Mexico and the Orinoco reach the temperature of 90 when the temperature of the air is much below that degree.

The second table exhibits the specific gravity of the river water at four places, from actual observations made at different seasons. There will appear some discordance among them, from the accident of my passing places at different states of the tide, and consequently not obtaining the maxima and minima at each place on the same trip. To obtain any thing like exactness in ascertaining the saltness of the river in each month of the year, it is obvious, that daily observations should be taken for a long period at many stations and at every change of the tide. There is great inequality of season in this particular: on the 31st October 1830, the specific gravity off Mud Point was 1006.5 at high water spring tide; whereas, in 1831, so late as the 6th November, it was but 1001. at the top of the springs.

But, although the observations I have collected are not sufficiently numerous to afford an accurate mean for each or perhaps any one point on the river, they may be employed to form a table of the whole by estimate. To ascertain the influence both of the tides and of the freshes, —the latter at one season pushing the sea water quite out of the river channel, upon which in the other season it constantly encroaches, until the water at Mud Point becomes almost as briny as at the Sand Heads, and a slight degree of saltness is perceptible even at Calcutta,— I drew out a table of distances from Calcutta, and inserted in columns for every month (repeated for each year of observation) all the observations of high and low water, with a few others when those were deficient. This would be much too confused and voluminous for your pages; but it has enabled me to prepare the following (third) table, which, although formed by estimate, and not by actual averages, is not likely to be very wide of the truth: indeed, I scarcely think the errors exceed .001 in any place. The zero, at the head of each column, represents the point at which saltness ceases to be perceptible at high and low water spring-tides. It will be seen, that the sea water gains a little in September when the freshes are the strongest; this is owing to the great rise of the equinoxial tides, which in the autumn are much higher than those of March, the average level of the sea being 3 to 4 feet higher in September, than it is at the end of the north-east monsoon.

TABLE 2.—*Specific Gravity of the River Húglí at and below Phaltah, as observed.*

	Phaltah.				Diamond Harbour.				Mud Point.				Ganga Sagor.				Total.	General.
	No. of obs.	highest.	lowest.	mean.	No. of obs.	highest.	lowest.	mean.	No. of obs.	highest.	lowest.	mean.	No. of obs.	highest.	lowest.	mean.	No. of obs.	mean.
January, 1830 and 1831,	3	1002.8	1000.5	1001.65	3	1003.2	1002.1	1002.65	3	1007.9	1005.	1006.45	3	1016.5	1015.4	1015.95	12	1004.17
February, 1829, 1830, 1831, and 1832,.. ..	3	1004.6	1000.	1002.3	8	1008.	1000.5	1004.25	6	1013.8	1008.	1011.9	7	1020.1	1014.2	1017.15	24	1008.9
March,1829,1831, & 1832	1	0	0	1005.5	5	1007.5	1005.7	1006.6	4	1015.5	1010.	1012.75	5	1019.7	1018.5	1019.1	15	1011.
April, 1830 and 1831, ..	2	1006.3	1004.7	1005.5	4	1012.2	1008.2	1010.2	3	1018.5	1013.7	1016.1	1	0	0	1020.3	10	1013.05
May, 1829, 1830, & 1831,	4	1009.4	1004.7	1007.05	8	1012.	1009.6	1010.8	4	1020.3	1013.9	1017.1	6	1023.	1022.	1022.5	22	1014.38
June,1831,(25th to 28th,) neap tides, ...	1	0	0	1000.2	2	1002.4	1002.	1002.2	2	1013.6	1009.1	1011.35	1	0	0	1022.	6	1008.94
July, (by interpolation,)	0	0	0	1000.	0	0	0	1001.	0	0	0	1004.	0	0	0	1015.	0	1005.
August, 1831, ...	2	1000.	1000.	1000.	1	0	0	1000.	1	0	0	1000.	*	0	0	1010.	4	1002.5
September, 1829, 1830, and 1831, ...	1	0	0	1000.4	1	0	0	1000.6	3	1001.7	1000.	1000.85	5	1013.5	1005.2	1009.35	10	1002.8
October,1828,1829,1830, and 1831, ...	0	0	0	1000.	2	1001.2	1000.	1000.6	5	1006.5	1000.	1003.25	9	1013.	1005.	1009.	16	1003.21
November, 1829, 1830, & 1831, ...	1	0	0	1000.	4	1001.3	1000.4	1000.85	3	1001.8	1000.1	1000.95	7	1010.8	1009.	1009.9	15	1003.81
December, 1829 & 1830,	1	0	0	1000.1	2	1001.6	1000.5	1001.05	3	1005.9	1004.	1004.95	4	1012.5	1012.	1012.25	10	1004.59
Number of observations and their mean,......	19	0	0	1002.	40	0	0	1003.4	37	0	0	1007.47	18	0	0	1015.21	141	1006.86
Extremes observed and their mean,.....	0	1009.4	1000.	1004.7	0	1012.	1000.	1006.	0	1020.3	1000.	1010.15	0	1023.	1005.	1014.	0	0

* At the mouth of the Duragra, the specific gravity of the water in the neaps was 1001.7 at ¼ ebb, and 1000.8 at low water, on the 31st August, 1831.

TABLE 3.—*Estimated Specific Gravity of the River Húglí, from Calcutta to the Sea, through Channel Creek, at High and Low Water, Spring Tides.*

Distance fr. Calcutta.	Place.	Jan.		Feb.		March.		April. O		May. O		June.		Aug.		Sept.		Oct.		Nov.		Dec.	
		H. W.	L. W.	H. W.	L. W.	H. W.	L. W.	H. W.	L. W.	H. W.	L. W.	H. W.	L. W.	H. W.	L. W	H. W.	L. W.	H. W.	L. W.	H. W.	L. W.	H. W.	L. W.
0	Calcutta,..					O,		0.5		0,6													
.5	Garden Re.			O,		0,1		0,6	O	1,0				No observations made in July.									
10	Akra,.. ..			0,1		0,3	O	1,0	0,4	1,7	O	O											
18	Bajbaj,....	1000,0		0,5	O	1,0	0,2	2,0	0,8	3,0	1,0	0,2											
22	Ulyabarya,	1000,5		1,0	0,2	1,5	0,5	2,5	1,0	3,5	2,0	0,4											
24	Achipúr,..	1000,6	O,	1,2	0,3	1,6	0,6	2,7	1,1	4,0	2,5	0,5											
27	Mayapúr,..	1001,0	0,2	2,0	0,5	2,5	1,0	3,0	1,3	5,0	3,0	7,0											
35	Phaltah, ..	1002,0	0,5	3,5	1,0	5,0	2,0	6,0	3,5	9,0	5,0	1,0	O										
39	Damúda R.	1002,5	0,7	4.0	1,5	5,5	2,5	7,0	4,0	10,0	6,0	1,5	0,5									O	
43	Rúpnarain,	1003,0	1,0	4,5	2,0	6,0	3,0	8,0	5,0	11,0	7,0	2,0	1,0			O				O		0,5	O
50	DiamondH.	1004,0	2,0	6,5	3,0	8,0	5,0	11,0	7,0	12,5	10,0	4,0	2,0			0,5		O		0,5		2,0	0,5
60	Kalpí, ...	1005,5	3,0	5,0	4,0	11,0	7,0	14,0	10,0	15,5	12,0	6,0	2,5			1,0		1,0		1,0	O	3,0	1,0
65	Rangafallah	1006,5	4,0	10,0	6,0	12,0	8,0	15,0	11,0	17,0	13,0	8,5	5,0			1,5	O	1,5		1,5	0,2	4,0	2,0
70	Silver Tree,	1007,5	5,0	12,0	7,0	13,0	9,0	16,0	12,5	18,0	14,0	12,0	7,0			1,7	0,2	1,7	O	1,8	0,5	5,0	2,5
73	Mud Point,	1008,0	6,0	13,0	8,0	14,0	11,0	17,0	13,5	19,0	15,0	14,0	9,0			2,0	0,5	2,0	0,1	2,0	1,0	6,0	3,0
75	Young's P.	1009,0	7,0	13,5	9,0	14,5	11,5	17,5	15,0	19,2	16,0	15,0	11,0			2,5	0,6	2,5	0,4	3,0	2,0	7,0	4,0
80	Comt. Cr.	1011,0	9,0	14,0	10,0	16,0	13,0	18,0	16,0	19,5	17,0	16,0	13,0	O	O	7,0	1,0	6,0	0,6	6,0	3,0	9,0	6,0
83	Bhagwa K.	1012,0	10,0	15,0	12,8	17,0	14,0	19,0	17,0	20,0	15,0	17,5	15,0	1,0	0,5	8,0	2,0	7,0	1,0	5,0	4,0	10,0	7,0
87	Dúragra,..	1014,0	12,5	17,0	14,0	19,0	16,5	20,0	18,0	21,0	19,0	19,0	17,0	2,0	1,0	9,0	3,0	8,0	1,5	9,0	5,0	11,0	8,5
91	Arhai Bán.	1015,0	13,5	18,0	15,0	20,0	18,0	21,0	19,0	22,0	20,0	20,0	18,0	3,0	2,0	9,5	4,0	9,0	3,0	10,0	6,0	12,0	10,0
95	Sát Bánkee	1017,0	15,0	19,0	17,0	21,0	19,0	22,0	20,0	23,0	22,0	22,0	20,0	4,0	3,0	11,0	6,0	10,0	4,0	11,0	9,0	14,0	12,0
97	Ganga Ság.	1017,0	15,5	19,5		22,5				24,0						12,0		10,5	7,0			15,0	
100	Edmondst. I.									27th	June,	1831.	22,0							6th	Dec.	13,0	

The numbers in this Table, with the exception of the first column, are to be added to 1000 to express the specific gravity.

O represents the point where the river water may be esteemed perfectly fresh.

VI.—SCIENTIFIC INTELLIGENCE.

[Extracts from European correspondence, communicated by G. Swinton, Esq. Calcutta.]

I.—*Burmese Varnish.*

"I have long been putting off writing to you in the hope of being able to give you some intelligence regarding your black varnish, which I was in great hopes would have been considered an important acquisition to the arts. I have however been baffled in all my attempts to get what I should consider a fair trial made of its merits. All the artists employed in the varnishing and japanning business are so wedded to their common routine and to the manipulation of materials which are familiar to them, that I have found great difficulty in getting trials made, and have very little confidence in the statements made to me of the results. I am not losing sight of the matter, however, and have still hopes of getting a trial made on a considerable scale by a great house at Birmingham. The managing partner of this house honestly told me, that although a better varnish than that which they now use were to be offered to them for nothing, they could hardly bring it into use, if it presented any considerable difficulties in its application, as that which is now prepared from Coal-tar, besides being so cheap (2s. per gallon), is easily worked, and produces the most beautiful skin imaginable. The beauty of the higher kinds of papier-maché ware is now very remarkable, and except in some of the gold ornaments, surpasses the best specimens of Chinese manufacture. It has occurred to me that canvas prepared in this way with your varnish would make indestructible grounds (as far as damp is concerned) for oil paintings.

A varnish has been discovered at Paris, which is used for preparing canvas and oak for painting on; it is of a most durable nature, and is sold in prepared squares of any dimensions.

2.—*Fishes of the Ganges.*

" I spent some time in Paris this summer, and saw a good deal of M. Cuvier. I used the freedom of mentioning your name to him, and your desire of taking advantage of your position to forward the interests of science. I asked him if there was any particular object in natural history which I might suggest to you as a desideratum, which could be supplied from India. He immediately replied emphatically, " Ah certainement, les poissons d'eau douce ;" he added that some gentlemen in Calcutta had already sent a good many of those of the lower rivers and parts of the country, but that they had no accounts of those of the higher parts.

3.—*Carton-pierre.*

Along with this I shall send a packet containing some letters, which I have received from persons with whom I had correspondence about your specimens. I have added one which I got a few days ago from a civil engineer now in Paris. It contains some account of a substance (Carton-pierre), which I think peculiarly calculated for forming ceilings for Bangalos, and even for the best pucka houses in India ; it forms pannels or compartments of any size, and could with great ease be put up between the beams of the ceiling. The art of making the carton-pierre was lost in France for 300 years : it is as white as marble, but much lighter : there are some curious accounts of it in the Memoirs of the Academy of St. Petersburg. Its composition is kept a secret here. The following is extracted from a French journal.

" L'art d'exécuter en carton des ornemens de cette substance florissait en France au seizième siècle. La perfection à laquelle il était parvenu à cet époque est attestée par les beaux plafonds qui décoraient au Louvre les appartemens du Roi Henri II.

Cet art se perdit ou du moins restait dans l'oubli pendant prés de trois siècles. On en vit reparaître, á l'exposition de 1806, quelques produits qui furent présentés par M. Gardeur. Ils étaient exécutés avec une pâte à laquelle on donne le nom de carton pierre: En 1819, M. Huseh recut une médaille de bronze pour de nouvelles applications de cette substance ; mais jusque là tout ce borne encore à d' heureux essais. Il etait reservé aux artistes dont nous allons parler de relever completement cet art, et de lui donner même un nouvel éclàt.

Ces artistes, qui se suivent de tres prés, malgré quelques légères différences dans la maniére de préparer le carton-pierre, parviennent á mouler cette substance avec une telle perfection, qu'ils obtiennent de suite, et sans reparage, les contours les plus nets et les surfaces les plus unies.

De belles épreuves de statues rappelant toute la grâce, toute la puretè et tout le'esprit des originaux, des ornemens du meilleur gout, offrant tout le relief et tout l'effet pittoresque de la sculpture, des candelabras, des colonnes, des entablemens profilès avec une grande pureté, prouvent que le carton-pierre est susceptible, entre les mains des hommes habiles dont nous parlons, de reproduire fidèlement les inspirations du statuaire, et de se prêter, avec une facilité merveilleuse, á l'execution des conceptions les plus délicates ou les plus grandioses de l'architecture, pour la décoration des intérieurs."

4.—*Progress of Improvement in France.*

Statistics.—Since the peace, France has increased three millions ; she has now about 33 millions of people, about 7,000,000 of families, and there are in this population four millions of small proprietors residing on their properties. France is improving rapidly. When the whole of the woodlands are converted into arable, and coal used instead of wood, France may easily carry a population of sixty millions of people.

The price of land carriage is about four pence per mile per ton ; in America about two shillings and one penny ; in Ireland about four or five pence. Iron sells in France for £18 per ton ;—in London for £ 7—in Wales for £ 6—Raw Sugar is raised here from Beetroot at 8 sous per lb. and it is considered that it will be raised for 6 sous per lb. France has doubled her consumption of Iron yearly within these few years.

Arts.—The instrument-maker, M. Gambey, has invented a new level, which Mr. Arago praises extremely, and the great circle which he is now making for Brussels, is a model of execution. You would have been astonished at the fine divisions cut in the limbs of all his instruments, exceeding any thing of the kind to be seen in London. I have been to see the sawing machine, which gives twenty-five cuts of timber in one inch ; and the snuff mill, which manufactures one ton of snuff in an hour ; it is driven by a thirty-six horse-power engine. The composition with which they paint the names of the streets is volcanic and quite monumental, it would be valuable for Edinburgh and other places in our country. The beautiful ladies combs now so much in fashion are made of the prepared horn hoofs of oxen : this manufacture is, I believe, hitherto unknown in England. The French are succeeding with the Cashmir Goats, they have now about two hundred or upwards in excellent thriving condition.

5.—*Mode of conducting the Meetings of the Academie.*

A very interesting letter was read before the Institute by Gay-Lusac. It was from Humboldt, and was addressed to Arago ;—the letter related to Humboldt's late journey into Siberia. Last Monday, a most important paper was read before the Institute by Brongniart, on Geology, in which some new doctrines were advanced, which were opposed by Cordier; the discussions on this subject became very animated.—Cuvier read a paper on the objects of Natural History, which had been collected by the naturalists who accompanied Captain Dumont d'Urville in his late voyage round the world.—M. Mathieu read a small paper regarding the invention of a new instrument for measuring distances on paper, and also for protracting distances correctly on maps: the instrument is extremely simple, and I think it will be of great use to the graphic art.—He also read a paper lately, describing an Instrument for drawing parallel lines: I have not seen this instrument. The Institute is the most interesting place I ever frequented, there is always something new; all the members are educated, scientific men, eminently distinguished in their several departments, well qualified to judge of whatever may come before them; there is no dross or rubbish, the entire body is solid and pure.'

6.—*Caoutchouc.*

[From the Journal of the Franklin Institute.]

We have received from the above-named gentleman some account of his experiments on the distension and inflation of Caoutchouc; he has also read a paper upon the subject before the American Philosophical Society, and several notices respecting them have likewise appeared in the daily journals. We may probably hereafter lay some further details before our readers. The communication referred to contains the following information:

MODE OF MAKING GUM ELASTIC INTO BAGS, SHEETS, &C.

Soak the gum elastic in sulphuric ether until soft, and almost inelastic, which in good ether will take from 10 to 24 hours. Then, if it is a plate, cut it with a wet knife, or parallel knives, into such sections, or sheets, or shapes, as may be desired, and suffer them to dry; or if a bag, apply a pipe or stop-cock, and inflate with the mouth rapidly. If the bag should expand equally, more slowly; and with occasional pauses, if unequally. By such means a bag may be made so thin as to become transparent, and light enough to ascend when filled with hydrogen. By graduating the extent of inflation, sheet caoutchouc of any given thickness is produced. If for blow-pipes, or other purposes, for which it is desirable that the bags should possess contractility, let them be inflated to the desired size and after an hour let out the air. Ever afterwards they will suffer as great a degree of extension, and again contract. If permanent sheets are wanted, the inflated bags are to be hung up until dry, after which no sensible contraction will ensue.

Caoutchouc softened by ether may be readily stretched by hand, over lasts, assume the shape desired, and may, therefore, be applied to a variety of useful purposes. In the form of straps and twisted strings, its elasticity offers many useful applications. It may be made to assume the form of a tube, to connect parts of chemical and other philosophical apparatus with each other; may be employed as covers for bottles, corks, &c. and indeed wherever the passage of steam, or air is to be prevented. It is also susceptible of numerous applications in medicine and surgery.

Mr. Mitchill has extended a bag which was not above the size of a skinned English walnut, and which weighed three drachms and a half, until its diameters were 15 and 13½ inches respectively. Larger bags have been made to attain a diameter of six feet; one of these when filled with hydrogen, escaped, and was found at the distance of 130 miles from the city. Balloons so formed have been exhibited before the several classes attending chemical lectures in Philadelphia.

The discovery, by the same gentleman, that essential oil of sassafras will soften caoutchouc so that it may be applied to any surface with a brush, promises also much utility. When dry it becomes again simple caoutchouc, with all its original elasticity; if it be applied on a plate of glass, dried, and then immersed in cold water, the sheet may be peeled off. It has been spread upon paper, and after becoming dry, the whole immersed in water, when on stretching it, the paper would, of course, separate into fragments, between which the gum elastic might be stretched, so as to separate them to the distance of a quarter of an inch without itself giving way, notwithstanding its tenuity; such a varnish will never crack, one of its essential attributes being elasticity.

7.—*Directions for collecting and preserving Plants in foreign Countries. By* W. J. Hooker, LL.D. Reg. Prof. Bot. at Glasgow.

On preserving Plants for a Hortus Siccus.

This is a much simpler process than is generally imagined by those unpractised in it; and many travellers have been deterred from collecting specimens by the time and trouble requisite for securing them in the way that has been generally recommended.

The main circumstances to be attended to are, to preserve specimens of plants in such a manner that the moisture may be quickly absorbed, the colours as much as possible preserved, and such a degree of pressure given to them, as that they may not curl up in the act of drying.

For this purpose, let a quantity of separate sheets of paper be obtained, of a folio size, and of an absorbent nature. Common cartridge or gray paper is perhaps the best. Brown paper does well enough for coarse plants, and blotting paper for the more delicate kinds. Two boards should be provided, one for the top and the other for the bottom of the mass of papers. For pressure at home, or when stationary for any length of time in a given spot, nothing serves better as a press than a weight of any kind, a large stone, a great book, &c. put upon the topmost board; and the great advantage in this is, that the weight follows the shrinking of the plants beneath. Whilst travelling, nothing is so convenient as three leathern straps with buckles—two to bind the boards transversely, and one longitudinally. It will be farther desirable to have a number of pieces of pasteboard, of the same size as the paper, to separate different portions of the collection, either such as are in a different state of dryness, or such as, by their hard or stout woody nature, might otherwise press upon more delicate ones that are in papers adjoining, and be the means of injuring them.

Thus provided, gather your specimens: if the plants be small, root and stem; if large, cut off portions of the branches of a foot or a foot and a half long, selecting always such as are in flower, and others in a more or less advanced state of fruit. Place them side by side, but never one upon another, on the same sheet, and lay upon them one, two, or three sheets, according to the thickness of your paper or of your plants, and so on, layer above layer of paper and specimens, subjecting them then to pressure. As soon as you find that the paper has absorbed a considerable portion of the moisture, (which will be according to the more or less succulent nature of the plants, and the heat and dryness of the season or climate,) remove the specimens into fresh papers; and let the old papers be dried for use again, either in the open air and sun, or in a heated room, or before the fire.

As to the spreading out of the leaves and flowers with small weights, penny pieces, &c. it is quite needless. The leaves and flowers are best displayed by nature in the state in which you gather them; and they will require little or no assistance with the hand, when laid out upon papers, to appear to the best advantage; especially if put in carefully on being fresh gathered. If the specimens cannot be laid down immediately upon being collected, they should be preserved in a *tin box*, where they will keep fresh for a day or two, if the atmosphere be not very much heated.

Some very succulent plants, such as CACTI, SEMPERVIVA, SEDA, ORCHIDEOUS PLANTS, &c., some plants with very fine but rigid leaves, such as the FIR tribe and the HEATHS, and some with compound pinnated leaves, require to have the specimens plunged into boiling water for a few seconds before they are pressed; this greatly facilitates the operation, by destroying the vegetative principle and preventing the leaves of many from falling off in the act of drying. In this case, the superabundant moisture should be absorbed by a cloth, or by applying, temporarily, pieces of blotting paper.

In most parts of Europe, and in all countries not oppressively hot, it is a good plan, and saves much paper, to lay out the specimens on their respective sheets, on the floor of a chamber during the night, or for five or six hours during the day, putting them up again and submitting them to pressure, as before, on the same papers. By this means, much humidity both from the plants and the paper is absorbed by the atmosphere, and the colour is better preserved. If, however, the climate be hot, a much shorter time will suffice, or the leaves will shrivel.

When sufficiently dry*, which with the greater number of plants, and in warm climates, will take place in the course of a few days, (and with two, or at most four shiftings of the specimens,) they should be placed between dry papers, one sheet of folio between each layer of plants; and they are then ready for transportation, either packed up in boxes, or well secured as a parcel, covered with oil-cloth. A great many specimens may thus be sent in a very small compass.

PALMS having their fructification, and their leaves very large, are with difficulty subjected to pressure. A few of their flowers should be pressed; and the cluster of fruit and a leaf may be simply dried in the air, and afterwards packed in boxes for transportation.

FERNS and MOSSES, and the larger proportion of CRYPTOGAMIC PLANTS, may be dried in the common way; such Mosses as grow in tufts, being separated by the hand.

SEA-WEEDS should be immersed for some hours in fresh water before they are dried; and common blotting paper is the best for absorbing the moisture from these plants.

If the FRUITS of plants are of a small size, so as to be preserved in a Herbarium, they should be gathered with the leaves and branches, as are the flowers. If of a large size, they should be kept separate. DRY FRUITS demand no care, except those which split open by means of their valves. These require to be tied round with a little packthread.

PULPY FRUITS are only to be preserved in spirits of some kind, and they should have a number attached to them, referring to the flowering specimens.

The best way to introduce plants from abroad into our country is by seeds. These should be gathered when perfectly ripe; and if a number of each kind be

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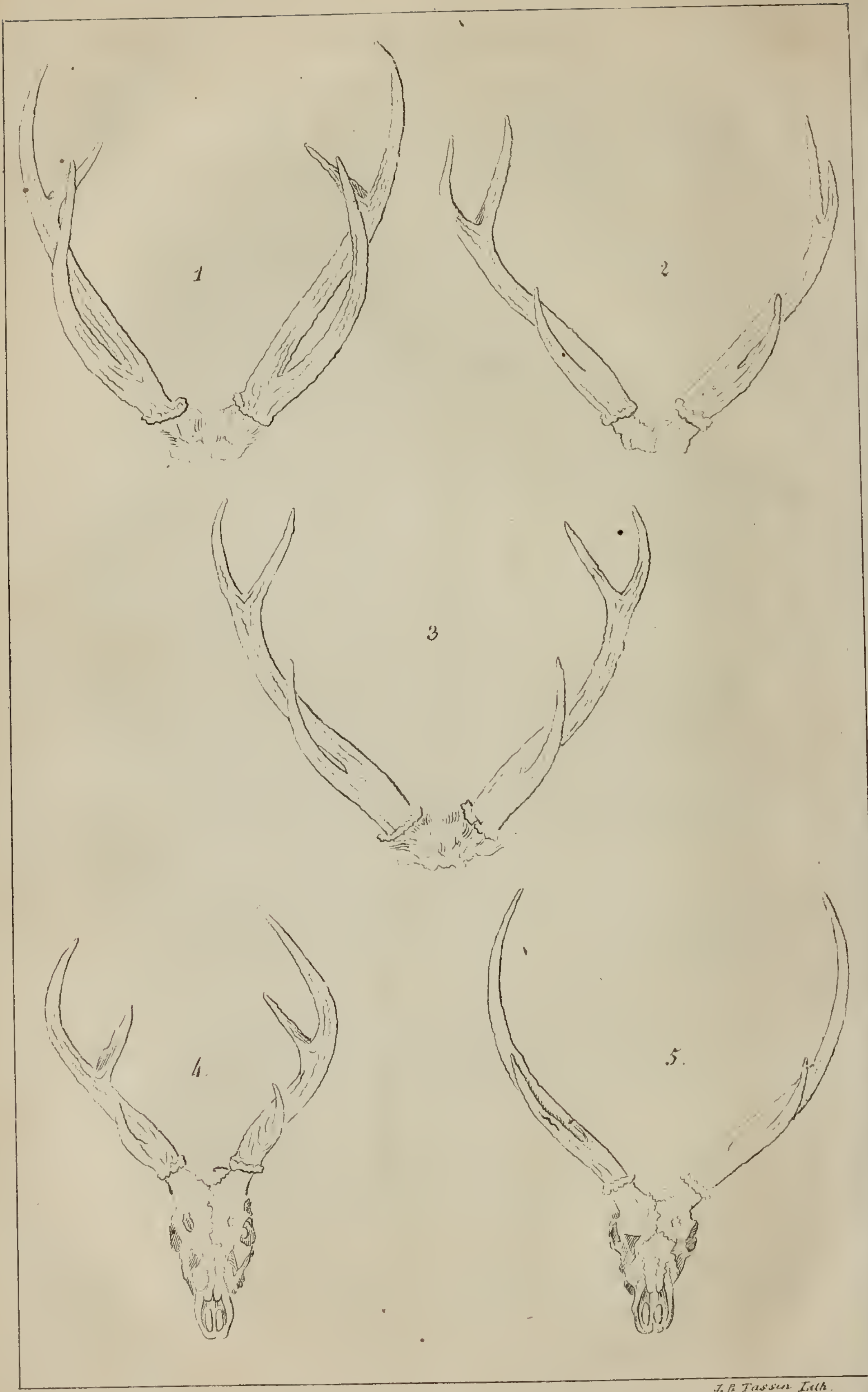
* The being sufficiently dry may be ascertained by the stiffness of the stems and leaves, and the specimens not shrinking or curling on being removed.

Pl. V. Vol. I.



J. B. Tassin Lith.

Horns of the three species of Jarâï (Rusa) inhabiting the Taraï & Saul forest.

folded in a separate piece of paper and kept dry in a box, they in general reach this country in a good state for vegetation.

OILY SEEDS, such as those of the TEA, COFFEE, most kinds of ACORNS, &c soon lose their germinative property. For such, it is necessary to provide a box and a quantity of loose sandy or peat mould. Put into the box a layer of this earth and then a layer of seeds, and so on alternately till the box be full.

BULBS of all kinds, and many ROOTS, not actually in a state of vegetation, cuttings of SUCCULENT PLANTS, ALOES, CACTI, and many other thick-leaved PARASITIC ORCHIDEOUS PLANTS, called AIR PLANTS, may be put into a box with dry sand, peat, or saw-dust; and these (as should the seeds and bulbs) must be kept free from damp.

Plants that it is desirable to remove with the ROOT, should be carefully placed together, but not too crowded, with common soil, in wooden boxes, the top of which is formed with two sloping sides like the roof of a house; one of these constitutes a lid that can be opened or shut at pleasure, so as to admit the air and water, and especially so as to exclude the spray of the sea, which would be highly prejudicial. The earth must be kept moderately moist, and the boxes always placed either on an exposed part of the deck of the vessel, or slung from the *tops*. In the latter situation they are liable to the least injury; only the person who has the charge of them must not forget to supply them with fresh water when they may require it.

With the plants and seeds, whether in a living or dry state, if they are not well known to naturalists, there should be pieces of paper, on which are to be indicated the uses of the kind as far as they have been ascertained, the particular country where it is gathered, the soil, the size, the elevation at which it grows above the level of the sea, and the name it is generally known by.

As soon as a sufficient number of plants are collected, no time should be lost in transporting them to their place of destination, since the dried specimens in particular, and the seeds, are liable to the attack of insects in warm climates; and the captain of the vessel should be particularly requested to keep them in a dry and airy part of his vessel.

Specimens of the WOODS are also highly desirable; of the GUMS, RESINS, and the various products of the trees, if employed in the arts or in medicine; and it may here finally be remarked, that those plants which are employed *as useful* in any way whatever by the natives, are what it is of most importance to possess in our gardens: nevertheless, the more common kinds, the very weeds of foreign countries, the Grasses, the Mosses, the Sea-weeds, and Lichens, will prove extremely valuable to a scientific Botanist.

8.—*Explanation of the Sketches of the Horns of the Jarâï, Plate V.*

[Described in the last number, page 66.]

1, 2, 3. The *Phúsro Jarâï*, mature. No. 1 has the upper antler or process, posterior and internal; No. 2, the same antler, anterior and external; No. 3, shews it doubtful. In No. 1, this same superior antler is remote from the end of the beam; in Nos. 2 and 3, it is approximated.

4. The *Râto Jarâï*, mature. .   5. The *Kâlo Jarâï*, mature.

Dimensions.	Feet and inches.				
	1.	2.	3.	4.	5.
Length along the curve, ...	2 10	2 6½	2 10¼	2 1¾	2 8¼
Utmost divergency, ...	1 11	2 1¾	2 5	1 8½	2 5¼
Divergency of tips, ...	1 11½	2 1	1 11¾	1 2	2 1
Circumference of base above the burr, ...	0 8	0 8½	0 8½	0 7¼	0 6⅞

VII.—*Proceedings of Societies.*

1.—ASIATIC SOCIETY.

Wednesday, 7th March, 1832.

The Hon'ble Sir C. E. Grey, President, in the chair.

The President announced to the meeting the request of the Editor of the Gleanings of Science to continue that publication under the designation of the Journal of the Asiatic Society.

Resolved, that permission be granted, to be continued as long as the publication is under the charge of one or both the Secretaries of the Society.

Read a letter from Mr. Goodhull, presenting drawing of a fossil shell.

Read a letter from Captain Mitchell, forwarding to the Museum a Bish Copra in spirits.

Read a note from Baboo Radhacant Deb, presenting a young Pigeon with two heads, for the Museum.

The Meteorological Registers for November and December were presented by the Surveyor General.

Mr. F. Royle displayed to the Society a portion of the collections made by him while superintendent of the Seháranpúr Botanic Garden, in the various branches of Natural History, and proceeded to illustrate the objects of his researches by a general review of the climate, the geology, the botany, and the zoological productions of the part of the country he had just quitted.

Such of his remarks as had not solely referenee to the objects under inspection by the Society, have been selected for publication in the present number: Upon the termination of his interesting address the President rose, and moved the thanks of the Society in the following words.

" I am sure that I only express what is felt by the Society, when I say that we greatly regret we have nothing better to offer to Mr. Royle than a vote of thanks in return for the gratification and instruction he has afforded us, or whereby we can signify the opinion which we entertain of his meritorious services in the cause of science. Other collections of greater magnitude have gone home from India. In the department of botany we know how vast and precious a freight was borne across the sea by our zealous and indefatigable friend Dr. Wallich, and with how much admiration the display of it has been hailed in Europe. Other cabinets of great merit, and, perhaps, more complete than this of Mr. Royle's in single branches of Natural History, have been formed of late years; but I am not aware of any, certainly not of any which has been freely submitted to the examination of our Society, which has been of equal variety, curiosity, and interest with that which is now open before us. Here are new acquisitions in the zoology, ornithology, entomology, and geology of northern India and the Himalaya; and in the scientific observations by which we have heard them explained and illustrated this evening, we find an error of the learned and celebrated founder of our Society corrected; familiar and household words of the existing races of India and Persia identified with the terms of the Materia Medica of Dioscorides, and the first annunciation of important geological discoveries by a friend of Mr. Royle's in continuation of his own researches, which promise to bring the fossils of India, so recently supposed to possess none of those primæval records, into curious and interesting comparison with the vast stores of Europe and America.

"It is peculiarly gratifying to myself to have had the duty of offering our thanks on this occasion, upon account of my having before seen this museum in that glorious region, to which it owes its existence, and having been indebted to Mr. Royle both for his civility in permitting me to inspect it, and for the pleasure and surprize of finding in the Botanic Garden, at Sehâranpûr, the English daisy, looking up from the plain of India to the lofty snows of the Himalaya."

Resolved, upon the motion of the President, seconded by Dr. Carey, that the Society, in tendering their thanks to Mr. Royle for the inspection of the extensive and interesting collections submitted by him to the Meeting, and the remarks illustrative of them, feel it incumbent to express their regret that any acknowledgments they can offer are an inadequate return for the gratification and instruction they have received.

And further that the Committee of Papers be requested to consider whether a letter may not be addressed to the Honorable the Court of Directors, introducing to their notice the labours of Mr. Royle; and if they deem it expedient, to prepare a letter accordingly for Mr. Royle to carry with him.

2.—MEDICAL AND PHYSICAL SOCIETY.

3rd March, 1832.

The following gentlemen, formerly proposed, were elected Members of the Society:—Messrs. Shirreff and Holmes, Assistant Surgeons, Bengal Service; Mr. Oxley, Assistant Surgeon, Sincapore; Mr. Richards, Surgeon, 8th Madras Light Cavalry, and Dr. J. N. Casanova. J. C. Boswell, Esq. Assistant Surgeon, at Penang, was proposed as a Member of the Society, by Mr. Hutchinson and Mr. Twining.

The following communications were then laid before the Society:

1.—A letter from Colonel Tod, presenting to the Medical Society, through Dr. Craigie, various objects of Natural History, from Van Diemen's Land. These consisted of some Lignites, two specimens of Ornythorynchus Paradoxus, and a variety of Birds. The thanks of the Society were voted to Colonel Tod, for his valuable present; and a Committee was requested to examine the several articles carefully, for the purpose of selecting such specimens as cannot be preserved in this country, and having them transmitted to England, while in a good state of preservation.

2.—Additional communications from Dr. Mylne, of Bombay, relative to Dracunculus, in confirmation of the opinions already advanced by him on that subject.

3.—A case of Disease of the Heart, drawn up by Mr. Spurgeon, and forwarded by Dr. Thomas, through the Medical Board.

4.—An Essay on Hospital Gangrene, by J. L. Geddes, Esq. of the Madras Medical service.

5.—Two cases, in each of which both the common Carotid Arteries were tied; by Mr. Preston of Cuddalore.

6.—An account of the Medical Topography of the Nielgherry Hills, and the influence of that climate on healthy and on impaired European constitutions, by Dr. Baikie.

7.—Remarks on Dracunculus, by Dr. Smytten, of Bombay.

8.—A Medical Report relative to the station of Gowhattie, in Assam; and an account of the diseases which have recently prevailed in that district, by G. Lamb, Esq. of Dacca, presented by the Medical Board.

9.—A report by J. C. Boswell, Esq. on an Opiate recently used at Penang. This medicine was made by digesting solution of tartaric acid in water on the dregs remaining after the tincture of opium has been prepared. Only a small quantity of this Penang Opiate was received, and it was tried by Mr. Twining, who reported that it appeared to possess considerable efficacy; its anodyne and soporific properties being estimated at about half the strength of Vinum Opii.

10.—Mr. Royle's paper, in pursuance of his proposal formerly laid before the Society, with a view of promoting the collection of a complete cabinet of specimens of the Materia Medica of Hindústan. The author considers his inquiries merely as preparatory to a complete investigation of the Materia Medica of India; which investigation he would wish to comprise, not only an inquiry as to the plants which produce each article; but would desire to see the real properties of the medicines ascertained by the most careful experiments, which, of course, can only be accomplished by the united labours of the Members of the Society, at some remote period: for the present, Mr. R. brought for inspection of the Society arranged specimens of nearly a thousand articles of Materia Medica, with an herbarium, containing the plants, from parts of which many of the articles are produced; and for the purpose of facilitating the labours of others, he stated the mode which he adopted to procure the specimens now laid before the Society. In the first place, he collected the various articles of Materia Medica procurable in the bazars, and then employed *Kubarees* to bring in the plants which produced the respective medicines; by this means he was enabled to ascertain the Botanical names of many of the plants indigenous at several stations.

In investigating the medicinal properties of the several articles, the author observes, that we may be somewhat guided by the sensible properties of the medicines: and no slight assistance may be obtained by reference to the natural families to which the plants belong—for instance, the Convolvulaceæ afford the Jalap, the Scammony, the Toorbud, (Convolvulus Turpethem) and several Indian purgatives. The Asclepiadæ afford emetic medicine, as the Ipecacuanha of America, and Asclepias Vomitoria, and Asclepias Asthmatica. The Coniferæ in India, as in Europe, yield Turpentine. The Euphorbiaceæ yield Euphorbium, and the Jatropha Curcas (Barbadoes Nut), and in India, the Castor Oil, and the Croton Tiglium; the latter affording an acrid oil of highly active properties. The Labiatæ in both countries possess aromatic and heating properties; while many of the Solaneæ are poisonous. The Gentianeæ being all bitter; the Rubiaceæ, mostly astringent, and the Umbelliferæ, aromatic. In fact, a very extended accordance may be observed in the sensible and medicinal properties of a large proportion of each of the natural families into which plants are divided. In preparing his MSS. the author states that he commenced by adopting the alphabetical arrangement of the Persian authors, inserting first the Asiatic names and synonymes: then the Greek names, followed by the Botanical name, the class, and order, according to the Linnæan system, and the natural order of the plant; after which he notices the country whence the article is said to be procured, the part of the plant which is used, and the medical properties ascribed to it by the Hakíms, or stated in their books, with some general remarks tending to identify the article. Separate lists contain the medicines belonging to the mineral and animal kingdom.

The 100 specimens of Materia Medica promised formerly by Mr. Royle, are deposited in the cabinet: and Members of the Society, at the different stations, are invited to collect and contribute such articles as may be peculiar to that part of the country where they are stationed. If each Member of the Society would carefully make a series of experiments to ascertain the medicinal properties of the drugs which he collected, when used by natives, as well as by Europeans, and forward to the Society a concise account of the same, much useful information would soon be obtained, which might be printed in an arranged series in the Society's Transactions.

Mr. J. C. Boswell's medical report and cases were then read, and discussed by the Meeting.

3.—NATURAL HISTORY SOCIETY OF THE MAURITIUS.

[*Extracts from the Proceedings of the* 17*th May and* 14*th June*, 1831.]

M. Lienard, Sen. read a description of two fishes of the island : one, of which a drawing was presented, known by the fishermen as the *Battoir*, not offering the distinctive characters of any of the known genera of the family of *Percoïdes*, to which it apparently belongs, has received provisionally the name of *Platésome.* The second, commonly called *Lion mâle*, is a *Holocentre*, but not the *Holocentre Samner* of CUV. and VAL. neither of these species are described in the tables.

Mr. J. Lienard presented an account of a crab of the genus *Portune*, accompanied by a drawing. Also a description and drawing of an *Acanthure* very rare in those seas.

Mr. Faraguet presented and explained his table representing geometrically the law of the temperature of the seas at different depths; it is founded on the experiments made on board the *Astrolabe*, the only ones of the kind upon which confidence can be placed. It was found that at a depth of 820 brasses (fathoms) to which the lead attained, the temperature was 6.4 Cent. (43° Fahr.) and that the curve representing the results is a parabola of a high order, having for assymptote a vertical corresponding to a temperature of 4 or 5° centigrade, (40 Fahr.) At the depth of 1000 brasses (fathoms) a brass cylinder of 3 lines thick (containing the thermometer ?) was broken, which is not surprising when the pressure is calculated.

Mr. J. R. Barry communicated a note on the subject of the temperature of mines of different depths. By observations made in Cornwall, in 1815, it was ascertained that at 1400 ft. Eng. below the surface, the temperature of mines exceeds that of the surface of the globe 28° Fahr. and that the heat augments progressively in descending at the rate of 1° for 65 feet.

Mr. J. Desjardins, Sec. read some pages relative to certain races inhabiting the Mauritius and Bourbon.

Also, conjointly with Mr. L. Bouton, Mr. J. D. read a notice of the Naturalist Commerson, well known as the principal contributor to the knowledge of the natural history of the island. Mr. J. D. treated of his zoological labours, while Mr. L. B. gave details of his life and works in general.

Commerson came to the island in 1768, and remained with M. de Bougainville to study its productions. He enjoyed greater means of research than any since his time. After a voyage to Bourbon and Madagascar, he returned to Mauritius, where he died on the 3rd March, 1773, at a place known by the name of *la Retraite.*

Mr. Ch. Telfair, president, presented 40 birds from Tasmania.

Mr. Lislet-Geoffroy offered for the library, the analyses of the Royal Academy's Proceedings from 1812 to 1829.

Mr. E. Baker, who had sent several manuscripts from Madagascar, on different subjects, was admitted a corresponding member of the Society.

Meteorological Register kept at the Surveyor General's Office, Calcutta, for the Month of March, 1832.

Days of the Month.	Minimum Temperature observed at Sun-rise.					Maximum Pressure observed at 9h. 50m.					Observations made at apparent Noon.					Max. Temp. and Dryness observed at 2h. 40m.					Minimum Pressure observed at 4h. 0m.					Observations made at Sunset.					Rain Gauge, No. 1.	Rain Gauge, No. 2.
	Barometer reduced to 32°.	Temper. of the air.	Depres. of M.B.Ther.	Wind.	Aspect of the sky.	Barom. red. to 32°.	Temper. of the air.	Depres. of M.B.Ther.	Wind.	Aspect of the sky.	Barom. red. to 32°.	Temper. of the air.	Depres. of M.B.Ther.	Wind.	Aspect of the sky.	Barom. red. to 32°.	Temper. of the air.	Depres. of M.B.Ther.	Wind.	Aspect of the sky.	Barom. red. to 32°.	Temper. of the air.	Depres. of M.B.Ther.	Wind.	Aspect of the sky.	Barom. red. to 32°.	Temper. of the air.	Depres. of M.B.Ther.	Wind.	Aspect of the sky.		
1	29,892	56,5	2,3	cm.	cl.	,954	73,	15,3	n.w.	cl.	,918	76,3	20,6	n.w.	cl.	,830	81,	22,1	n.w.	cl.	,823	80,	22,3	n.w.	cl.	,828	73,	13,1	cm.	cl.		
2	,900	58,	3,8	n.w.	do.	,980	75,	15,3	do.	do	,931	79,3	21,8	do.	do.	,845	82,	23,3	do.	do.	,832	81,7	23,	do.	do.	,836	76,	12,8	do.	do.		
3	,872	58,5	2,6	cm.	do.	,911	76,3	13,1	w.	do.	,861	82,8	21,9	w.	do.	,785	86,5	24,8	w.	do.	,784	85,5	22,6	w.	do.	,795	78,	11,8	do.	do.		
4	,792	66,5	2,	do.	do.	,852	79,	11,5	s. w.	cu.	,822	83,5	14,8	s. w.	do.	,739	85,5	14,1	s.	cu.	,725	83,3	14,6	s.	cu.	,726	78,7	9,7	s.	cu.		
5	,746	72,	2,5	s. w.	cu.	,792	78,	6,5	do.	do.	,769	83,5	9,3	do.	cu.	,719	70,3	1,1	do.	n.	,704	73,3	5,1	do.	cus.	,691	72,5	4,8	cm.	cis.		
6	,820	68,3	1,1	cm.	fg.	,910	75,5	5,6	do.	cl.	,890	83,	12,3	do.	do.	,821	87,5	19,8	s. w.	cl.	,820	86,	19,5	s. w.	cl.	,820	81,5	16,5	do.	cl.		
7	,912	61,3	1,4	do.	cl.	,972	80,3	19,8	n.e.	do.	,898	84,5	18,3	n. e.	cl.	,858	87,5	20,6	n. e.	do.	,844	86,3	19,6	n. e.	do.	,849	80,	10,1	do.	do.		
8	,846	71,5	1,6	s. w.	cy.	,881	79,7	5,2	s.	cu.	,828	84,5	12,	s.	cu.	,757	88,	16,3	s.	cu.	,759	82,3	10,8	s.	do.	,775	79,5	7,	s	do.		
9	,861	68,	8,5	n.	cl.	,936	79,5	14,	n.	cl.	,886	86,	21,8	n.	cl.	,820	88,	24,5	n.	cl.	,813	87,	23,5	n.	do.	,821	81,3	12,6	cm.	do.		
10	,823	65,	3,5	cm.	do.	,872	82,5	17,3	s. w.	do.	,828	87,5	20,6	s. w.	do.	,737	92,3	22,8	s. w.	de.	,718	91,8	22,1	s. w.	do.	,720	83,	13,5	s. w.	do.		
11	,820	70,3	7,1	n. w.	do.	,866	79,7	15,5	n.w.	do.	,841	84,	19,8	w.	do.	,744	90,3	22,4	w.	do.	,730	88,7	19,8	w.	do.	,732	85,3	18,4	w.	do.		
12	,820	68,3	7,1	n.	do.	,882	79,5	14,	n.	do.	,839	84,	17,3	n.	do.	,761	90,	25,5	n.	do.	,738	88,	23,3	n.	do.	,742	81,	14,3	cm.	do.		
13	,848	63,3	6,8	cm.	do.	,927	79,7	17,3	do.	do.	,901	83,5	22,	do.	do.	,808	85,7	24,5	do.	do.	,803	84,5	21,9	do.	do.	,808	77,5	12,3	do.	do.		
14	,879	61,5	4,8	n. w.	do.	,932	78,5	15,5	n.w.	do.	,901	82,7	23,7	n.w.	do.	,817	87,	26,3	n. w.	do.	,801	86,3	23,4	n.w.	do.	,800	78,5	14,	do.	do.		
15	,860	58,7	1,8	w.	do.	,813	80,	19,7	w.	do.	,882	89,7	22,8	s. w.	do.	,800	92,	25,1	s. w.	do.	,779	91,3	23,4	s. w.	do.	,788	83,3	16,6	s. e.	do.		
16	,835	66,5	2,3	cm.	do.	,902	77,5	5,8	n. e.	cu.	,873	86,	13,1	n. e.	do.	,797	91,5	16,3	n. e.	do.	,788	91,	13,8	n. e.	cu.	,786	84,5	8,	cm.	do.		
17	,848	66,5	2,3	do.	do.	,927	82,5	10,	do.	do.	,914	87,5	13,8	do.	cu.	,847	91,3	17,4	s. e.	cu.	,816	89,7	15,5	s. e.	do.	,818	85,	11,5	do.	do.		
18	,887	70,3	1,8	n.w.	cu.	,947	83,5	13,6	s. w.	cl.	,919	88,	12,1	n.	cl.	,824	93,	20,1	n.	cl.	,813	91,3	20,3	n.	cl.	,824	86,3	14,8	do.	do.		
19	,927	65,5	3,8	cm.	cl.	,976	83,7	20,7	n. e.	do.	,947	90,	22,5	n. e.	do.	,874	93,	23,	n. e.	do.	,862	91,7	22,5	n. e.	do.	,863	85,	11,5	do.	do.		
20	,924	70,7	1,5	do.	do.	,969	82,7	8,8	n.w.	do.	,924	88,	15,5	n w.	do.	,830	92,7	20,2	w.	do.	,815	90,7	19,8	w.	do.	,815	88,7	17,5	do.	do.		
21	,839	72,	1,5	do.	cu.	,885	81,7	8,	n.	ci.	,834	90,7	17,2	do.	cu.	,764	93,	20,1	n. w.	ci.	,742	92,3	19,8	n. w.	cu.	,773	82,	13,	n. e.	cis.		
22	,828	70,7	3,5	do.	cis.	,875	85,	15,8	w.	cu.	,869	83,3	14,6	do.	cis.	,797	84,7	15,2	s. w.	cis.	,763	84,5	14,6	s. w.	cis.	,737	81,3	12,4	cm.	cl.		
23	,809	65,	1,8	n. e.	n.	,883	77,8	7,8	do.	cl.	,850	82,7	9,8	w.	cu.	,794	86,8	14,6	e.	cu.	,782	86,3	12,6	s. e.	cl.	,792	80,5	8,6	s. e.	do.	0,60	0,48
24	,827	68,7	1,7	cm.	cu.	,951	68,	3,5	n. e.	cis.	,939	72,3	6,6	n. e.	do.	,880	73,3	6,8	n, e.	do.	,862	71,7	5,5	n. e.	cis.	,862	70,3	3,6	n. e.	cis		
25	,933	66,3	1,6	n. e.	cis.	,974	76,3	7,1	do.	cl.	,929	81,7	10,8	do.	cl.	,811	83,7	11,2	s. e.	do.	,810	82,7	10,8	s. e.	cu.	,774	78,5	7,6	s. e	n.		
26	,877	68,5	2,	n.	do.	,982	69,	1,5	n.	n.	,914	74,7	4,	do.	cis.	,836	75,	4,5	n. e.	cus.	,837	74,5	3,6	cm.	n.	,809	72,5	2,3	cm.	do.	1,18	1,00
27	,877	66,7	1,2	cm.	do.	,951	72,	3,8	n.w.	cu.	,922	76,	5,5	n.w.	cu.	,851	80,3	8,6	n. w.	cu.	,851	77,5	9,	n. w.	cu.	.867	73,7	7,7	n.	cl.	1,32	1,25
28	,957	67,5	3,	do	cl.	,025	76,5	5,6	n. e.	cl.	,998	79,5	13,8	n. e.	do.	,927	81,3	13,8	n. e.	cl.	,921	80,5	14,3	n. e.	cl.	,930	70,7	11,5	do.	do.		
29	,945	63,	2,8	n.	do.	,003	76,5	9,6	cm.	do.	,977	82,	15,8	do.	cl.	,903	85,	16,1	w.	do.	,884	81,5	16,5	n. w.	do.	,893	80,5	12,3	cm.	do.		
30	,909	66,	1,5	cm.	do.	,942	82,7	11,8	do.	do.	,909	86,	15,5	do.	do.	,835	88,7	16,	s. w.	cu.	,814	88,	15,3	s. w	do.	,819	84,7	11,5	do.	do.		
31	,887	72,	1,1	do.	do.	,890	82,5	7,6	s.	do.	,864	88,	11,8	s.	cu.	,780	90,5	12,	s.	do.	,772	88,7	13,	s.	cu.	,791	81,5	2,8	s.	do.		
Mean	29,865	66,3	2,9			,921	78,5	11,2			,890	83,6	15,5			,813	86,4	17,7			,800	85,2	16,8			,803	80,0	11,1			3,10	2 ,7

Abbreviations. In the column "wind," small letters have been used instead of capitals; *cm.* means *calm.* In the column "aspect of the sky," *cy.* is *cloudy; cl. clear; rn. rain, ci. cirrus; cu. cumulus; cs. cirro-stratus; cus. cumulo-stratus; cc. cirro-cumulus; n. nimbus.*

JOURNAL

OF

THE ASIATIC SOCIETY.

No. 4.—*April,* 1832.

I.—*Geographical Notice of Tibet. By* Mr. Alexander Csoma de Körös.

The vast mountainous tract of country between about 73° and 98° east longitude from London, and 27° and 38° north latitude, may be called by the general name of "Tibet," since the Tibetan language is understood every where from Beltistan (or Little Tibet) down to the frontier of China, although there be several corrupt dialects of it, and the inhabitants of these countries, in general, have the same manners and customs, are addicted to the same faith, (to Buddhism,) and have the same religious books written or printed in characters common to all the different provinces.

The native name of Tibet is "*Pot*," as it is pronounced commonly; "*Bod*," more properly. It denotes both the nation, and the country: for distinction's sake the country is expressed by "*Bod-yul*" (Bod-land), a male native "*Bod-pa*," and a female one "*Bod-mo*." The Indian name for Tibet is *Bhot*.

The natives of Tibet apply the name *Pot*, or *Bod*, especially to the middle Tibet, or to the two provinces "*U*" and "*Tsang*" (*Dvus-Qtsang*, pronounced *U-tsáng*), the capitals of which are *Lhassa* and *Zhikátsé*. Hence a native of those two provinces is called by them especially *Pot-pa*. The eastern part of Tibet is called "*K'ham*" or "*K'ham-yul*," also "Great Tibet." The north-western part towards Ladak is called "*Nári*." Bhutan is called by several names by the Tibetans; as, "*Lhopato*," "*Lho-mon-k'ha-zhi*," "*Lho-bruk-pé-yul*," or simply "*Lho*," (the south.) According to these divisions, the inhabitants of Tibet are distinguished thus: "*Pot-pa*" (or *U-tsáng-pa)*, means a native of middle Tibet; "*K'ham-pa*" (or *K'ham-ba)*, one of eastern Tibet; "*Náripa*," one of western Tibet; and "*Lho-pa*," a native of Bhutan.

The whole of Tibet occupies high ground, and lies among snowy mountains. Hence it is called in Tibetan books, by several poetical names, expressive of snow, ice, or frozen snow, cold, and high elevation. The highest ground in Tibet is in *Nári*, especially the peak called *Tísé or Tésé*, in Tibetan, and *Kailasa* in Sanscrit, about 80° E. longitude, and 34° North latitude. The sources of the Indus, Setledge, Gogra, and the Brahmaputra rivers are in *Nāri (Mñahris)*. There are several large lakes also. Tibetan writers, in describing the situation of Tibet, have likened *Nári* to a lake or watering pond; *U-tsang* to four channels; and *K'ham-yul* to a field.

Tibet is bounded on the north by the countries of the Turks and Mongols, whom the Tibetans call *Hor*, and *Sok-po (Hor-sok)*. On the east by China, (*Gyanak* in Tib.) On the south by India, (*Gyagar* in Tib.) On the west by India, Cashmir, Afganistan, *Tazik-yul*, and Turkistan.

The hill people of India, who dwell next to the Tibetans, are called by them by the general name "*Mon*," their country *Mon-yul*, a man *Mon-pa* or simply *Mon*, a female *Mon-mo*.

From the first range of the Himalaya mountains on the Indian side to the plains of Tartary, the Tibetans count six chains of mountains running in a north-western and south-eastern direction, when viewed from Kangri in Ñári (a lofty mountain running from south-west to north-west), whence the ground commences to take on one side a north-western and on the other side a south-eastern inclination. In the spacious valley, which is between the third and fourth range of the before mentioned mountains, is the great road of communication between *Ladak* and *U-tsang*. The principal countries or districts in this direction, from north-west, are as follows: *Beltistan* or Little Tibet, *Ladak*, *Teshigang*, *Gár* or *Gáro* (the lower and upper), *Troshot*, *Tsáng*, *U*, *Bhrigang*. It is here likewise, that the two principal rivers, the *Sengé k'há-bab*, and the *Tsánpo* take their course; that by Ladak to the north-west, and may be taken for the principal branch of the Indus; this to the south-east, and forms afterwards the Brahmaputra.

The countries on the Indian side that lie next to Tibet, commencing from Cashmir, are as follows: "*K'ha-ch'hé-yul*" (*or K'ha-ch'hul)*, Cashmir; *Varan*, *Mandé*, *Palder* or Chatirgerh, *Pángé*, *Gár-zha* or Lahul, *Nyungti* or *Kullu*; *K'hunu* or *Knaor*, and *Bésahr*; *Kyonam* and *Shák'hok*, or Garhwal and Kamaon; *Dsumlang; Gorkha-yul; Pal-yul (Bal-yul)* or Népal; *Lhopato* or Bhutan; *Ashong* or Asam.

The names of the countries or districts in Tibet that lie next to India, commencing from Cashmir, are as follows: *Himbab* (near to Cashmir), *Purík, Zanskar, Spiti, Gugé, Purang, Kyirong, Lhoprák, Myánam, Lach'hi, Mon-ts'ho-sna.*

Beyond the fourth range of the Himalaya mountains, or in the next valley to the north of Ladak, there are the following districts, counting them eastward: *Ñubra, Rudok, Tso-tso, Bombá, Chang-ts'ha-k'há, Chang-ra greng.*

The three great divisions of Tibet are:

1. Tibet Proper, or *U-tsáng*. 2. *K'ham-yul*, or the eastern part of Tibet, and 3. *Ñári*, or the north-western part of Tibet.

I. Tibet Proper or *U-tsáng*. It is that part of Tibet which lies next to the north of Asam, Bhutan, and Nepal, that is called by this name. This is the most considerable part of Tibet. The inhabitants of this division are the most industrious, skilful, and polite of all the Tibetan races. The number of the inhabitants in these two provinces is said to be about one hundred and thirty thousand families. *Lhassa* is the capital of the province *U*, as also of the whole of Tibet. From the seventh till the tenth century it has been the residence of the kings of Tibet. Now it is the first place for commerce in Tibet, the seat of government, and the residence of the Chinese *Ambans* (or ministers). There are several religious establishments. Near Lhassa is *Potala*, the residence of the great Lámá, (styled *Gyel-vá-rin-po-ch'hé*,) the head of the sect called *Géluk-pa* or *Geldanpa*. Other remarkable places, in the province *U*, are: *Yam-bu-Lhá-gáng*, a fort or castle built in the fourth century, by *Thòthori*, a king. It has been the residence of the ancient kings. It contains some antiquities, and plastic images of the ancient kings. It is a few days' journey to the south from Lhassa. *Sam-yé (Bsam-yas)* a royal residence and a large monastery, one day's journey from *Lhassa*, built in the eighth century by *K'hri-srong-déhu-tsan*, a celebrated king. There are deposited several ancient books taken from India. In the province of *U*, among other forts or castles, *Dé-ch'hén-song* and *Haspori* are the most considerable. In the province of *Tsang*, the following ones are of some repute: *Chang-nam-ring, Chang-Lha-tsé, Phun-ts'hok-ling*, and *Gyang-tsé.*

2. *K'ham-yul (K'hams-yul)*, called also *Pot-ch'hen*, or Great Tibet, consists of the eastern part of Tibet, and is bounded

by China on the east. There are several small principalities; as, *K'ham-bo*, *Gábá*, *Li-thang*, *Dé-gé* (or *Der-ghé*), *Brag-yak*, *Dép-ma*, *Go-jo*, *Gya-mo-rong*, *Jang-sa-tam*, *Amdo*, *K'hyamdo*, &c. The people of these parts differ very much from the rest of the Tibetans in their stature, features, dress, customs, and in the manner of speaking the Tibetan language. They are very robust, passionate, void of artifice or cunning, not fond of ornaments on their dress. In *K'ham-yul*, those called *Pon* or *Bon*, holding still the ancient religion of Tibet, are very numerous. They have also their literature, religious order, several monasteries, and kill several animals, great and small cattle, for sacrifice: they have many superstitious rites.

3. The north-western part of Tibet, from *Tsang* to *Ladak*, is called *Ñári.* This part is of very great extent, but the number of inhabitants is inconsiderable, not exceeding fifty thousand families together with Ladak and Beltistan. There have been several small principalities formerly in *Ñári*, as, *Gugé, Puráng*, *Kangri;* but all these belong now to the great Lámá at Lhassa, and are governed by *K'harpons* (commanders of forts) sent from Lhassa. There are also in *Ñári* very extensive deserts. The inhabitants dwell in tents, made of hair cloth; exercise a pastoral life, without any agriculture. Their number is said to amount to ten thousand families, and they all are under the *sGar-pon* or chief officer residing at *sGár* or *sGáro*, who is sent from *U-tsang* or *Lhassa*, and generally remains there for three years.

Gugé, part of *Ñári*, lying to the north of Garhwal and Kamáon, consists of two valleys, inhabited by somewhat more than two thousand families. The principal places are *Tsaprang* and *Tholing*, not far from each other. The first is the residence of the commanding officer called the *Kh'arpon* of *Tsaprang*, and the second is a large monastery and the seat of a Lámá styled the *K'hanpo* of *Tholing*. He resides during the summer at *Teshigang*, another large monastery, a few days' journey to the north from *Tholing*. These two places, (*Tsaprang* and *Tholing*) have been the residence of the princes that have reigned there from the 10th till the end of the 17th century.

Ladak, formerly called *Mar-yul*, still has its own prince, but he must accommodate himself to the political views of the Chinese. *Zan-skar*, *Purik*, *Ñubra*, form part of the Ladak principality. In the whole of Ladak the number of the inhabitants does not exceed twenty thousand families. Nearly the half of them are Mohammedans, mostly of the Shia persuasion. *Lé* (*slé*) is the capital of Ladak, the residence of the prince, and the emporium of a considerable trade with Turkistan, Lhassa, and the Panjáb countries. It is about 15 to 20 days' journey from Cashmír to the east, and nearly under the same latitude, (i. e. 34° north lat.)

Little Tibet or Beltistan (*Belti-yul*, in Tibetan), is the most north-western part of Tibet. There are several chiefs. The chief residing at *Kárdo* is the most powerful among them; those of *Kyeré* and *Kuru*, with some others, depend on the former. The chief of *Shigár* holds sometimes with the prince of Ladak and sometimes with the chief of *Kárdo*. The chiefs of *Minaro*, *Hasora*, &c. are the heads of some predatory tribes. In the several defiles to the south, in the neighbourhood of Beltistan, there live some predatory tribes, among whom the most notorious are the *Dárdu* people. These barbarous tribes are either of Afghán or Hindú origin. The inhabitants of Beltistan are Mahomedans of the Shia persuasion. They speak a dialect of the Tibetan language, but have nothing of the Tibetan literature. They keep some books or fragments in Persian. The correspondence from Ladak with the chiefs of those parts, is carried on in Persian, as also with Cashmír. The people of Beltistan are very unhappy on account of their chiefs having continual quarrels with each other, or with the prince of Ladak. The climate is warm. In the lower part of Beltistan, snow never falls. The soil is good. There are several kinds of grain; they have two crops. There are likewise several sorts of excellent fruits; as, of apples, pears, peaches, plums, figs, grapes, mulberries, &c. &c. There is a great want of salt and wool in those parts; formerly there existed a commercial route from Cashmír to Yarkand through Beltistan, (of 30 days journey;) but that country being in an unsettled state, the Cashmírian merchants afterwards preferred that through Lé, in Ladak, although it is very circuitous.

The people of *Lhopáto* or Bhutan, on account of their language, religion, and political connexion, belong to Tibet. But in their customs and manners they have adopted much from the Indians. They are more clean in their dresses and houses than the other Tibetan races. The men are of a martial spirit, like those of *K'ham-yul*, with whom they are said to have much resemblance in their character. The people of Bhutan speak a corrupt dialect of the Tibetan language; but there are several religious establishments, a great many books, and some religious persons are well acquainted with the Tibetan language and literature. They are Buddhists of the sect called in Tibet *Brukpa* (vulg. *Dukpa.*) They adopted this kind of Buddhism in the 17th century of our æra, when *Nák-Váng Nam-gyel*, a Lámá of great respectability, leaving *Tsáng* in middle Tibet, established himself in

Bhutan. There are counted now about forty thousand families. The whole province of Bhutan consists of four districts or valleys, which if counted from east to west, are as follows: *Thet-yul*, *Thim-yul*, *Patro* or *Pato*, and the middle district. The principal place is *Teshi-ch'hos-dsong.*

Lakes.—There are four principal lakes in Tibet. The *Ma-pham yu-ts'ho* (Mansarovara), in Ñári, is the most considerable, of a circumference of about one and a half day's journey. In *U-tsáng*, the *Yarbrokyu-ts'ho*, *Mu-le-sgrum ts'ho*, and *Ñam-ts'ho ch'hukmo* are likewise of great extent. There are many others of inferior rank or less compass; as, that of *Lú-nág* to the west of *Ma-p'ham.* From *Rúdok* (near Ladak) to the east or south-east, there are many salt lakes.

Medicinal or mineral waters.—Between *U* and *Ts'ang* there are some hot springs, used in curing cutaneous diseases and the gout. But such hot springs are numerous in the mountains lying east from the *Ma-p'ham* lake; especially at one place there is a hole out of which continually issues vapor, and at certain intervals, hot water is ejected with great noise to the height of 12 feet.

Glaciers.—The summits of many of the Tibetan mountains remain through the whole year covered with snow. But there are especially four glaciers or mountains covered with ice or frozen snow; as, *Tisé, Havo, Shámpo, and Pulé.*

Mines.—Mines are rarely excavated in Tibet. In the northern part of *Ñári*, and in *Gugé*, some gold dust is gathered, as also in *Zanskar* and Beltistan it is washed from the river. If they knew how to work mines, they might find in many places gold, copper, iron, and lead.

Petrifactions are found at many places in Tibet, especially in *Ñári.* On the 2nd and 3rd range of the Himalaya mountains, there are several sorts of them. Sálgráms and shells are found most frequently, in many places. All such petrifactions are denominated in Tibetan, according to the resemblance they have to anything; as, sheep-eye, sheep-horn, sheep-brain, swine-head, bird-leg, cow-tongue, stone-trumpet, &c. They are not objects of reverence in Tibet, neither of curiosity. Some of them, after being burnt and reduced to powder, are used as medicaments in certain diseases.

In the whole of Tibet, there is, in general, a deficiency of wood, both for fuel and for building, or timber, especially in *Ñári* and *U-tsang.* In *Bhutan* and *Beltistan* there are many sorts of fruit trees. In *K'ham-yul* there are some woods and forests. In the western part of *Ladak*, and in *Beltistan* some vines are cultivated. In middle

Tibet and Ladak the mountains are in general naked, destitute of herb, grass, and every vegetable. In the valleys, where the fields can be watered or irrigated, several kinds of corn are produced, especially wheat, barley, buck-wheat, millet, pease, and some others. In *Ñári* and in the northern deserts of Tibet, there grow several kinds of medical herbs and plants, and there are likewise good pastures; but there are in the deserts no fields for producing corn, and what they want they purchase from those who inhabit the southern parts of Ñári, and give them in exchange yaks, sheep, wool, woollen cloth, salt, borax, &c.

Rice is no where cultivated in Tibet. There are some kinds of pulse; as pease, bean, and lentils. There is no great variety of esculent plants. They have some turnips, cabbages, carrots, onions, garlics, and a few others; but for potherbs they use in general such greens as grow wild. In the western part of Ladak, in Purik, there is a certain plant, (with bushy stalks) called Prángos, which is a good remedy against the rot in sheep, if given for food for a certain time, in autumn.

The daily food of the Tibetans consists, in general, of gruel, or thick pottage prepared from the meal of parched barley *(satu)*, several kinds of flesh, bread, sour-milk, curds, potherbs, and of tea prepared in a particular manner in a churn, with butter, salt, and with some milk, or without this last ingredient.

The origin of the Tibetans is referred in their fabulous history to the union of an ape with a she demon. Some derive them from India; some from China; others from the Mongols, and others from the Turks. Nothing can be certainly said in this respect. They have an original language, which has little affinity to that of any of the nations mentioned. It is probable, that the royal family who reigned in middle Tibet from about 250 years before Jesus Christ till the 10th century, was derived from India, from the *Lichabyi* race, and it is certain that their religion and literature is of Indian origin. The Tibetans are ignorant of their origin. They distinguish now five sorts of people or races (or nations) among themselves; as 1. *K'hamba*, one dwelling in *K'ham-yul.* 2. *Pot-pa,* one inhabiting *U-tsang.* 3. *Brok-pa* or *Hor-pa*, one living in the deserts to the north-west of Lhassa. 4. *Nári-pa*, one of *Ñári*, *Ladak* and *Beltistan*, and 5. *Lho-pa*, one of *Bhutan.* All of whom have yet other subdivisions. They differ much from each other in their stature, character, dress, and in the accent with which they pronounce the Tibetan language. But they can all understand each other. They all agree (with the exception of the Mahommedans in Ladak and Beltistan) in having the same religion, whose records are in the same language and character.

II.—*Account of Barren Island, in the Bay of Bengal, drawn up by the late Dr. J. Adam.*

(Read at a meeting of the Asiatic Society.)

Barren Island, with its volcano, from which the accompanying specimens were obtained*, has been described in the 4th vol. of the Researches by Lieutenant (now Colonel) Colebrooke. That gentleman, however, did not visit it himself, but was indebted for his description to Captain Blair, who appears to have surveyed the whole cluster of the Andamans. The account is altogether very short, and any further particulars regarding the island, I have conceived, may not prove uninteresting. In this hope, I now beg leave to lay before the Society the following narrative, communicated to me by the same gentleman who has contributed the specimens. I shall give it in his own words, and I trust need make no apology for so doing.

"In the month of March last, in the passage from Carnicobar to Rangoon, I had occasion to approach close to Barren Island. It was first visible at daylight, and at 7 A. M. being within 10 or 12 miles of it, I could plainly perceive with my glass, volumes of white smoke issuing from the crater of the volcano. About 9 o'clock, we were very close to it, and being attracted by the singular appearance presented to us, and the wind at the time being adverse, I determined on visiting the island. Accompanied by my chief officer, I pulled for a small bay where, it was supposed, we should have no difficulty in landing. On approaching however to within a hundred yards of the shore, we were suddenly assailed by hot puffs of wind, and on dipping our fingers into the water, were surprized to find it as hot almost as if it had been boiling. The stones on shore, and the rocks exposed by the ebbing of the tide, were smoking and hissing, and the water was bubbling all round them. At this place we had a complete view of the cone, which did not then appear a quarter of a mile distant. Being unable to effect our object here, we pulled a little to the southward, and landed in a cove. We now commenced ascending an almost perpendicular precipice, holding on by the loose grass that grew out of the ashes covering the rocks. With no small danger and difficulty we reached the top of the cliff, and had before us a smooth surface of ashes, extending to what we supposed to be the summit of the island. There being nothing to hold by, and the acclivity very abrupt, we all joined hands, and in this way, at length, succeeded in gaining the top of a ridge. Here

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* These specimens are, or ought to be, in the cabinet of the Asiatic Society.

we found a small tree, or rather large shrub, and being much fatigued with our previous exertions we sat down under its shade, and enjoyed from thence a fine view of the volcano. It is an immense cone, regularly sloping from the base to the summit, and in appearance and color (to compare great things with small) resembling a heap of sifted coal ashes, with cinders scattered over its surface. I cannot say exactly what the diameter of the base may be, but should suppose it not less than 800 or 1000 yards; at the top it may be about 30, and the whole of this space seems occupied by the mouth. Even at this height I could observe no flame, but large volumes of thin white smoke kept continually issuing from it. This cone stands by itself in the centre of an amphitheatre of hills, which nearly close around it; the only opening to the sea being where we attempted to land. The summits of the hills to the N. E. are completely smooth, and covered with ashes; those to the S. W. although partly covered with ashes also, have a good many small shrubs scattered over them, with dry parched grass growing on the surface. This appearance countenances a belief, that it is only in the south-west monsoon, or rainy season, that eruptions take place, at which time the S. W. wind would blow the dust and ashes on the hills in the opposite direction, or N. E.

" Having dispatched a lascar from the spot where we sat down, to ascertain if it was yet far from the summit of the Island, he returned and stated, that we had apparently advanced a very little way compared with what still lay before us; and that we could not accomplish our object and be back before dusk. We therefore thought of descending, and as it would have been dangerous to do so the same way we came up, we were obliged to go by the other side of the ridge, where we had some grass, and occasionally a shrub or two to hold by.

" We now rowed to where we first endeavoured to land, and found that the tide had flowed several feet, which enabled us to have the boat close in, and step on shore on the rocks. Being desirous to examine the crater, we had to walk about three quarters of a mile over immense fragments of the specimen No. 1, which extended from near the sea side to within a short distance of the volcano, and along the only valley or outlet that the island presented. From whence this rock was derived, I could not decidedly say. It was lying carelessly and so loosely as hardly to afford a sure footing in walking over it. It is indeed difficult to describe the form in which this was lying, for were you to take any quantity of large and small pieces of No. 1. and throw them down in the most random manner, you could not make them assume the strange disordered appearance that nature here presents. I should not suppose that these masses were thrown from the volcano; as in that case, it appeared to me they would have been agglutinated together when in a state of fusion from intense heat, and also fixed to the surface. The impression on my mind at the time was, that some faint convulsion of the earth had elevated them directly from below. Along this dark tract there was no ashes, nor any thing indeed but the rock itself. On reaching the base of the cone, I casually picked up the specimen No. 2. Here viewing it, I judged the elevation to be half a mile to the top; but in my estimation of distances I do not pretend to be even near the truth. It sloped so suddenly from about halfway up to the top of the cone, that I considered it next to impossible to climb to the mouth. We ascended however 30 or 40 yards, sinking ancle-deep in ashes, at each slip, and I here took up the specimens Nos. 3 and 4, and the other two smaller pieces. I did not bring away any specimen of the ashes, but the color exactly resembles that of No. 3. In the whole of our ramble, we did not meet with a spot capable of yielding any vegetation, with exception of the withered grass formerly alluded to: nor, although we looked anxiously for fresh water among the rocks, could we perceive the smallest signs of it. The geographical site of the Island as given by Horsburgh seems perfectly correct; at least it agreed with my observations. The shore is extremely steep, and a ship may almost rub her side against the rock. Close in shore we could observe either tides or currents setting on eddies round some of the points; and in pulling from where we first endeavoured to land, to where we did land, we were in ripplings."

On examining the specimen No. 1, it is evident that it must have undergone the action of fire; and notwithstanding the above opinion to the contrary, it has in all probability been ejected from the crater of the volcano. On this point indeed we have positive evidence, as Captain Blair, in Col. Colebrooke's description, declares he saw these masses thrown out from the volcano in a state of ignition, "many of which rolled down the cone, while they were close to it, and bounded a considerable way beyond them." The black scoria seems to derive its color from an impregnating iron; it contains minute crystals and grains of felspar. The specimen No. 2, resembles the former, but has been thrown from the volcano at an earlier period, and exhibits the contained crystals in a state of decomposition. No. 3 is a very compact lava, containing embedded in its substance distinctly crystallized basaltic hornblende. No. 4, though vesicular, is more compact than the two first varieties. Besides the felspar, it contains some dark-colored crystals, the nature of which I have not fully ascertained.

I may add, that the conjecture, respecting the volcano's being in activity only during the S. W. monsoon, derived from the appearance of the hills, is supported by analogy in similar cases, as it has been frequently observed that volcanic eruptions are influenced by the state of the atmosphere. In a late number of the Edinburgh Philosophical Journal, I met with a notice on this subject, which I shall here take the liberty of transcribing. Under the head of "Detonations in Mount Brazier," it is stated, that M. Dubois Ayne examined in 1818, the structure of the mountain situated between Senes and Leerogne in the Alps, which is known to emit flame, and produce detonations, which are most frequent when the wind is in one direction. He found that there were beds of pyritous chalk, marly schistus, radiated sulphuret of iron, and bituminous substances, &c. in the strata of limestone that formed its sides, and he supposes that the flames and detonations are produced by the accidental inflammation of hydrogen liberated by the action of water on the above substances." As rain generally accompanies the S. W. monsoon in the Bay of Bengal, may we not reasonably infer, that the activity of the volcano on Barren Island at that season also depends on the presence of water and its consequent conversion into its gaseous elements ?

III.—*Flora Indica, or Descriptions of Indian Plants.* By the late William Roxburgh, M. D. F. R. S. E. &c. &c. Vols. I. II. and III. Printed at Serampore, 1832.

[To be completed in four volumes.]

The appearance of the above work may well be considered as a subject of congratulation, not only as a lasting tribute of justice to the memory of one of our most distinguished men of science, but also as affording our countrymen, in this country, the means of prosecuting a very pleasing branch of their studies in Natural History.

The length of time that the present work has remained in manuscript, within the precincts of this metropolis, would argue either an apathy on the subject, or that the work itself had not been considered of sufficient value to risk the expences of publication. But that this cannot have been the reason is evident from the fact, that the two first volumes, which were published twelve and nine years since, had so extensive a sale as to have been long out of print, while inquiries too respecting it have continued as numerous as ever ; and there is no doubt that, had this work been published many years ago, it would have had not only an extensive circulation, but it would have been the means of producing a considerable number of zealous botanists, who would have investigated what was described, and described what they found to be new: for at present, though there are numbers well inclined to prosecute the study of Indian Botany, of whom many are placed in the most favourable situations for obtaining a name, at the same time that they might contribute to the progress of the science; yet that the number of actual cultivators have been so few, can only be ascribed to the difficulty which each has had in prosecuting a subject on which no books were procurable; and without these, we are apt to fancy that we can do nothing, or suppose that we can find nothing which has not been already discovered. That nothing can be more erroneous is evident from the fact, that even in well-explored countries, such as England, Scotland, and France, many new plants have been found even in the most recent times.

The appearance of this work is to be considered an important circumstance, not only for the information itself communicated, but also from its being in an English dress; for the neophytes of science will be more readily induced to enter a mansion of which the threshold is made accessible. Nothing so much promotes the spreading of a science as the publication of works of a popular nature and compendious form, and the present will be the forerunner of many such. That some attempts of this kind have not hitherto been made, can only be accounted for, by the supposition, that those who have laboured to acquire a knowledge of the science, surrounded as it is with great difficulties, have rather employed themselves in exploring new fields, than in endeavouring to assist others up the toilsome ascent, which they had by dint of much labour themselves ascended.

That materials have not been wanting for giving a short though imperfect view of Indian Botany, may be inferred from a view of the numerous species and genera of Indian Plants which are enumerated in the System of Wildenow and the Synopsis of Persoon. If the Indian species in these works had been extracted and published in a separate work in English, something might have been done towards inducing a greater taste for Indian Botany. But in justice, the want of such works must, in a great measure, be ascribed to the want of encouragement, and the apathy with which all endeavours to prosecute any of the branches of natural, or any other science, are viewed in India, and most other English colonies; where what is pleased to be styled *practical* knowledge, is alone valued, and the inutility of scientific acquirement dilated on with a degree of complacency which is amusing, as chiefly indulged in by those who are totally unacquainted with the nature and objects of the species of knowledge they affect to despise, and the ultimate tendency of which they would perhaps be the more surprised to find was to produce the most certain practical results.

That materials have not been wanting we repeat, is evident, if we call to mind the authors who have expressly written on Indian Botany ; and among these, it is lamentable to find, that until the time of the author of the present work, none of our countrymen had distinguished themselves in the field.

As not having written expressly on the subject, it is perhaps needless to mention the names of Theophrastus, Dioscorides, and Pliny, though in their works many plants are mentioned as being natives of India, and these form very interesting subjects of research in the present day, besides Galen, Oribasius, Paulus Ægineta, and among the Arabians, Mesue, Serapion, Rhazes, Avicenna. By the latter authors many plants are mentioned, as being the produce of India, of which no attempt appears hitherto to have been made towards their identification. Ibn-ul-Bakhtar is said to have traversed Africa, Arabia, and India, for the prosecution of his favourite study of plants : his MSS. in the Escurial, contain descriptions of several thousand species ; and his work, which is frequently referred to by the Persian authors on Materia Medica, was much consulted in the composition of the Geographia Sacra of the learned Bochart.

The earliest Europeans who seem to have paid any attention to the useful plants of India, are the Portuguese physicians at Goa, Garcia *ab Horto* and Christopher da Costa, whose observations, with those of Belon, form the basis of the work of Ausius entitled *Exoticorum libri decem.* Antwerp, 1563. In the works of Prosper Alpinus, though on the plants and medicine of the Egyptians, many plants are mentioned of which the products are brought from India.

The first work, however, of any note on the plants of India is that of Rheede, entitled *Hortus Malabaricus*, in 12 volumes, folio, containing 794 plates, which, considering the time they were published, are highly creditable productions. Rheede resided chiefly on the Malabar coast, and was Governor of the Dutch settlements in the East Indies ; he procured all the new and curious plants in his power, described them, and had drawings made ; the plates have in them the native names, with the Arabic and Hindí characters. Plukenet collected nearly 8000 plants, and his works give plates of nearly 3000 species, among which are several Indian plants.

Kæmpfer travelled in Persia, Arabia, and India on the Coromandel coast and along the banks of the Ganges, Java, Japan, &c. and his work *Amœnitates Exoticæ* contains accounts of many, and plates of some, plants of Japan, of which nearly allied species are found in the Himalayas. The sixth number of his work, which contained 600 figures of scarce plants growing along the Ganges, has been entirely lost.

Burmann, in his *Thesaurus Zeylanicus*, 1737, has given descriptions and figures of many Asiatic and some Indian plants.

Rumph came as physician to the East Indies, and became Chief Magistrate and President of the Mercantile Association of Amboyna; he collected carefully all the productions of India, especially plants. These are described and figured in his work, *Herbarium Amboinense*, 1750—1755, in six volumes, folio, with a supplementary or 7th volume bound up with the 6th. The descriptions are in Latin and Dutch, in separate columns, and the figures are extremely good.

N. J. Burmann, son of John Burmann, was Professor of Botany at Amsterdam. In his *Flora Indica*, 1768, he has represented in 67 plates, 176 very scarce plants, which had been collected by his father.

Rottler, Professor of Botany, at Copenhagen, has given excellent figures and descriptions of many of the Indian *Cyperaceæ*. This work is in folio, published in 1773, with 21 plates.

Retzius, Professor of Botany at Lund in Sweden, published in six *Fasciculi*, from 1779 to 1791, in folio, with 19 plates, many Indian plants discovered by travellers, particularly Kœnig, who visited both the Coromandel and Malabar coasts, as well as Ceylon and Siam.

Thunberg, in his *Flora Japanica*, has given descriptions and figures of many of the plants of Japan, several of which, or nearly allied species, are to be found in the Himalayan mountains.

Though not strictly Indian botanists, it is sometimes useful to refer to those who have written on the botany of neighbouring countries, especially Asiatic; and among the most useful of them may be mentioned the work of Forskal, on the plants which he found when travelling with Niebuhr, in Arabia. The Indian reader will be surprised to find so many names with which he is familiar : the Arabic names being given both in the English and the Arabic character, and without doubt introduced by the Mahomedan conquerors into India. Fr. Hosselquish travelled as a botanist in Syria; Olivier and Michaux in Persia, and Pallas in Siberia. Loureiro, a Portuguese, went as Missionary to Cochin China, but as he could not without medicine succeed in his plans, he studied the productions of the vegetable kingdom. The *Flora Cochin-chinensis*, edited by Wildenow, contains descriptions and plates of the plants he found in that country. Sonnerat died in 1813, after having employed 20 years in his travels; he visited the isles of France and Bourbon, Madagascar, the Phillipines, Moluccas, New Guinea, the Coasts of Malabar and Coromandel in India, Ceylon and China. Many of his plants are described by Lamarck in his invaluable *Encyclopedie de Botanique.*

We now come to the time of the author of the present *Flora Indica*, who independent of many contributions to the transactions of learned societies, and to the periodicals of the day, was principally brought to notice by his work entitled *The Plants of the Coast of Coromandel*, which was published by the order, and at the expence of the Honorable the Court of Directors, the selection being made from five hundred drawings and descriptions presented by Dr. William Roxburgh, then their Botanist in the Carnatic. With a more immediate view to utility, preference was given to subjects connected with "medicine, the arts, or manufactures ;" but new plants also were admitted, or such as had hitherto been imperfectly described, although their qualities and uses remained unexplored.

John Gerard Kœnig, a native (it is believed) of Courland, came to India in 1768, under the protection of the king of Denmark, chiefly for the purpose of studying the natural history of the country : he was prosecuting his botanical researches in the Carnatic, when Dr. Roxburgh, who entered the service at Madras in 1766, became acquainted with him. Dr. Roxburgh had applied to botany under Dr. Hope in the University of Edinburgh, and bringing with him to India a love of the study, he found in Dr. Kœnig an experienced conductor through a wilderness as yet unexplored by either.

On the death of Dr. Kœnig, Dr. Russel was nominated his successor ; he contemplated the publication of a work on the useful plants of Coromandel, which though perhaps less generally interesting to the botanists in Europe, might prove of real service to India.

Circular letters, with a list of the plants proposed for the first publication, were sent by the Medical Board to the subordinate settlements, requesting it might be favoured with any information respecting the subjects in question, which the medical gentlemen might have it in their power to communicate ; and in consequence several useful communications were received. Dr. Russel however left India before the proposal could be carried into execution. But as the object was approved of by the Court of Directors, the directions their letter contained fell fortunately into hands well qualified for carrying them into execution.

Our author, now disengaged from the duties of his station, was pursuing his favourite study at Somalcottah, when he thus became permanently attached to botanical pursuits. He had made experiments on the cultivation of pepper and indigo; had written on qualities of the Swietenia bark, and had communicated other discoveries, to the *Philosophical Transactions*, *the Indian Repository*, and *the Asiatic Re-*

searches. He had made large collections of plants in the Carnatic, and for several years previously to his appointment had retained a painter constantly employed in drawing plants, which he accurately described, adding such remarks on their uses as he had learned from experience or collected from the natives.

The drawings and descriptions arrived in England in 1791 and 1794, when the number of 500 were completed. It was from these that the first selection was made.

Sir Joseph Bankes undertook the superintendence of the engravings, and Dr. Russel of the letter press, in consequence of Dr. Roxburgh's intended residence in India, as he was in 1793 selected to be superintendent of the botanical garden at Calcutta. After many years of laborious investigation he was compelled to visit his native country for the recovery of his health; but he died, as we learn from his son, at Edinburgh, in February, 1815.

The work now consists of 3 volumes, in large folio, with 300 plates drawn in a very superior style. They are selected chiefly for their useful properties, as may be observed in the long account given of the *Oldenlandia umbellata*, Chay root or East Indian madder; the numerous experiments shew the care that has been bestowed on the application of botany: also in the account of the sandal-wood tree, the Catamaran tree, *nux vomica*, cleaning nuts, the teak, several esculent species of *ceropagia*, marking nut, Sapan-wood tree, *Swietenia febrifuga:* the *mehwah* tree, the *butea frondosa*, with experiments on its gum; *embryopteris glutinifera, phœnix farinofera, areca catechu, feronea elephanta, Ægle marmelos, mimosa Arabica, Rottlera tinctorea.* Under *mimosa catechu*, it is observed, "but the natives have no idea of extracting from it, or any other, the extract called *catechu (terra Japonica):*" this is an inaccuracy, as large quantities of *catechu* are made from it in the upper provinces of India. *Terminalia chebula*, with directions for dyeing yellow: *Shorea robusta, Dipterocarpus turbinatus*, the Cardamum tree, *Scirpus tuberosus*, or water chesnut of the Chinese, *saccharum Sinense:* the *Sona* tree, *Gmelina arborea,* for fibres: observations on the different kinds of cotton.—The above list shews the number of useful plants, described and figured in the great work of Dr. Roxburgh, a work perhaps less known in India than in any other part of the civilized world.

It may appear that much time has been unnecessarily employed in noticing a work of Dr. Roxburgh's, which has no immediate reference to that now under consideration; but the fact is, that the two works, though published at such considerable intervals, are closely connected together, form one whole, interpret each other, and are well calculated to give a correct view of his labors as an Indian botanist.

The present work, containing descriptions of all the new plants which he had discovered, as well as notices of those which, though previously described, he had found in India, was completed many years ago, and the manuscript deposited with Dr. Carey, the venerated Editor of the work. An idea of the labours of Dr. Roxburgh may be formed by an inspection of the catalogue published by Dr. Carey, called the *Hortus Bengalensis*, and which may be considered an index to the present work. This was published in 1814, at the time that Dr. Roxburgh was obliged to make a voyage to sea for the benefit of his health, when Dr. Carey embraced the opportunity of his absence to bear testimony to those abilities, that zeal and success which had been so eminently displayed in bringing the Botanic Garden to its then state of perfection. We quote his words from the Government Gazette of August, 1831.

> "The garden was begun by Colonel Kyd, in March, 1786, and collections of plants from different parts of the east were soon introduced into it with such success, that the number of plants brought into it in eight years amounted to more than three hundred. Dr. Roxburgh joined it in autumn, 1798. His unremitted attention to its improvement, and his eminent abilities as a botanist, are far more fully exhibited in the following catalogues than they could possibly be by any eulogium from a friend. The number of described species now in the garden amounts to 3500; for the knowledge of no fewer than 1510, as named and described in this catalogue, we are indebted to his indefatigable and discriminating researches. Among these are a great number of new genera, some of which have a considerable number of species ascertained; to these should be added those plants contained in the second catalogue which, though not in the Botanical garden, have been described and many of them accurately drawn by him: these amount to 453. The extensive correspondence which he maintained, not only with gentlemen in all parts of India but in most parts of the world, will be witnessed by the list of donors to the garden which he superintended; and the liberality with which he always communicated to those who applied to him, requires no other witness than the universal voice of the inhabitants of India, and even of many in Europe and America, to whom he constantly sent supplies. He was elected member of the following Societies:—Phil. Soc. and Linn. Soc. of Philadelphia,—Soc. Encour. Arts,—Roy. Soc. Physicians, Edinburgh,—Linn. Soc. London,—Roy. Soc. Edin.—Soc. Nat. Hist. at Berlin."

The above extract gives a succinct view of the invaluable labours of Dr. Roxburgh, and though his work cannot be considered as an entire account of all the plants of India, yet it is a tolerably full one of what is commonly considered India, that is of the peninsula and of the plains of Hindústhan; for in Dr. Roxburgh's time the north-western and hill provinces were little known, and Silhet, Assam, and Ava, had been, with the exception of the former, but little explored. It is still therefore, though completed so many years ago, the best work we have on Indian botany, and the two volumes now published, give a true indication of the value of the two others, which are to follow immediately to complete the work. The *Hortus Bengalensis*, of which a reprint appears to be imperiously called for, gives a list arranged according to the Linnæan classification of all the plants which are described in Dr. Roxburgh's *Flora*. In this list, opposite the Botanic names, the Indian ones are given, together with the places of growth, names of donors, duration and habit, time of flowering and of seed, with frequent reference to figures of the plants, in the works of Rheede and Rumphius. A portion of this work, extending as far as nearly to the end of *Pentandria Monogynia*, was formerly printed, with which the invaluable additions of Dr. Wallich were incorporated. But as this volume of the work has been long out of print, and as the sons of Dr. Roxburgh were anxious that the *Flora Indica*, on which he bestowed so many years' unremitting labour, should be presented without any further delay to the scientific world, Dr. Carey, at their request, has superintended the progress of the present edition through the press: not considering themselves however at liberty to make use of Dr. Wallich's invaluable notes and additions, Captains Roxburgh have omitted them in reprinting the first part of the work. The present edition of the *Flora*, therefore, to be completed in four volumes, will consist of the manuscripts left with Dr. Carey by Dr. Roxburgh, without any addition. We therefore miss along with Dr. Wallich's additions Dr. Carey's various Sanscrit Synonymes, which added so much value to the former edition.

The volumes under review extend to the end of *Polyandria Polygynia*. From the nature of the work it is not easy to give an idea of its contents, except by mentioning that it contains descriptions in English of most of the plants usually found in India, exclusive generally of those of the hills, as far as the first thirteen classes. Dr. Roxburgh's high character as a botanist will be a sufficient warrant for the correctness of the specific descriptions. Generic characters were not so much or so accurately studied in Dr. Roxburgh's time, as they are now. The general reader may obtain a tolerable idea of their value by turning to the several articles where the useful properties of the plants are particularly described. In the first volume, we would particularly refer to the valuable notices respecting the several useful species of *Curcuma*, from one of which an excellent substitute for Arrow-root is procured ;—the different kinds of ginger ;—of cardamum ;—the observations at p. 85, respecting the manufacture on the coast, of barilla ;

—the superiority of the China sugar-cane, at p. 240, over that commonly cultivated in India;—at p. 476, *Convolvulus Turpethum* used as a purgative by the natives of India;—the observations on *Sapistanum*, at p. 589, and at 617, on *Scopolia aculeata*, as a cure for jungle fever. In the second volume *Nerium tinctorium* is mentioned as producing a kind of Indigo, and *N. tomentosum*, a yellow dye; *Asclepias asthmatica* is highly spoken of as a substitute for ipecacuanha;—the *Asclepias tenacissima* as yielding fine silky fibres, of which the mountaineers of Rajmahl make their bow-strings;—*Asclepias tingens* is mentioned as yielding a green dye;—*Salsolanudiflora* for the production of pearlash, and *Sanseviera zeylanica* as affording what is called China grass. Most of the Indian trees and plants, remarkable for any useful properties, are always indicated, and the native names being mentioned under the botanic ones, facility is afforded for obtaining any of the articles that may be required for experiment.

In conclusion it may be useful to indicate, that if the generic characters were all printed in a tabular form at the commencement of each volume, considerable inconvenience would be saved in discovering the genus of a plant with which we are unacquainted; for instead of turning over to the generic characters throughout the volume, we should have them presented to us within the compass of a few genera. If the learned and highly venerated Editor should not consider it as coming within his plan to embrace our suggestion, we will in a subsequent number of the Journal offer in a tabular form all the genera contained in Dr. Roxburgh's four volumes of the *Flora Indica.*

IV.—*A Sketch of the Route and Progress of Lieutenant A. Burnes and Dr. Gerard.* By a recent Traveller.

[We have to thank our correspondent for the following sketch of the proceedings of two travellers, upon whose adventurous journey to explore the Oxus are directed the eyes of all who are interested in geographical research. The information is evidently drawn from private letters, but we trust, that the authors will not deem the publication of the extracts to which we have confined ourselves, premature, only because they were not expressly written for such an object.]

Before the travellers quitted the last civilized capital on the north-west, the splendid city of Lahore, so much celebrated for its palaces, gardens, and mosques, densely populated by an active and cheerful race, Ranjít Sinh desired to leave an indelible impression on their minds of the splendour of his court. Dr. Gerard writes:

"Our entertainment might be compared to those splendid feasts "described in the Arabian Nights; we were transported into a little "paradise of pleasure; the Maharaj himself tasted, in more senses than "one, of the intoxication of the scene, and ere morning most of his "chieftains and guests were 'hors de combat.'"

Having procured letters of introduction to the several chiefs who occupy the west bank of the Indus, and provided themselves with *húndìs* to an ample amount on the *kotís* of Peshawur and Kabúl, the travellers left Lahore about the beginning of March. In their progress towards the Indus, they visited the great salt range which stretches between the Indus to the Jelum, and made a considerable deviation from the straight road to visit *Dádan Khán*, where some of the chief excavations of the article exist*.

While on the banks of the Jelum, they were much struck by the immense size of the firs floated down the river; the houses in all the towns along its banks are roofed therewith. Immense cedar trees were seen rolled down from the hills; it was these that supplied materials for Alexander's fleet: one tree measured thirteen feet in girth, which may afford some idea of their applicability to ship-building.

From *Dádan Khán* they went to *Darapúr* on the Jelum, but notwithstanding a very active search they failed to discover the remains or site of the city of Bucephalus, founded by Alexander, in honor of his famous charger. The celebrated fortress of *Rotas*, is situated a short distance to the west of the town and river of Jelum, near a broad sandy stream, which contains little water. This fortification was built by the well known Patán emperor Shér Shah, who expelled Hamayún, the son of Baber Shah, from the throne of Delhi.

Lieutenant Burnes and Dr. Gerard halted one day to look at this noble fortress, but they deem it, "with all its formidable extent, a piece of stupendous folly."

The next place of interest the travellers visited, was the tope of *Manikyála*, the history of which ancient structure still remains a problem. They obtained many coins with devices apparently Grecian, from the peasants of the neighbourhood†. Dr. Gerard observes, that although the probable inference is, that from "any of the memorials which have been discovered, the tope marks the site of the town of Taxilla, the appearance of the building does not accord with so great

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* An account of these mines by Lieut. Burnes will be found in the present number.

† Three of these coins, and impressions of one more and of two ancient gems, have reached us, which in addition to the coins discovered by Colonel Ventura, are now under investigation.—Ed.

antiquity. Two thousand years make sad havoc in masonry; it is more likely that it belongs to the Bactrian dynasty." The construction, the figure, and isolated situation of the tope of *Manikyála*, is certainly of a singularity to attract the attention of all travellers; but there is nothing in the mere workmanship that would lead one to suppose, that it may not have been executed by the inhabitants of the neighbourhood. This is perhaps satisfactorily proved from the existence of several monuments of the same shape, on the west of the Indus, and from a comparison with an ancient building in the immediate vicinity. The building alluded to is a saint's tomb, surrounded by a stone wall, about a mile from the tope to the southward. The building material is the same; a porous limestone, which is dug out within a short distance of the surface of the ground, in fact indurated *kankar:* similar specimens of which are to be met with in various places between the Jumna and Ganges. At the Khyber pass, on the road from Peshawur to Kabúl, another tope of much the same construction is found; as likewise at Balabágh beyond Jelalabad, on the same road. Without comparing all these edifices together, we cannot very well form a correct opinion; but it may be doubted whether either the Grecian or Roman edifices, which have survived the wreck of time, can furnish an example at all corresponding to the tope of *Manikyála;* and if such a doubt proves to be true, we can scarcely longer abstain from giving the people of the country credit for erecting this mausoleum, for such we take it to be, as there is no evidence of its utility to men who are alive. After leaving this place, they visited Ráwal Pindi, a large and well inhabited town; it was here that Shah Sujah passed a considerable time after being expatriated; it is situated near the mountains, and the climate is excellent. "There are many pleasant vallies in the neighbourhood; but what conveyed most gratification to the travellers was the enchanting wild and beautiful garden of Hosein Abdaleh, situated under the brow of a mountain, copiously watered by streams of clear transparent water, decorated with all sorts of exotic flowers, shrubs, and plants; it was here they reposed their weary limbs; they found rest and stillness in this mansion of delight and tranquillity; they remembered a pleasing description of it in Lalla Rookh, but regretted they had not the book to ascertain how far the picture corresponded with the original. They were surprized with the variety and number of trees; the romantic nature of the scenery; the rich verdure and the tout ensemble made them feel as if they stood on English ground: but desolation was worn by every thing visible; the garden mourned and had put on its weeds of woe; summer houses and once gay retreats were tumbled from their exaltation; they were in heart-sickening ruin. Even the trees suffered grief and vexation; a violent tempest a few years before had up-rooted some of the finest, and they now lay low with their drooping heads in the water." At the town of Hosein Abdali, is a saint's tomb, around which is a fine stream of water full of fish. One of the great roads to Kashmìr passes this place, and strikes into the hills, bringing the traveller to Kashmìr in seven days. After leaving Ráwal Pindí, a causeway cut through a hill is passed; it is excellent of the kind, but one does not exactly feel convinced of the important utility assigned it. In the centre of it, on one of the walls, is a Persian inscription, denoting that it had been constructed in the time of Shah Jehan; but much of the context was obliterated. From Hosein Abdali our travellers made their way towards the Indus; here they were met by Harí Sinh, who shewed them every attention.

It is now necessary to advert to the nature of the country passed between Lahore and this river. Between Lahore and the hills, on which stands *Rotas*, is an uninterrupted level plain, confined by the Himalayan branches of hills on the north, and various checquered and intersected plains on the south. They passed over the three principal streams of the Panjáb; the Raví, the Chínáb, and the Jelum, and the most populous and best cultivated part of the Panjáb. The country, &c. as far as *Rotas*, in appearance resembled Hindústan: the people, their customs, their houses, their crops and cultivation, their dress, all appeared but little modified. The flatness of the country, the aspect of their towns and villages, surrounded by groups of trees, gave little or no indication of change; but beyond *Rotas*, the country assumed broken and highly contrasted features; small ranges of hills met them on the right and left; small streams were frequently passed. The elevation of the country, according to Dr. Gerard's barometric observations, now became above two thousand feet above the level of the sea. The climate was materially modified, and they even experienced hoar frost, and sand ice, as late as the 10th and 12th of March. The climate was good, and the air temperate all day. With the nature of the country, the inhabitants also seemed less polished, severer in their manners, and less easy in their circumstances; the population was also scantier, the villages fewer, and far between: the northern hills now frowned more immediately upon their course, and tended to increase the comparative desolation of the country; the stories of the murderous *Gakers*, the tales of the successful resistance or easy conquest of the strong places they passed, harmonized with the scenery. They now felt that they were really beyond the boundary of Hindústan. Our travellers prepared themselves now for the assumption of the native dress, and began gradually to accustom themselves to the adoption of oriental manners and customs. This was done to secure them from attracting notice, and thus ensuring their personal safety, and a free intercourse with the people of the countries through which they might pass. Dr. Gerard writes : "After leaving Lahore, we began to assume the native costume, and divest ourselves of the cumbrances and comforts of civilized life, and we are now (Atok, 16th March,) in every respect in a suitable condition to mingle with the Afgháns, and even to encounter robbers. Our poverty will however protect us ; our beards are growing, and our faces are getting black from the sun's ardour. Our habits cannot be too coarse to correspond with our vagrant character. I wish other parts of us besides our face would change colour, as we are liable to be betrayed by our awkward attitudes. Our shirts stick close to our backs, as we cannot afford their renewal ; in fact our clothes are still too good, and the sooner they become greasy the better. Two mules carry all our baggage and servants : our beds are upon our horse rolled up like a pedlar's pack. By and bye we shall mess with our servants, of whom we are already a counterpart ; and when we say our prayers five times a day, and use our fingers for chopsticks, we shall pass on unnoticed. We have parted with every superfluity ; it was with regret however that I gave up two of my spare barometer tubes :—the instrument still remains, and if I am so fortunate as to get an observation on the *Hindú kush*, I shall be satisfied ; in case of fracture, our thermometers will still give approximate altitudes."

Having reached the Atok, they were welcomed by Harí Sinh, whom they found encamped in the plain of the Indus ; they paid him a visit in his tents, which brought back the scenes of Lahore grandeur. Harí Sinh having forded the river the previous day, they were determined to try the same experiment, and accordingly proceeded on elephants with him ; but the enterprize cost them the sacrifice of a man and two horses ; the people struggled, and losing the ford, were swept down by the rapid stream : seven sawars lost their footing, but all were recovered, except one. Their elephant rolled deeply, but never had occasion to swim ; the next branch of the river was more difficult, but they prevented the horsemen following them ; in recrossing, they kept in close order, and repelled by this means the impetuosity of the current. This stream has been frequently forded by the armies of the Sikhs in latter times with little or no loss of lives. Our correspondent says, that "Atok has lost much of its repute as a place of strength, since the fords have become so greatly known. Elphinstone speaks of Shah Shujah's passage as a prodigy, and the first of the kind. The Sikhs who accompanied us in our passage, being predestinarians, undertook the fording of the Indus without concern, saying they were accustomed to it."

Lieutenant Burnes writes, that the sand of the Indus, near Atok, yields a small quantity of gold*: the process of extraction by repeated washings is very tedious. Quicksilver is employed to take up the gold, by amalgamation, from the coarser grains which remain on the sieves. Some of the smaller rivers falling into the Indus are said to contain more gold than the latter.

The same traveller also describes a curious phenomenon observed at the confluence of the Indus and Kabúl rivers, half a mile from Atok, (for Macartney's map is here in error,) in the following words : "An *ignis fatuus* constantly shews itself in this place ; two, three, and even four lights are visible at a time, and continue to shine through the night. It appears at first sight to be the reflection of the water on the rock, well smoothed by the current ; but then it only shews itself in one particular spot, and though the whole banks are so smoothed, it is confined to a few yards. There was and could be no deception : the natives cannot account for it, and its continuance during the rainy season is the most inexplicable part of the phenomenon in their estimation. The valiant Mán Sinh, who carried a war of revenge against the Mahomedans beyond the Indus, fought a battle on this spot, and the lights are considered by some as the departed spirits of the slain. For my own part I cannot solve the mystery regarding this "Will o' the wisp," which I only credited after having seen it." The water of the Indus has the reputation of being specifically cold, but this is a vulgar error arising from the relative difference of temperature between the river and atmosphere. On the 18th March it was 22° Farh.

While at Atok, our travellers received friendly letters from the chief of Peshawur, Sultan Mahomed Khan, and they were the more acceptable as they had not sent information to him of their approach. For this civility they believe they were indebted to Shah Shujah ; however they would have rather wished that it had been omitted, as it was scarcely their intention that their progress should be made a matter of notoriety. While on this subject, Dr. G. makes the following remarks : "It is quite ridiculous to view ourselves as natives, while every other person sees through the thin veil of dissimulation ; we

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* A specimen has reached us in safety.—Ed.

are however passing the best way for our safety and comfort, by appearing in the dress and habits of the country, by which we shall avoid the idle gaze and intrusions of the mob, the importunity of beggars, and the reckless cupidity of robbers. It is impossible for one to assume disguise who has been long at the court of Ranjít Sinh, and who continues to be treated as a Sahib to the very limit of his authority; but it never was our intention to mask ourselves. Sultan Mahomed Khan is going to send horsemen to meet and escort us, which is rather too much kindness, and he will only disgrace himself by caressing such dirty disreputable fellows as we now appear." Ranjít Sinh's troops stationed in this fort made some opposition to the baggage of the travellers being ferried across; the fact was, they were in a state of mutiny in consequence of large arrears being due to them. They crossed shortly after to the opposite side of the river, on which is situated the fort of Khyrabad. On the 10th, they were at Akora, on the banks of the Kabúl river, preparing for their onward journey to Pesháwar. S. E.

Allyghur, 11*th April*, 1832.

V.—*Some account of the Salt Mines of the Panjáb. By* Lieut. S. Burnes, *Bombay Army.*

Locality.

In the high lands of *Kabúl*, between the city of that name and *Pesháwar*, a range of hills springing from the roots of the white mountain *(Sufèd Koh)*, crosses the Indus at *Hara-bágh*, and terminates on the right bank of the *Jelum*, or Hydaspes of the ancients. This range formerly figured in our maps under the name of *Jood*, after it had passed the river; but it has been more appropriately denominated the salt range, from the extensive deposits of rock salt which it contains. An account of that part of it near *Hara-bágh*, where the Indus in its course southward cuts this range and lays open its mineral treasures, will be found in Mr. Elphinstone's work. In the neighbourhood of *Pind-Dádan-Khan*, a town about 100 miles N. W. of Lahore, the salt mines which supply the northern provinces of India with that necessary of life are excavated in the same range. The following particulars pretend not to rank as a scientific account of these mines, my only object being to convey that information which a journey to so unfrequented a part of the Panjáb has enabled me to collect.

Formation.

The salt range forms the southern boundary of a plateau between the Indus and Hydaspes, which rises about 800 feet from the plains of the Panjáb. The hills rise to an actual height of about 1200 feet from the valley of the *Jelum*, which gives them an elevation of about 2200 feet from the sea. They exceed five miles in breadth. The formation is sandstone, occurring in vertical strata, with pebbles or round stones imbedded in various parts of it. Vegetation is scanty, and the bold and bare precipices, some of which rise at once from the plain, present a frightful aspect of desolation. Hot springs are found in various places. Alum, galena, and sulphur also occur; but a red clay, which is chiefly found in the valleys, is a sure indication of a salt deposit, and it is to be found at intervals throughout this range*. The supply of the mineral is now drawn from *Pind-Dádan-Khan*, whence it can be conveyed with facility both up and down a navigable river.

Mines.

At the village of *Keoru*, five miles from *Pind-Dádan-Khan*, we examined one of the principal mines. It was situated in a valley near the outside of the range, which was cut by a rivulet of salt-water. It opened into the hill through the red clayey formation above mentioned, at a distance of about 200 feet from the base. We were conducted by a narrow gallery, sufficient to admit of one person passing another, for about 350 yards, of which fifty may be taken as actual descent. Here we entered a cavern of irregular dimensions, and about an hundred feet high, excavated entirely in salt. The mineral is deposited in strata of the utmost regularity, occurring like the external rock in vertical layers. Some of them however subtend an angle of from 20 to 30 degrees, and have the same appearance as bricks that have been placed upon one another. None of the layers exceed a foot and a half in thickness, and each is distinctly separated from its neighbour by a deposit of argillaceous earth, about an eighth of an inch thick, which lies like mortar between the strata. Some of the salt occurs in hexagonal crystals, but oftener in masses; the whole of it is tinged with red, varying from the slightest shade to the deepest hue;—when pounded the salt is white. The temperature of the cavern exceeded that of the open air by 20 degrees, when the thermometer stood at 64° (in February). The natives state that these mines are much colder in the hot season, but this only shews that they undergo little or no alteration, while the heat outside increases as the season advances.

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* We have safely received the specimens of these minerals transmitted by Lieut. Burnes.—Ed.

Mode of working.

There were upwards of an hundred persons, men, women, and children, at work in the mine, and their little dim burning lamps on the sides of the cavern and its recesses shone with reflected lustre from the ruby crystals of the rock. The cavity has been excavated from the roof downwards. The salt is hard and brittle, so that it splinters when struck with the sledge-hammer and pick-axe. The rock is never blasted with gun-powder, from fear of the roof falling in; and accidents of this kind sometimes happen in the present simple mode of excavation. The mines are not worked for two months during the rains for the same reason. The miners live in villages among the hills. They have a most unhealthy complexion, but do not appear to be subject to any particular disease. They receive a rupee for every 20 maunds of salt brought to the surface; a task which may be performed by a man, his wife, and child, in two days. In those mines, where the mineral is near the surface, it is hewn into blocks of four maunds, two of which load a camel, but it is usually broken in small pieces. This salt holds a high reputation throughout India with native practitioners, from its medical virtues. It is not pure, having a considerable mixture of some substance (probably magnesia), which renders it unfit for curing meat. The natives of the Panjáb ascribe the prevalance of *nazla* to its effects. That disease is said to consist of a running at the nostrils, which wastes the brain and stamina of the body; with what truth I know not.

Supply.

As the salt range contains a supply which is inexhaustible, the mines yield any quantity that may be desired. Two thousand five hundred maunds of Lahore, one of which is equal to one hundred pounds English, are extracted daily, which gives about eight lacs of maunds for the year. A few years since this salt was sold at the mine for a half and even a quarter of a rupee per maund, but its price has been now raised to two rupees per maund, exclusive of duties. It is closely monopolized by the Panjáb Government, and Runjít Sinh hopes to derive an annual revenue of sixteen lacs of rupees, with 2½ additional for the duties. A lac and a half of rupees however is expended in working the mineral. The profits amount to about 1100 per cent. though the salt is sold for one-third the price of that of Bengal, which averages 5 Rupees per maund of 80 lbs.* The *Panjáb* salt is exported by the *Jelum* to *Multan* and *Bhawalpúr*, where it meets that of the *Sámar* lake. It finds its way to the banks of the *Jumna* and to *Kashmír*, but it is not exported

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* Vide Mr. Ramsay's Evidence before the Committee of the Lords.

westward of the Indus. Runjít Sinh has prohibited the manufacture of salt in all parts of his dominions, yet it is very questionable if he will ever derive so large a revenue from it as he now expects. The farmer of the monopoly, a cruel and tyrannical màn, is now mercilessly oppressing the people to extract it. The natives do not know the period at which these mines were first worked, but it must have been at an early date, since the mineral is laid open by the Indus. They were used by the Emperors of Hindústán, but the inquiring Baber does not mention them in his Commentaries.

VI.—*Mode of extracting the Gold Dust from the Sand of the Ningthee River, on the frontier of Manipúr.*

[Extracted from Captain Grant's Letter to Mr. G. Swinton, dated Manipúr, 1st March, 1832.]

Read 4th April, 1832.

I forward a specimen of the gold found in the sand of the Ningthee river, and partly extracted in my presence. The process is very simple, as is also the apparatus employed; the latter consists of a plank four feet in length, two and a half wide at the upper end, and tapering towards the lower one, which is one and a half; it is hollowed out so as to leave an edge of half an inch round the sides and upper end, the under end being left open for the water to run off; the lower half of the plank is cut into a succession of grooves half an inch deep and the same in width. This plank is placed slightly sloping towards the lower end, and the sand washed through a coarse sieve which frees it from the pebbles and gravel: the fine sand which remains in the grooves of the plank is then placed in a wooden trencher, polished on the inside with *keoo*[*], and in shape and size resembling a shield, with a very small receptacle in the centre: this is immersed so as to leave its outer edge on a level with the surface of the water, and by a rotary motion, the fine sand is washed off and the gold remains in the small receptacle. The whole operation occupied about a quarter of an hour, and the quantity of gold found was about a grain troy weight. Gold is found in greater abundance at most other places, where searched for in the sands of the Ningthee, than at Helaoo, where I witnessed the process; it is also only found where the sand is mixed with pebbles and gravel: the black sand, which accompanies it, is invariably found with the gold; its appearance, in fact, denotes the pre-

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[*] The black varnish of the keoo tree, which grows in the Rutboo valley, supposed by Dr. Wallich to be the same as the varnish tree of Ava. G. S.

sence of the latter. I also forward a specimen of an ore which is abundant in the bed of the Maglung; being no mineralist, I will not venture to pronounce an opinion as to the nature of the metal it contains*. I inquired of the *kubas*, who could give me no information on the subject. I enjoyed a coal fire every evening during my progress up the Maylung; it burned well, but the smell was somewhat strong; there are quantities of it to be found in all parts of the bed of the nalá, the *kubas* say it is petrified teak charcoal: an opinion in which I am inclined to agree, as I saw immense logs of that timber, which were undergoing the change to petrifaction; and parts which were partially burnt, were to all appearance the same as the coal. I have got specimens of the coal and petrified teak, but do not send them, having sent some four or five years ago, to Mr. Tucker; I also perceived a notice on the subject by Dr. Richardson: should you wish it, I will send them on hearing from you. The *kubas* and *nagas* use the petrified teak for striking fire to tinder; there is one peculiarity respecting its locality which struck me, it is that I have only observed it (in all places between Mulphoo and Sunayachil), at about the same distance from the Ningthee, that is, at the foot of the last range of the Augoching hills on their eastern side.

VII.—*Note on Indian Saline Deposits.* By the Reverend R. Everest.

[Read in the Phys. Cl. on the 4th April, 1832.]

Some months ago I had the honour of laying before the Society my views respecting the deposits of common salt in the soil of the *Bundelkhand* country, as mentioned by Capt. Franklin, and also those of the *Bhartpúr* district, as mentioned by an anonymous writer, in the GLEANINGS. I then ventured an opinion, that these deposits were not to be considered as characteristic of the new-red-sandstone, partly because their chemical composition differed from that of the rock-salt deposits in Europe: the *Bhartpúr* deposits being stated to consist of muriate, with some sulphate and carbonate of soda; the rock-salt of Cheshire, on the other hand, being composed principally of muriate of soda, with some sulphate of lime; and partly, because it was in no wise proved that these deposits were connected with the sandstone formation itself, further than by their existence in the superincumbent soil. I now beg to call your attention to the newly discovered saline deposit in the plain

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* Iron pyrites.

about a mile to the west of this, as confirmatory of my previous opinion. The salt is principally composed of carbonate, with a mixture of sulphate and muriate of soda. It effloresces on the surface in the dry weather, and is scraped off by the natives. I had the soil opened above a foot in depth, and it appeared to be equally impregnated beneath.

This deposit is not connected with any sandstone, and is 35 miles distant from the nearest point of the great sandstone formation of *Bundelkhand.* From inquiries I have made, I am led to believe, that similar saline deposits are not unfrequent in this district. Capt. Franklin mentions salt in the valley of the Ganges beyond *Mirzapúr*, and the salt of the *Bhartpúr* district is not proved to be connected with the sandstone; therefore we have no reason to believe it peculiar to any formation. As the sulphate of soda is said to be collected in large quantities from the soil of the basaltic districts on the western side of India, it is not improbable that these saline deposits are distributed over the peninsula of India co-extensively with the nodules of *kankar* (carbonate of lime) and hydrated iron ore.

Ghazipur, *March*, 1832.

VIII.—*Smelting of Iron in the Kasya Hills.*

The following is the method pursued from time immemorial by the natives of this part of the country in working down the ores of iron so plentifully met with hereabouts.

There are large grass huts at least twenty-five feet high, the thatch of which reaches down to the ground on all sides. The interior, of an oval form, 15 by 30 feet, in the two diameters, is divided into three apartments; the central one being the smelting room.

Two large double bellows, with the nozzles pointed downwards, are set upon one side of the apartment, on the upper part of which a man stands with one foot on each, his back supported by two planks. He holds a stick in his left hand, which is suspended from the roof, and has two strings attached to it below, connected with the two bellows: these are worked quickly by a wriggling motion of the loins, and the strength of the leg.

The nozzles of the bellows unite in a tube which leads underground, from a sort of wind chest, to the hearth about four feet in front of them. Over the hearth is a chimney of pipe-clay braced with iron hoops, two feet in diameter at the bottom, and about six feet high. The mouth at bottom is on the side away from the bel-

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IRON SMELTING FURNACE
of the
KASYA HILLS

lows, and the chimney inclined from them to direct the heated air from the smelter towards an opening in the roof. At the right side of the bellows and even with the top of the chimney, is a trough containing damp charcoal and iron-sand: at every motion of his body the operator with a long spoon tumbles a piece of this charcoal with the iron-sand adhering to it, down the funnel of the furnace, and when a mass of melted or rather softened iron is formed on the hearth, it is taken out with tongs, and beaten with a heavy wooden mallet on a large stone by way of anvil. The iron in this state is sent down to the plains for sale or barter. The smelters say that they procure their fire-clay in large quantities from the vicinity of the limestone hill at *Chirra Púnjí,* whence on a former occasion I sent you a series of geological specimens, among which, if I remember right, was some of this clay, of a light straw colour and slaty texture, containing minute micaceous particles. W. C.

References to Plate VI.

1. The chimney of the furnace supported by stone pillars, so as not to touch the hearth.
2. One pair of bellows open.
3. Ditto shut.
4. Frame on which the man rests.
5. A primitive ladder for mounting the bellows.
6. The wooden mallet.
7. The tongs.
8. The spoon.
9. The trough supported by a wooden fork.

VII.—*On Chinese Vermilion.*

[Translated into French from a Chinese Technologic Encyclopedia, entitled, *Thian-koung Kaï-we,* or *Exposition of the Wonders of Nature and the Arts.* By M. Stanislas Julien*.] From the Nouveau Journal Asiatique.

Cinnabar, liquid silver, the red of silver, are in reality one and the same thing. What causes them to bear different names is that the substance is either pure or coarse, or old or recently extracted.

Cinnabar, of the first quality, comes from *Chinpé* (now *Mayang*), and from *Sitchouan.* It is found in a state of purity in the bosom of the earth, and does not require purification by fire. This cinnabar, which is used to polish the tips of arrows, metallic mirrors, &c. is thrice as valuable as mercury: whence it is carefully picked and sold under its native form, that is, in the state of sand or red powder. If melted, it loses a great part of its value.

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* The Chinese edition whence this article is extracted bears the date of 1637.

The coarse cinnabar, of the second quality, needs to be purified by the fire, when it forms mercury.

The cinnabar of the first quality is found by digging the ground at a depth of 70 feet. The presence of the mineral is indicated by the appearance of small white granular stones. The largest pieces are of the size of an egg. The second sort does not enter into any pharmaceutic preparation. It is ground up and used by the painters and colorists in the same manner as that which is prepared directly from mercury. Its matrix does not always appear under the form of white stones, but has sometimes a mixture of blue and yellow. It is found about 20 feet below the other. Sometimes it is met with in a stratified sandy soil, and then the stony and sandy gangue is easily separated. This kind of cinnabar is found in abundance at *Koucitchou Ssein*, at *Thoungjin*, &c. also in great quantities at *Changtcheou* and at *Tsintcheou.*

The cavities from which the second sort is collected, have a whitish aspect. When recently extracted, it may be separated without the necessity of previous pounding. This cinnabar, on first coming from the mine, has a brilliant surface, which soon tarnishes on contact with the air.

To prepare the vermilion, they take the cinnabar, and pound it in an iron mortar shaped like a boat, with a stone pestle of a flattened spherical form, and placed at the end of a vertical lever moved by four men, by means of a bar which passes through it. The powder is thrown into clean water, and left to soak for three days and three nights. One part falls to the bottom of the vessel, the other, lighter, floats on the surface: this is removed with a skimming ladle and placed in a second vessel. It is then called *Eult chou*, or *second red.* The cinnabar which was deposited in the first vessel, is taken out, dried in the sun, and is then called *Theout chou* or *first red.*

To obtain quicksilver from the ores, either the second quality, inferior cinnabar, white and newly extracted, or the deposit, or the skum separated on the surface of the water, are employed.

Thirty pounds of one of the above ores is put into an iron vessel, with a convex head of the same metal, having a small opening in its centre: the two are carefully luted together, and a curved iron tube fitted hermetically into the aperture at top, with hemp and luting.

Thirty pounds of charcoal are necessary for the distillation: when the retort becomes hot, one end of the iron tube is plunged into cold water, so that the vapour which rises from the metal pot distils over through the tube, and condenses in the water. In five hours the whole of the cinnabar is transformed into mercury, which is taken out of the water after having been suffered to repose for 24 hours.

Sometimes the mercury is treated afresh, to be converted into vermilion, which is then called *Intchou*, that is to say *red of quicksilver.* A retort of porcelain, or a double vessel of metal, are employed indifferently for this purpose: to one pound of mercury two pounds of sulphur are added; the mixture is triturated until it forms a blackish powder: it is then put into the crucible, which is covered with an iron cover, held down by a bar of iron laid across the top of it, and tied down on either side to the lower vessel by means of a loop of brass wire made fast round the latter. All the openings are then carefully closed with lute, and the pot is set upon an iron tripod, under which a fire of resinous faggots is maintained for a considerable time; whilst the cover is kept cool with an old swab soaked in water. The mercury then combines with the sulphur, and sublimes in a very fine powder, which adheres to the sides of the vessel. The cinnabar which fixes on the inside of the cover is of the brightest colour. When the vessel is quite cold, the vermilion is taken out. The excess of sulphur is found precipitated to the bottom, and may be employed a second time. One pound of mercury gives 14 ounces of cinnabar of the first quality, and 3½ oz. of the second quality.

The cinnabar obtained by the action of fire, and that from the pulverized native ore, have exactly the same appearance; nevertheless the former is never used in painting the houses of princes and persons of distinction: the only sort employed for this purpose being the pure pulverized mineral from *Thoung chin* and *Pe-tchouan.*

When intended to be used in writing, the vermilion is ground up with gum and made into small cakes. Rubbed upon a stone palate (encrier,) it presents a red of the richest brilliancy: if pounded on a tin slab, it forms a black colour, and is then fit for the varnishers, and gives to objects a glistening tint which enhances their price. Mixed with the oil of the *Thoung* tree, it assumes a very bright appearance: but if varnish be added to this, it loses its brilliancy and becomes of a deep black colour.

Thus we have described faithfully all that concerns the preparation of native and artificial cinnabar, as well as that of mercury. All that has been said about *the sea of cinnabar* and *the vegetable cinnabar* rests on no foundation whatever: they are mere reveries fit to amuse the credulous and lovers of the marvellous.

When mercury has been converted into vermilion, it has no longer the power to return to its original state, because it has then arrived at what may be called *the final limit of transformation.*

X.—*Abstract of Meteorological Tables, kept at Bancoora, by* Mr. J. MacRitchie, *for* 1830 *and* 1831.

1830.

Months.	Ther. lowest 24 hours	Ther. highest 24 hours.	Barometer. Noon.	Rain in inches.	Prevailing Winds.	Occasional observations.
January,	62.8	71.7	29.890		N. W.	
February,	ab	sent				
March,	78.2	85.1	.678	0380	N. W.	4 Foggy mornings. Hailstorm on 26th, stones 9. in. in circum. Total Eclipse of ☾.
April,	82	88·4	.610	2.370	S W	
May,	84	90.3	.479	5 627	W. N.W.	Very cloudy and rainy.
June,	85	89.8	·331	8.600	W.	Rains set in on the 6th, with severe thunder, lightning, and rain.
July,	34 5	9. 2	.425	15.500	W.	
August,	83 3	9.	4 62	6.908	S. E.	
September,	35.	9.2	5 00	4.784	N. W.	Total Eclipse of ☾ visible on 3rd.
October,	33.	87.5	6 37	1.672	W.	Stormy 2 days.
November,	73.1	81.6	6 25	.963	N. W.	
December,	61.6	70.	89 5		N. W.	
Yearly aver.	78.5	84.7	29.592	46.804	N. W.	On surface generally variable.

1831.

January,	66.3	73.	29.871		W.	A distant Comet visible for 10 days.
February,				3.000		Partial Eclipse of moon on 26th.
March,	73.5	79.9	.748	1.642	N. W.	
April,	83.1	88.1	.610	4.397	W.	
May,	87.	92.8	.510	0.300	W.	Very hot and dry generally.
June,	86.5	91.2	.370	15.989	N. W.	Rains set in heavily on the 9th.
July,	85.5	89.7	.385	10·987	W.	
August,	85.	87.5	.345	11.286	S.	
September,	82.5	87.5	.538	10.259	E. S. E.	
October,	81.2	87.2	·600	5.854	N. E.	Rains broke up on 31st, with a violent hurricane, for 12 hours, from 6 P. M. to 6 A. M. 1st Nov. Bar. ranged from 29.5 to 28.8. Torrents of rain. Trees torn up. Extraordinary cloudy and rainy month for the time of the year.
November,	70.	78.	.685	4.460	N. W.	
December,	69.5	73.5	.810	1.438	N. W.	
An. Mean,	79. 1	84.4	29,588	69.652	W. N.W.	On surface generally variable.
Mean of 2 years,	78.8	84.5	29,590	58.228	W. N. W.	Range of Bar. from 29.920 to 28.800.

The Thermometer I observe by is a self-regulating one by Carey, and seems to answer the purpose very well. The Barometer is one of Bate's Marine ones. The rain-gauge is made by Knight.

XI.—Miscellaneous Notices.

Extracts from a Native Receipt Book.

The following receipts may prove highly useful to such of your correspondents as are engaged in Indian field sports, and can appreciate the advantage of being their own *elephant doctors* when professional advice is not procurable; they are extracted from the nostrums of a first-rate Delhi mahout, and I have had an opportunity of trying most of them at different times in my sporting days, when I made a point of attending personally to the comforts and welfare of my noble sporting companion. Should these receipts prove useful to fill a vacant sheet occasionally, I shall be happy to continue the supply. W. L.

Medicines, &c. for Elephants.

1. When an elephant's back is swollen, and it is necessary to cut it to let out the matter, the wound is to be well cleansed with the following, previously to filling it with No. 2. Make an extract from the root of the madár, add thereto 1 chittak of salt and 1 cowrie weight of níla tútía, to be removed every evening for about 8 days, to cleanse the inside well; then fill it with No. 2 for about 16 days, removed twice a day, at first for 8 days, and afterwards once in 8 days, and the upper part of the wound and swelling to be well anointed with the salve No. 2. No. 3 to be then sprinkled well over the wound twice a day.

2. *Salve for the sore back.*

Musabbar, [aloes.]	4 chittaks
Sindúr Guzaratí, [red lead.]	2 ditto
Olive Oil	4 ditto
Chota jewarkíatta, [flower of barley.]	2 seers
Karwa tèl, [mustard oil.]	1 seer
Níla tútía, [blue vitriol.]	2 chittaks
Wax	2 ditto
Opium	1 cowrie wt.

3. *To dry up the sore.*

Nutmegs	2
Ilachís, (cardamums.)	1 chittak
Dár-chíní, [cinnamon.]	1 ditto
Isafgol, [*Plantago.*]	1 chittack
Tukhm-Balangu, (*Dracosephalum Royleanum.*)	1 ditto
Sang jaráhal, (alum ?)	1 ditto
Paprí kat, (white *catechu.*)	1 ditto

To be finely powdered and sifted through fine cloth, and to be applied to the wound to dry it up.

4. *Lotion for inflamed eyes, &c.*

Rab-ul-sus or liquorice to be soaked in water in an earthen pot, and to be beaten to a strong froth with the hand, and as it subsides is to be taken up and thrown upon the elephant's eyes; this is very cooling.

5. *Ditto another.*

Poppy heads	4 chittaks
Dhania, [coriander seed.]	4 ditto
Sounph, [*anethum.*]	4 ditto
Nousádar, [sal ammoniac.]	4 ditto
Salt, Bherí, [black salt.]	4 ditto
Salt, Sámar	4 ditto

To be steeped in water for 4 days in the shade in an earthen vessel.

6. *Ointment for swollen and inflamed eyes.*

Sabzí, [hemp leaves.]	4 chittaks
Phitkari, [alum.]	1 ditto
Opium	1 pysa bhar
Ounla, [myrobalan seed.]	2 ditto

Roast the alum and rub it well up with the sabzí in a little water, then with the other ingredients apply all round the eye for 3 or 4 days.

7. *Powder for ditto.*

Bhímsení Caphùr, [purified camphor.]	1 tola
Fine sugar	1 tola

Powder and sift very fine together, then take a feather and introduce a little into the eye for 4 or 5 days, when the eyes are very much swollen and inflamed.

8. *For accidental bruises, or swollen back or feet from long journies, or hard work, or from exposure to cold or water.*

Nosádar, [sal ammoniac.]	4 chittaks
Sámar salt	8 ditto.
Kárwa tel	1 seer.

To be finely powdered, and beat up with the oil, and applied to the part affected, at the same time to be fomented with cow-dung fuel (úplah).

9. *Cathartic for an Elephant when she eats earth, or shows other symptoms of a foul stomach.*

Musabbar Kamungarí, [aloes ?]	12 chittaks
Chouk	12 ditto
Gandak balesnar, [sulphur.]	12 ditto
Híng, [assafœtida.]	12 ditto
Old gur, [molasses.]	1 seer.

To be made up into three balls, to be given at three different times. If however the elephant will not take this, give

No. 10. The roots of sarpat, 10 seers, to be made into an extract with water, make up 5 seers atta into cakes with ½ seer of salt, and the above extract: having baked the cakes, make the elephant eat them.—Should this be too violent, give

No. 11. Rice, 5 seers, boiled, to which add 4 chittaks of dahye; if not procurable, butter; continue for a few days, after which the following cordial:

12. Shrab, [wine.]	1 seer
Kátkí	4 chittaks
Gol mirich, [black pepper.]	4 ditto
Anar ke chilka, [rind of the pomegranate.]	4 ditto

To be boiled in water and then mixed with the shrab, and the cakes to be broken up and mixed with these ingredients.

13. *A salve for an Elephant's back when nearly healed up.*

Bara ním, (leaves of the.)	1 chittak
Chotah ním, (do.)	1 ditto
Bylawe	2 ditto
Tutía, [blue vitriol.]	1 pysa bhur

To be filled into the wound, and a piece of rag stuffed gently in.

(To be continued.)

XII.—*Proceedings of Societies.*

1.—ASIATIC SOCIETY—PHYSICAL CLASS.

Wednesday Evening, the 4th April, 1832.

The Honorable Sir Edward Ryan in the Chair.

1. Mr. Kyd presented some specimens of Barnacles of an unusual size, taken from a piece of timber found floating in the Bay of Bengal.

2. Mr. Calder presented, on the part of the *Société d'Histoire Naturelle de l' Ile Maurice,* copies of the proceedings of that Society, and of the Annual Reports delivered at the Anniversary Meetings of the 29th August, 1830—1831.

There seems to have existed so far back as 1801, a *Society of Emulation* at Port Louis, Mauritius, instituted by Messrs. Bory de St. Vincent and Lislet Geoffroy, and several other naturalists who remained in the isle on the occasion of Gabarres expedition. From time to time it published articles on Natural History and other branches of knowledge—it held its last meeting to greet the arrival of Freycinet in the French ship of discovery, *L'Uranie*, in 1818.

Under the French government, Genl. Decaen had intended to add a cabinet of Natural History,with a library and collection of instruments,to the Lyceum founded by him, but the project was, from some unknown cause, frustrated. Long previous to the thought of such an institution, however, most of the natural productions of the isle had been brought to the knowledge of the world through the labours of Aublet, Commerson, Sonnerat, Jossigny, the Viscount de Kerhoens, so often quoted by Buffon, and even the celebrated St. Pierre, to whom may be added De Cossigny, Beauvais, and Céré.

In 1826, two naturalists resident at Port Louis, in the most disinterested manner offered to contribute their own collections towards the formation of a Museum connected with the College; but circumstances changed with English rulers, and no answer even was deigned by Sir G. Lowry Cole, or Genl. Darling.

The present Society owes its origin entirely to the private exertions of Mr. C. Telfair, Mr. J. Desjardins, and their friends.—They first thought of calling it "the *Asiatic Society*," and connecting its labours with those of Calcutta and London, but preference was at length given to the present designation of "the Natural History Society of the Mauritius." It opened its meetings on the 24th August 1829, the anniversary of the birth of the Baron Cuvier, the most distinguished natural philosopher of the present age; and the same auspicious day was fixed for the subsequent annual festivals of the Society. Two of these have since elapsed, and on each occasion an able and copious analysis of the past year's labours was read by the secretary Monsieur Desjardins. The present Governor Sir Charles Colville, at the earnest request of all the members, accepted the office of patron, and granted an apartment of the government house for the meetings of the Society. Reports of the proceedings of the Society will be published regularly in the Journal.

2. Read a letter from the Revd. R. Everest, addressed to the President, on the subject of the Indian sandstone, and describing the extraction of carbonate of soda and common salt from the soil in the neighbourhood of Ghazipúr.

3. Read a note on the geology of Elephant Hill on the Quedah Coast, by Dr. Ward, Madras Medical Establishment, accompanied with specimens of the rock, communicated by Sir Charles Grey.

The country north of Quedah beach is an immense plain nearly level with the sea, and covered near the coast with mangrove, rising gently towards a small chain of hills to the east, 16 to 20 miles distant. The soil is a rich white clay mixed with sand. From this plain, 6 miles inland, and quite insulated, rises abruptly the Elephant rock. The ground around it is a complete swamp, and the elephants in approaching were buried to the howdah in mud. The rock is a close grained limestone of a grey colour: it is penetrated by a number of caves of various dimensions: stalactites hang on the face of the rocks within and from the roof :—the floor is leveled by a stalagmitic incrustation, covering loose calcareous earth about 60 or 70 feet deep. In one of the caves, at an elevation of 8 or 10 feet above the surrounding plain, an insulated mass of shells was found; cockles, oysters, and a larger kind of muscle, connected together by calcareous matter: there was no appearance of shell strata in the rock.

The caves contain no sculpture. The natives assert that formerly the Elephant rock was surrounded by the sea.

4. A letter from Captain Grant, of Manipúr, communicated by G. Swinton, Esq. describing the process of extracting gold from the sand of the *Ningthee*; specimens of the gold dust and sand accompanied, and some crystallized pyrites. [This paper is inserted in the present number.]

5. Some account of the Lacquered or Japanned Ware of Ava, communicated by G. Swinton, Esq. on the part of Major H. Burney, Resident at Ava; illustrated by a complete series of specimens of the ware, as well as of the materials with which it is manufactured: also of the varnish and of the various metallic dyes used to colour it. [This will be published in our next.]

6. Description of a new species of Buceros of Nipál, the *Buceros Homrai*, by B. H. Hodgson, Esq., with remarks on its anatomical structure, by Dr. J. Bramley, and with an accurate drawing of the animal.

7. Account of the Salt Mines of the Panjáb, by Lieut. S. Burnes, Bombay Army, enclosed in a letter from that officer, dated *Rawil Pindi*, 10*th March*, 1832, with specimens of the native ore of lead, sulphur, alum, and red clay, from the range in which the salt is found. [Published in the present number.]

The thanks of the Society were voted for the contributions of the evening.

2.—MEDICAL AND PHYSICAL SOCIETY.

7th April, 1832.

J. C. Boswell, Esq. Assistant Surgeon, at Penang, was elected a Member of the Society. The following communications were presented to the Meeting:

1. An Essay on Lepra Tuberculata, as it appears in Bengal, by Dr. T. A. Wise.

2. Remarks on Variola and some Varioloid Diseases, which have recently occurred subsequently to Vaccination, by H. S. Mercer, Esq.

3. An additional communication on Dracunculus, with cases, by Dr. Mylne.

4. Proces verbal of the Proceedings of the Society of Natural History of the Mauritius, at the Meetings of 25th October and 23rd November, 1831, transmitted by Monsieur Desjardins.

5. A case of Lithontrity Instruments, with a copy of Mr. Atkinson's printed letter, addressed to the Medical Board of Calcutta, describing the process of Lithontrity. A letter from the Secretary of the Medical Board, states, that should cases of Urinary Calculus occur in the practice of any of the medical men at the Presidency, these instruments will be available for their use.

6. At the same time, Dr. Casanova brought for inspection of the Society, a complete set of instruments, made precisely after the model of those used by Mons. Civiale, at Paris; together with that author's work on Lithontrity. Mons. Civiale's apparatus is peculiar in the lightness and firmness of its construction, and in having a spiral spring to regulate the pressure of the borer against the stone;

during the action of the drill; so that the aid of an assistant to the operator is not required. Dr. Casanova stated to the Society, that he has now a case of Urinary Calculus, under treatment by Civiale's process, and he exhibited some portion of the stone which had been reduced to a powder by the first operation, on this subject. A chemical examination made by the President, proved this to be composed principally of carbonate of lime, with some phosphate of lime, and scarcely any lithic acid: a very slight trace of iron was apparent, probably from attrition of some particle of the Lithontriteur. Dr. Casanova also presented to the Society, the fragments of a stone on which he had successfully operated at the Mauritius; and he offered his apparatus, made after Civiale's model, for the use of any of the professional men at the Presidency, who might require it either for operation, or to have a similar apparatus made here.

7. A letter from Mr. Royle, on his departure from Calcutta, presenting for the Library six medical works, viz.

Dionis's Surgery.
Le Dran's Surgery.
Lommius de Febribus.
Sennertus, Epitome Institut. Medicianæ, cum libro de Febribus.
Albertus Magnus de Morbis Mulier.
Michaeli's Scotus, Opusculum de Secretis Naturæ.

The following papers were then read and discussed by the Meeting:

The case of disease of the heart formerly presented by the Medical Board.
Dr. Casanova's case of Elephantiasis.
Mr. Mercer on Small-pox after vaccination.

This paper commences with a few remarks on the occasional occurrence of small-pox oftener than once in the same person; the author then observes, that although the greatest benefits have been derived from vaccination, (the efficacy of which generally as a preventive of variola he fully acknowledges,) still it must be allowed, that sometimes a modified small-pox occurs after vaccination; and in few very rare instances, the severer forms of confluent small-pox happen. Seven cases of variolous and varioloid disease have recently fallen under the author's observation, the particulars of which he now placed before the Society; from consideration of these cases, he concludes, that the varioloid disease, after vaccination, occurs in a great variety of forms, and with considerable diversity in its eruptive symptoms, as well as in the degree of intensity of the attendant pyrexia. He is also inclined to believe, that some individuals who have been for a time protected against variola by vaccination, may become afterwards liable to suffer from the former disease; although the present cases would not support a conclusion that there was any particular period at which the prophylactic property of vaccination ceased; as the patients he has lately treated, while suffering from varioloid diseases, were aged respectively, 29, 28, 22, 20, 19, 13, and seven years; they were vaccinated in infancy, and there is no evidence that any of them had in the interval been exposed to variolous contagion.

Mr. Hutchinson on the Proximate Cause of Cholera.

Mr. Hutchinson attempts to explain the mode in which the phenomena of that disease are produced. The idea of its depending on inflammation in the intestinal canal, (even were it shewn that an affection of that nature is invariably present, in the early stage of the disease, which it is not,) he considers totally inadequate to account for the phenomena. Mr. H. conceives Cholera to depend on a certain state of disorder of the functions of respiration, whereby the changes essential to life, effected in that process, are influenced; perhaps principally the consumption of oxygen and evolution of carbonic acid gas. This state of disorder, Mr. H. considers to be the consequence of certain noxious changes, either in the electrical or gaseous constitution of the atmosphere; (most probably, by the former remotely, and the latter more directly;) by which the delicate nervous tissue of the lungs becomes impaired in its energies, and oxygen ceases to be consumed in the quantities essential to life.

3.—NATURAL HISTORY SOCIETY OF THE MAURITIUS.

Tuesday, 20*th July*, 1831.

M. Delisse, sen. communicated a letter received by him from M. Cailand, *Conservateur-adjoint* of the Museum of Natural History at Nantes, in which he proposed to effect a mutual exchange of objects with such of the members as might desire it.

The President read a letter from Sir Alexander Johnstone, to his excellency the Governor Sir Ch. Colville, dated London, 26th Feb. begging him to apprize the Society that H. R. H. the Duke of Sussex, now Pres. of the Royal Society of London, would extend his patronage to all scientific or literary Societies which might be formed at the Mauritius. The same letter mentioned the favorable reception of Professor Dabadie's observations on the comet of 1830, both by the Royal and by the Royal Asiatic Society, of which he had been elected an honorary member.

The Secretary was directed to acknowledge the honor of H. E.'s communication.

Mr. L. Bouton read an extract of a letter from Mr. Ad. Brongniart, inviting the aid of the Society in aiding the objects of the new school of arts and manufactures of Paris (where a new course of studies is recently opened,) by forwarding specimens of all substances employed in the domestic arts and manufactures of the island.

Mr. Lienard, sen. having proposed to write to the Governor, praying his support of the classes of physic, chemistry, and natural history, which had lately taken the place of the Botanical lectures at the Royal College,—Mr. Delisse, sen. read a work he had drawn up on the subject, which met with approbation from all the members present, and he was requested to undertake the drafting of the present address.

Mr. Bojer gave verbally the description of two birds of Agaléga, (male and female,) which he took to be the Ibis of the ancients: the specimens were from M. Delisse's collection.

The number of objects presented at this meeting was considerable.

A tiger skin, 12 feet long,—*by M. Wieké.*

A mummified head from New Zealand, of the chief Mallowolla, sent from Sydney by Captain Foreman,—*by Mr. C. Telfair.*

The rib of a woman which fell to his share in a feast among the cannibals of the same place,—*by Captain Briggs.*

Mr. Briggs saved and brought away a child of 7 or 8 years old, which was about to be sacrificed; its features are those of the Malgaches, or Creoles of the Isle of France.

The skins of two Maki, also some minerals and insects, with descriptions,—*by Mr. Cameron.*

Capt. Briggs, Mr. R. Campbell of Sydney, and Mr. S. Lair, of Paris, were elected honorary members.

XI.—*Catalogue of Mammalia observed in the Dakhan.* *By* Major W. H. Sykes.

[Reprinted from the Proceedings of the Zoological Society of London.]

Homo sapiens, L.—The people inhabiting the Dakhan have the Georgian form of skull; their stature is low; the colour of the skin brown, with shades running into yellow white in the higher classes, and black in the lower. The females are not distinguished for fertility, the average number of births to a marriage being less than in Europe. More males are born than females, and in nearly four millions of people I found the proportions of females to males to range in different districts from eighty to ninety females to one hundred males.

Semnopithecus Entellus, F. Cuv. *Mákar* of the Mahrattas.—This species is found in large troops in the woods of the Western Ghats. It is not venerated by the Mahratta people, nor do they object to its being killed.

SEMN.? ALBOGULARIS, Sykes. *Semn. ? suprà flavo nigroque, infrà albo nigroque, irroratus; gulà albâ; artubus nigris: mistacibus latis aures penè obvelantibus; superciliorum pilis rigidis exstantibus.*

Hab. in Madagascar ?

This species (a living individual of which is now in the garden of the Society) appears to be new to science. It is only provisionally classed as a *Semnopithecus*, pending our inability to examine its posterior molars. The animal was obtained at Bombay, where it was believed to have been taken from Madagascar; and as it has some characters in common with the *Cercopitheci* (especially with the group of which the *Cerc. Sabæus* forms a part) and the *Semnopitheci* of India, it may ultimately prove to be a connecting link between the African and Asiatic monkeys. It wants the long limbs of the *Semnopitheci*: and although its tail is very long, it is not particularly thin.

The following is the description of the animal—a male. Canines remarkably long (nearly ¾ of an inch), slender, sharp; incisors very short and even. Head rounded and short. Ears very small, nearly rounded, and for the most part concealed in the long hair about the head. Eyes deeply seated, and shaded by a continuous arch of long hairs directed forwards. *Irides* broad; of a brown ochre colour: hair forming a bunch on each cheek and resembling whiskers: no beard. Cheek pouches rudimentary only, not observable externally, even when filled, being concealed by the bushy hair of the cheeks. Thumbs of anterior hands short and distant; those of the posterior long. Whole of the upper surface of the animal of a mingled black and yellowish ochre colour, each hair being banded black and ochre; the black prevailing on the shoulders, the ochre on the back and flanks. Under surface grizzled white and black. Anterior limbs uniform black; posterior black, with a little of the dorsal colour. Chin and throat pure white. Tail black, half as long again as the body.

The manners of this monkey are grave and sedate. Its disposition is gentle but not affectionate: free from that capricious petulance and mischievous irascibility characteristic of so many of the African species, but yet resenting being teased, and evincing its resentment by very smart blows with its anterior hands. It never bit any person on board ship, but so seriously lacerated three monkeys, its fellow passengers, that two of them died from the wounds. It readily ate meat, and from choice would pick a bone even when plentifully supplied with vegetables and dried fruits.

Macacus radiatus, Geoff. *Waánar* of the Mahrattas.—This well known species inhabits the woods of the Western Ghats in small troops. A female brought to England by me and presented to the Society, was capricious and mischievous in disposition, but of surprising courage and marked intelligence. It manifested considerable attachment to myself, which was less transient than I had anticipated, as it greeted me with evident demonstrations of joy on my visiting it in the gardens after the lapse of a month without seeing me. The natives of Western India educate this monkey to perform certain tricks.

Pteropus medius, Temm. *Warbagúl* of the Mahrattas.—This species is very numerous in Western India. Such variations are found in the colouring of different individuals in the same troop, that two or three species might be supposed to exist in it; but the great mass so closely resembles the *Pter. medius* of M. Temminck, that I do not consider myself justified in describing the *Rossette* of the Dakhan as a distinct species. The only persons in Western India who eat these *bats* are the native Portuguese, but I can personally testify that their flesh is delicate and without any disagreeable flavour. I have measured individuals with a greater length of body (14½ inches) than is given to the *Pter. Javanicus* of Dr. Horsfield.

Nyctinomus plicatus, Geoff. (*Vespertilio plicatas*, Hamilton?)

This *bat* bears a very close resemblance to Dr. Horsfield's *Nyct. tenuis*.

Rhinolophus Dukhunensis, Sykes.—*Rhin. suprà murinus, infrà albido brunneus; auribus capite longioribus: antibrachio corpus longitudine æquante.*

This *bat* belongs to the same section as Dr. Horsfield's *Rhin. insignis*, but differs from that species in being much smaller; in having the ears larger and more rounded; the nose-leaf with the upper lobe concave, ridged beneath and revolute above; and the front lobe oblong and notched in the centre. It differs from the *Rhin. crumeniferus*, Pér. and Le Sueur, (which is the *Rhin. marsupialis* of M. Geoffroy's lectures, and the *Rhin Speoris* of M. Desmarest,) in being much smaller, this species having the fore arm nearly half as long again as the Dakhan bat. The upper nose-leaf also is much more produced, and finally the colour of the fur in this species is reddish. The fore arm of the *Rhin. Speoris* as figured, is 2 inches 2 lines long, and the body and head 2 inches 2 lines. In the Dakhan species the fore arm is only the length of the body. Expansion of its wings 10 inches.

Sorex Indicus, Geoff. *Cheechondur* of the Mahrattas.—These troublesome and disagreeable animals are very numerous in the Dakhan, but much more so in Bombay. They do considerable damage in cellars by tainting the wine; and the passage of an individual over a vessel of water impregnates the whole mass with the scent of musk. I have had occasion to remark that the sebaceous glands in an old male were very large, and the odour of musk from them almost insupportable; while in an adult female the glands have been scarcely discoverable, and the scent of musk very faint. The Indian Shrew is as much carnivorous as insectivorous. Having killed the *Sorex Indicus* and *Sor. giganteus*, in the same room, and seen them frequently together, I look upon them as of the same species.

Ursus labiatus, Blainv. *Aswail* of the Mahrattas.—The system of dentition of this well-known animal appears to be anomalous; for instead of six incisors in each jaw, I have never seen more than four in the upper and six in the lower; the two centre teeth standing a little in front of the line of the rest. I have had opportunities of examining many skulls of animals of very different ages, and possess specimens at the present moment, all of which agree in the number and position of the incisor teeth. One of these individuals is so young that I do not conceive that the deficient incisors can have fallen out; nor is there any appearance of dentition having existed in the places which they should have occupied. It might be deemed advisable therefore to remove this animal from the genus *Ursus*.

An *Aswail* brought to me from the woods when quite young, and which lived some time in my possession, fed by choice almost exclusively upon roast mutton and fowl; rejecting all fruits and vegetables. It ate, however, steeped grain (*Cicer arietinum*), and was very fond of buttermilk. These animals when taken young are readily instructed.

Lutra Nair, F. Cuv. *Jahl Márjar* or *Water Cat* of the Mahrattas.—The *Otter* of Dakhan differs only from the *Nair* in wanting the white spots over the eyes, in having a white upper lip, and in being somewhat larger; discrepancies which do not justify its being separated as a species.

Canis Dakhanensis, Sykes.—*Kolsan* of the Mahrattas.

Can. rufus, subtus pallidior: caudá comasá pendente: pupilla rotundatá.

This is the *Wild Dog* of the Dakhan, and differs from any wild species hitherto described. Its head is compressed and elongated; its nose, not very sharp. The eyes are oblique: the pupils round, *irides* light brown. The expression of the countenance that of a coarse ill-natured *Persian Greyhound*, without any resemblance to the *Jackal*, the *Fox*, or the *Wolf*, and in consequence essentially distinct from the *Canis Quao* or *Sumatrensis* of General Hardwicke. Ears long, erect, somewhat rounded at the top, without any replication of the *tragus*. Limbs remarkably large and strong in relation to the bulk of the animal; its size being intermediate between the *Wolf* and *Jackal*. Neck long. Body elongated. Between the eyes and nose, red brown: end of the tail blackish.

From the tip of the nose to the insertion of the tail, 33 inches in length: tail 8½ inches. Height of the shoulders 16½ inches.

These animals hunt in packs, and the specimen brought to me was found to have the stomach distended with the remains of a *nylgau*.

None of the *domesticated Dogs* of the Dakhan are common to Europe.

The first in strength and size is the *Brinjarí Dog*, somewhat resembling the *Persian Greyhound*, in possession of the Society, but much more powerful. It is employed by the erratic people, the Brinjarís, in protecting their herds and in hunting. Its strength enables it to pull down the largest animals of the chase. It is courageous and intelligent.

The *Pariah Dog* is referable to M. Cuvier's second section. These animals are very numerous; they are not individual property, and breed in the towns and villages unmolested. Many of these dogs hunt very well by scent.

Amongst the Pariahs is frequently found the *Turnspit Dog*, long backed, with short crooked legs.

There is also a petted minute variety of the *Pariah Dog*, usually of a white colour and with long silky hair, corresponding to a common *Lap-Dog* of Europe; this is taught to carry flambeaux and lanterns.

The last variety noticed is the *Dog* with hair so short as to appear naked like the *Canis Ægyptius.* It is known to Europeans by the name of the *Polygar Dog.*

CANIS PALLIPES, Sykes.—*Landgah* of the Mahrattas.

Can. sordidè rufescenti albidus ; dorso nigrescenti ferrugineoque vario ; pedibus totis pallidè ferrugineis ; caudâ sublongâ pendente.

This is the *Wolf* of the Dakhan. Its head is elongated, and its muzzle acuminated : a groove exists between the nostrils. Eyes oblique : *irides* yellowish bright brown. Ears narrow, ovate, erect ; small for the length of the head. Tail pendent, thin but bushy, extending below the *os calcis.* General colour of the fur a dirty reddish white or whited brown. Along the back and tail very many of the hairs are tipped black, mixed with others tipped ferruginous. The tail ends in a black tip. The inner surface of the limbs, the throat, breast, and belly, dirty white ; legs pale. From the ears to the eyes reddish grey, with a great number of short black hairs intermixed ; from the eyes to the nostrils, light ferruginous. The fur from the *occiput* to the insertion of the tail is two or three inches long, gradually shortening as it approaches the sides ; hence all over the body very short and lying close.

The description is taken from two three-parts grown animals, which I had alive for a considerable time in my possession.

Length from tip of nose to insertion of tail 35 to 37 inches ; of the tail 11 to 12 inches ; the hair extending two inches beyond the measurement.

These animals are numerous in the open stony plains of the Dakhan ; but are not met with in the woods of the Ghats.

Canis aureus, Linn. *Kholah* of the Mahrattas.—The *Jackal* of Dakhan appears to be identical with the *Lavantine* and *Persian Jackal.* They are numerous in the Dakhan, and are terrible depredators in the vineyards. They are easily domesticated when taken young. I had a very large wild male and a domesticated female in my possession at the same time. The odour of the wild animal was almost unbearable. That of the domesticated *Jackal* was scarcely perceptible.

CANIS KOKRI, Sykes.—*Kokrí* of the Mahrattas.

Can. suprà rufescenti-griscus, infrà sordidè albus ; caudæ comosæ apice nigro ; pedibus rufescentibus ; pupillâ elongatâ.

The *Fox* of the Dakhan appears to be new to science, although it much resembles the descriptions of the *Corsac.* It is a very pretty animal, but much smaller than the *European Fox.* Head short ; muzzle very sharp. Eyes oblique : *irides* nut-brown. Legs very slender. Tail trailing on the ground ; very bushy. Along the back and on the forehead fawn-colour, with hair having a white ring near to its tip. Back, neck, between the eyes, along the sides and half way down the tail reddish grey, each hair being banded black and reddish white. All the legs reddish outside, reddish white inside.

Chin and throat dirty white. Along the belly reddish white. Ears externally, dark brown, and with the fur so short as to be scarcely discoverable. Edges of eyelids black. Muzzle red-brown.

Length 22 and 22½ inches : of the tail 11½ to 12 inches.

Viverra Indica, Geoff. (*Viv. Rasse*, Horsf.) *Jawádí Márjar*, or *Civet Cat* of the Mahrattas.—There are two varieties of this species of *Viverra* in the Dakhan ; one inhabiting the woods along the Ghats ; the other the country eastward of the Ghats. The animal of the Ghats exactly resembles a specimen now in the

Museum, and formerly in the Menagerie of the Society; the ground colour being much grayer, and the lines more distinctly broken into spots. The other variety resembles in its ferruginous tint the specimens of the *Rasse* presented to the Society by Major-General Hardwicke, but has the four black longitudinal lines or stripes on the sides of the neck more marked, and is considerably larger: two of my specimens from the Dakhan being 27¼ and 28½ inches long.

The Dakhan variety exhales a very powerful odour of musk, and the organs for the secretion of this drug are of considerable size.

The specimen presented by me to the Society died on board ship; and some hundreds of capillary worms were found all over the body lying between the skin and the flesh.

Herpestes griseus, Desm. *Mangús* of the Mahrattas.—The *Mangús* of Dakhan is no doubt the *Herp. griseus* of M. Desmarest, but very considerably exceeds in size the published measurements of that species; my specimens measuring from 19¾ to 20½ inches from the tip of the nose to the insertion of the tail, and the tail 15 to 16½ inches. This animal is decidedly plantigrade. In movement it appears to slide along the ground, rather than trot or canter. It is believed by the Mahratta people to have a natural antipathy to serpents, and in its contests with them to be able to neutralize the poison from the bite of the serpent, by eating the root of a plant called *Mangús-wail;* but no one has ever seen the plant. Probably they allude to the *Ophiorhiza Mungos*.

Paradoxurus Typus, F. Cuv. *Ud* of the Mahrattas.—This animal, which is by no means rare in the Dakhan, is always lively, and a specimen in my possession was remarkable for the energy with which during the night time it chased round its cage. Its carnivorous propensities were so strong that it snapped off and devoured the heads of all fowls that incautiously approached its cage; but on board ship it was fed entirely on rice and clarified butter. In the stomachs of some individuals examined at Poona, I found fruit, vegetables, and *Blattæ*.

Hyæna vulgaris, Cuv. *Tarras* of the Mahrattas.—*Hyænas* are numerous in Dakhan. They are susceptible of the same domestication as a dog. The animal given by me to the Society was allowed to run about my house at Poona; and on board ship it was in the habit of gamboling like a dog. It allowed persons to put their hands into its mouth without attempting to bite ill-naturedly. It was fed on rice and clarified butter.

Felis Tigris, L. *Pattite Wagh* or *Striped Tiger* of the Mahrattas.—Royal tigers are so numerous in the province of Khandesh, that 1032 were killed from the years 1825 to 1829 inclusive, as appears by the official returns handed to me. They are much less numerous in the collectorates of Poona, Ahmednagar, and Dharwar.

Fel. Leopardus. *Chíta* of the Mahrattas.—This would appear to be the *Leopard* of Mr. Temminck's monograph of the genus *Felis*. It is a taller, longer, and slighter built animal than the succeeding, which I consider the *Panther*. It differs also in more of the ground colour being seen, and in the rose spots being much more broken: there are also other specific diffierences which the nature of this catalogue does not admit of my entering into. The natives of Dakhan consider the *Chíta* and succeeding Cat as distinct animals. The *Chíta* is rare. The *Panther* very abundant. I do not possess a specimen of the *Leopard;* the only one I was enabled to obtain having been given by me to the East India Company.

Fel. Pardus. *Bíbla Bagh* of the Mahrattas.—This species is so abundant that 472 were killed from 1825 to 1829 inclusive, in the four collectorates of Dukhun. It exactly resembles the animal figured as the *Panther of the ancients* in Mr. Griffith's 'Translation of the Régne Animal.' It differs from the preceding in its smaller size, stouter make, darker ground colour, and in its crowded rose rings. The Society is in possession of several of these Cats; amongst others a half-grown animal from the Dakhan, which I presented to it in December last.

Fel. Jubata, L., and *Fel. venatica*, H. Smith. *Chíta* of the Mahrattas.—These presumed species appear to me to be identical, the specific differences deduced from the hair originating in domestication. I have a skin of the wild animal with a rough coat, in which the mane is marked, while domesticated animals from the same part of the country are destitute of a mane and have a smooth coat. They are led about like greyhounds; but when carried out to hunt are placed upon a cart.

Fel. Chaus, Guld. *Mota Rahn Manjur*, or *Larger Wild Cat* of the Mahrattas.—This species has a very extended geographical range, being found in Egypt, on the Caspian, in Persia, at Bangalore, and in the Dakhan. It frequents bushy moist situations. The only addition I can give to the published descriptions of it, is that the *irides* are of a bright reddish light yellow.

Fel. torquatus, F. Cuv. *Lhan Rahn Manjur*, or *Lesser Wild Cat* of the Mahrattas.—This animal is a pest, from the damage it does in poultry-yards in the Dakhan. It inhabits the grass roofs of houses, and thick hedges, and obscure places of our cantonments, shunning the face of man and the light, but is constantly on the alert at night. My specimens differ only from the *Fel. torquatus* figured in the third volume of the Histoire Naturelle des Mammifères, in the ears externally being tipped dark-brown, and in having two narrow stripes behind the eyes instead of one. The sexes resemble each other in colour, marks, and size.

Mus giganteus, Hardw. *Ghús* of the Mahrattas.—This is the well-known *Bandikút Rat*. In fully grown individuals, none of the teeth are tuberculous. Two specimens in my possession exceed in size any yet described, measuring respectively $16\frac{7}{10}$ inches, and $14\frac{5}{10}$ inches on the body. Tail $11\frac{5}{10}$ and $11\frac{4}{10}$ inches.

Unlike the *common Rat*, these animals seem to be entirely granivorous. They burrow under walls, and make such considerable excavations as to injure the foundations of buildings.

Mus decumanus, Pall. *Chúa* of the Mahrattas.—This species, the well known *Norway* or *Brown Rat*, abounds in Dukhun. It has been seen to migrate in thousands, destroying the crops in its march.

Mus Musculus, L.—This mouse is comparatively rare in the Dakhan.

Mus ———. Bright light chesnut above, reddish white below. Tail much longer than the body: size of the common mouse. Found only in fields and gardens. I believe this species to be new, but until I can recover the specimens which I brought to England, I refrain from naming it.

Sciurus Elphinstonii, Sykes.—*Shekrú* of the Mahrattas.

Sc. suprà nitidè castaneus, infrà rufescenti-albidus; caudæ dimidio apicali pallidè rufescente.

This very beautiful animal is found only in the lofty and dense woods of the Western Ghats, and has rarely been seen by Europeans in the Dakhan. It is of the size of the *Sc. maximus*, and the general arrangement of its colours is the same; and as the *Sc. maximus* passes through some gradations of colour, the *Sc. Elphinstonii* might be supposed by casual observers to be a variety of that species. I am enabled to state, however, from personal observation, that the latter does not change its colour at any period of its life; specimens being in my possession of the most tender and mature ages.

Ears and whole upper surface of the body, half way down the tail, outside of the hind legs and half way down the fore legs outside, of a uniform, rich reddish chesnut. The whole under surface of the body, from the chin to the vent, inside of limbs, and lower part of fore legs, crown of the head, cheeks and lower half of tail, of a fine reddish white, the two colours being separated by a defined line and not merging into each other. Feet of a light red. Forehead and down to the nose reddish brown, with white hairs intermixed. *Irides* nut-brown. Ears tufted. Length of a male in my possession from the tip of the nose to the insertion of the tail 20 inches. Length of tail $15\frac{1}{4}$ inches.

The cry of this animal is *Chúk, chúk, chúk;* at first uttered slowly and then rapidly, and it is so loud as to have a startling effect.

I have dedicated this *Squirrel* to a very distinguished person and a zealous promoter of scientific research, the Hon. Mountstuart Elphinstone.

Sc. Palmarum, Briss. *Kharrí* of the Mahrattas.—This well-known *Squirrel* is so abundant in gardens in the Dakhan that I have repeatedly caught two or three at once by simply planting out under a tree, a common wire rat-trap, baited with a little flour. Nothing can be more light and elegant than the movements of these little creatures. I have witnessed some singular instances of affection for their young in this species, which my limits do not permit me to detail.

Hystrix leucurus, Sykes.—*Sayal* of the Mahrattas.

Hyst. caudâ albâ.

This animal appears to be distinct from the European species, which it closely resembles in form and covering. It is nearly a third larger. All the spines and tubes of the tail are entirely white, which is not the case in the *Hyst. cristata*. The spines of the crest also are so long as to reach to the insertion of the tail. The ears are much less rounded, and the nails are shorter, infinitely deeper and more compressed, and with deep channels below. The white gular band is more marked; and, finally, the Asiatic species is totally destitute of hair, spines where wanting being replaced by strong bristles even down to the nails.

This species is abundant in the Dakhan and is very good eating. Like the African *Porcupine*, when alarmed or irritated it shakes the tubes and spines of its tail violently, producing a startling noise. It stamps also with great energy with its hind feet; and when it assails an adversary it runs obliquely backwards, transfixing the foe with its spines.

Lepus nigricollis, F. Cuv. *Sassah* of the Mahrattas.—This species of *Hare* is so common in the stony and bushy hills of the Dakhan that I have had nearly a dozen brought to me, in the course of a few hours, by two or three men using nets called waggurs.

Manis crassicaudata, Griff. *Kuwli Manjur*, or *Tiled Cat* of the Mahrattas.—This species is very common in the Dakhan. They are incapable of climbing trees, and invariably move with the foreclaws doubled under the feet, so that they appear to walk on their knuckles. They live on white ants, and lap water like a dog; and like a dog also they are infested by the large blue tick. Their only defence is in coiling themselves up, and so strong is the muscular power of the tail, that I have had two men attempt in vain to unroll an animal.

Sus Scrofa, L. *Dúkar* of the Mahrattas.—*Wild Hogs* abound in the Dakhan, and the males attain to a very great size. I am not satisfied that there is any specific difference between the European and Asiatic *WildHog*. Every village abounds with *Hogs*, but any property in them is equally abjured by individuals and the community. They live in the streets, are the public scavengers, and dispute with the *Pariah Dogs* the possession of offal matters thrown out from the houses. They are certainly of the same species as the *WildHog*. The flesh of the latter is eaten by almost all castes of Hindús excepting the Brahmins and Banías; but the flesh of the village *Hog* is not even touched by the carrion-devouring outcasts the Mahr. The *village Hog* is of the same colour as the wild animal, mostly a rusty black, and the only variations are slate black or slate intense brown; but it is not above two-thirds of the size of the latter. Tail never curled or spirally twisted.

Equus Caballus, L. *Ghora* of the Mahrattas.—A fine breed of *Horses* exists on the banks of the Bíma and Mann rivers in the Dakhan, supposed to have been improved by the Arabian blood. I have been assured by a Brahmin that as much as 10,000 rupees (1,000*l.*) has been paid by a native chief for an animal of this breed.

The variety of the horse called *Pony* by us, and *Tattoo* by the Mahrattas, is sedulously propagated in the Dakhan, on account of its great use in the transport of baggage. The *Tattoo* is remarkable for its vicious propensities.

Equus Asinus, L. *Gadha* of the Mahrattas.—The *Ass* of the Dakhan is very little larger than a good mastiff or Newfoundland dog, but I have not remarked any other difference between it and the ass of England. Wild asses do not exist there, but they are said to be found in Katíwar.

Camelus Dromedarius, L. *Unt* of the Mahrattas.—The *Dromedary* is rarely bred in the Dakhan, but is in very general use; indeed armies in India could scarcely move without its aid. The two-humped *Camel* is not known.

Moschus Meminna, Erxl. *Pisoreh* of the Mahrattas.—This beautiful little animal is found in considerable numbers in the dense woods of the Western Ghats, but never on the plains. It readily reconciles itself to confinement, and a friend of mine had a pair that bred yearly. Its *irides* are of a deep brown. The flesh is excellent eating.

Carvus equinus, Cuv. *Sambur* of the Mahrattas.—This animal, which abounds in the Ghats of the Dakhan and in Khandesh, is no doubt the same as the Malayan *Rusa* figured in Griffith's 'Translation of the Régne Animal.' It wants the size of the *Cerv. Aristotelis* of Bengal, also called *Sambur* (not *Sambu*), and is not so dark in colour.

Cerv. Mantjak, Zimm. *Baiker* of the Mahrattas.—This beautiful species of *Deer* is a native of the Western Ghats of the Dakhan, and is never seen on the plains. An examination of the animal now in the Society's gardens will afford satisfactory evidence that those who have hitherto figured the animal, in works on Natural History, have been unhappy is not representing its true character. It always runs with its head down and back arched. It is supplied with large suborbital sinuses, which it uses in the manner of the *Ant. Cervicapra.*

Antilope Cervicapra, Pall. *Bahmaní Hern* of the Mahrattas.—This animal abounds on the plains of the Dakhan in flocks of scores, but is not met with in the Ghats. The suborbital sinuses are capable of great dilatation, and the animal applies them to objects as if for the purpose of smelling.

ANT. BENNETTII, Sykes. *Ant. cornubus nigris, lyratis, apicibus lævibus leviter introrsum antrorsumque versis, ad basin ultra medium annulatis (annulis* 8-9*) ; rufescenti-brunneus, infrà albus, fasciâ laterali haud conspicuâ; fasciâ mediâ strigâque ab angulo oculi ad oris angulum extensâ nigris ; caudâ nigrà.*

Kalsípí or *Black Tail* of the Mahrattas. *Goat Antelope* of Europeans.

This *Antelope* is found on the rocky hills of the Dakhan, rarely exceeding three or four in a group, and very frequently solitary. It belongs to the same section as the *Ant. Dorcas.* Horns erect, slightly diverging from each other, bending slightly backwards, at first subsequently with their joints bending forward. Ringed for $\frac{3}{5}$ of their length. The whole upper surface and outside of the limbs rufous or red brown. Under surface and inside of the limbs white. Tail black. A black patch on the nose. A black narrow streak from the anterior corner of each eye towards the angle of the mouth. Suborbital sinuses very small ; in dried skins not observable ; nor does the animal dilate them unless very much alarmed. Limbs long and slender ; black tufts at the knees. Body light. The female has horns, but they are slender, cylindrical, and without rings. The buttocks present a heart shaped patch of white. Unlike the *Ant. Cervicapra* it carries its tail erect when in rapid motion. It stands as high as the *Bahmaní Hurn,* but has less bulk.

Ant. ————. Brown Antelope.

I possess the skin of a three-parts grown *Antelope,* a native of the Dakhan, which lived for some months in my possession, but which its immature age prevents me from identifying, It had much the air of the *Ant. rufescens* and *Ant. silvicultrix.* It promised to have been a stouter animal than the *Ant. Bennettii.* Its habits were quite different, and it was remarkable for the impunity with which it fed, like a goat, upon the poisonous *Euphorbia Tirucalli.* The whole animal was brown above, whited brown below. Horns cylindrical, pointed, without rings.

Capra. Hircus, Linn. *Bakí* of the Mahrattas.

The *goats* in the Dakhan are gaunt, stand high on their legs, have the sides much compressed, and are covered with long shaggy hair, which in most is black. Ears nearly pendent. *Irides* ochrey yellow or reddish yellow. Tail always carried erect in movement.

Ovis Aries, Linn.—*Sheep* are most extensively bred in the Dakhan, and as many as 20,000 or 30,000 sheep and goats may be seen together in the uncultivated tracts. The Dakhan variety has short legs, short thickish body, and arched chaffron. The wool is short, crisp, and coarse, and in nine out of ten sheep is black. Coarse blankets only are made of the wool. In most sheep there is a white streak or line from the anterior angle of each eye towards the mouth, and a white patch on the crown of the head. Away from our cantonments sheep are bought at 2*s*. per head.

Ant. picta. Pall. *Damalis risea,* H. Smite. *Rúi* of the Mahrattas. *Nylgaú* of the Persians.

This animal is an inhabitant of the Western Ghats of the Dakhan. The female is of a much redder slate hue than the male, and the young are absolutely rufous, changing and deepening to gray-slate with age.

Bos. Taurus, var. *Indicus.*(*Bos. Indicus,* Linn.) *Pohl* and *Byl* of the Mahrattas.

This animal, remarkable for its hump, is when early training to labour or to carriage nearly destitute of it. The *Brahmaní Bull,* of which the Society has a fine specimen, in its free state, is scarcely able to move from obesity ; but employed in the yoke or in carrying loads it would hardly be recognized as belonging to the same race. Park cattle are most extensively bred by the singular erratic people, the Brinjarís, and an army rarely moves in the field without 15,000 or 20,000 bullocks to carry its grain. Dwarf cattle are not met with in the Dakhan.

Bos. Bubalus, Br. Male called *Tondgah;* Female, *Mahís* of the Mahrattas.

The *Buffaloe* of the Dakhan, which is the long-horned variety, is mostly bred in the Mawals or hilly tracts along the Ghats. In those tracts much rice is planted, and the male *Buffaloe* from his superior hardihood is much better suited to resist the effects of the heavy rains, and the splashy cultivation of rice than the bullock. The female is also infinitely more valuable than the cow, from the very much greater quantity of milk she yields.

Meteorological Register kept at the Surveyor General's Office, Calcutta, for the Month of April, 1832.

Days of the Month.	Minimum Temperature observed at sunrise.					Maximum Pressure observed at 9h. 50m.					Max. Temp. and Dryness observed at 2h. 40m.					Minimum Pressure observed at 4h. 0m.					Observations made at sunset.					Observations at 10½ P. M. in Calcutta.					Rain Gauge, No. 1.	Rain Gauge, No. 2.
	Barometer reduced to 32°.	Temper. of the air.	Depres. of M.B.Ther.	Wind.	Aspect of the sky.	Barom. red. to 32°.	Temper. of the air.	Depres. of M.B.Ther.	Wind.	Aspect of the sky.	Barom. red. to 32°.	Temper. of the air.	Depres. of M.B.Ther.	Wind.	Aspect of the sky.	Barom. red. to 32°.	Temper. of the air.	Depres. of M.B.Ther.	Wind.	Aspect of the sky.	Barom. red. to 32°.	Temper. of the air.	Depres. of M.B.Ther.	Wind.	Aspect of the sky.	Barom. red. to 32°.	Temper. of the air.	Depres. of M.B.Ther.	Wind.	Aspect of the sky.		
1	29,876	71,5	1,	cm.	cl.	,935	83,	6,4	s.	cu.	,887	87,	11,8	s.	cu.	,877	85,3	12,1	s.	cu.	,883	82,	9,8	s.	cl.	,906	77,0	5,0	s.	cu.		
2	,880	74,	1,8	s.	do.	,939	85,5	6,6	s.	ci.	,850	90,3	13,8	s.	do.	,843	86,5	9,3	s.	cis.	,849	82,7	8,2	do.	do.	,881	76,4	4,4	s.	cu.		
3	,864	74,3	1,6	s.	cu.	,917	81,5	7,	s.	cu.	,811	88,8	13,6	s.	ci.	,808	86,7	11,8	s.	do.	,823	82,8	8,6	s. e.	n.	,849	78,2	5,2	s.	cu.		
4	,780	76,3	2,8	s.	cl.	,802	85,7	8,5	s.	cl.	,688	91,8	11,3	s	cl.	,684	89,7	9,9	s.	cl.	,692	84,5	6,	s.	cl.	,735	79,3	5,3	s.	cu.		
5	,695	78,	2,8	s.	cu.	,728	87,5	8,	s.	do.	,631	94,	12,1	s.	do.	,618	92,3	11,8	s.	do.	,623	86,3	6,8	do.	do.	,711	82,0	2,8	s.	st.		
6	,650	78,	2,1	s. w.	do.	,714	89,3	10,1	s. e.	ci.	,663	89,5	12,7	w.	cus.	,644	88,	11,5	s.	cu.	,643	86,	8,3	cm.	cis.	,722	80,0	5,0	s.	cl.		
7	,690	75,7	3,8	s. e.	do.	,784	80,7	9,2	cm.	cis.	,695	88,3	15,1	s.	cis.	,469	86,	11,9	s. w.	cis.	,652	82,8	9,6	s. w.	do.	,783	79,1	8,3	var.	,,		
8	,748	70,3	2,6	cm.	cl.	,824	82,	9,	w.	ci.	,699	94,8	20,9	s. e.	cl.	,690	93,5	19,8	s. e.	cl.	,692	86,	11,8	s. e.	cl.	,,	,,	,,	,,	,,		
9	,792	73,	1,5	cm.	ci.	,870	86,5	10,3	s. w.	cl.	,782	97,7	18,5	s.	do.	,775	97,	18,	s. e.	do.	,779	88,	9,3	s.	ci	,877	79,2	3,4	cm.	cl.		
10	,866	74,5	1,3	s.	do.	,922	87,	11,5	s. w.	ci.	,818	97,5	22,	s. w	ci.	,806	94,	17,3	s. w.	ci.	,826	88,3	12,8	do.	cl.	,892	80,5	5,7	cm.	cl.		
11	,829	73,5	4,8	cm.	cis.	,897	86,3	13,8	s. w.	cl.	,785	97,3	18,8	s.	cl.	,766	95,5	19,6	s. e.	cl.	,764	87,3	15,6	s. e.	do.	,818	79,0	4,8	s.	cl.		
12	,814	74,3	1,8	cm.	cl.	,861	87,	10,1	s.	do.	,752	98,	26,8	s. w.	do.	,730	96,5	27,	s. w.	do.	,736	88,5	14,8	s.	do.	,853	80,2	3,3	s.	ni.		
13	,819	75,5	1,8	cm.	cu.	,853	86,3	8,4	s.	cu.	,755	95,	17,8	s. e.	do.	,735	93,3	15,8	s. e.	do.	,734	86,	10,	s. e.	do.	,817	78,9	3,0	s.	cis.		
14	,742	77,5	3,3	s. w.	cl.	,776	87,8	10,3	s.	ci.	,658	96,5	15,3	s. w.	do.	,610	93,3	13,4	s.	do.	,641	86,7	8,	s.	do.	,716	80,0	2,8	s.	cl.		
15	,689	77,	2,8	s.	do.	,729	87,5	8,	s. e.	cl.	,652	93,	14,4	s. e.	ci.	,641	91,3	13,1	s. e.	ci.	,664	85,7	6,5	s. e.	do.	,742	79,9	2,1	s.	ci.		
16	,719	78,	2,3	s.	cu.	,779	85,5	8,3	s.	cu.	,694	91,5	11,5	s. w.	cl.	,682	89,3	9,8	s. w.	cl.	,696	84,	5,1	s.	do.	,746	80,7	2,3	s.	n.		
17	,707	78,3	3,1	s.	do.	,779	85,	9,3	s. w.	do.	,694	88,7	11,2	s.	cu.	,660	87,5	10,3	s.	cu.	,665	83,7	7,5	do.	cu.	,786	80,8	4,8	s.	n.		
18	,741	78,3	3,3	s. e.	cis.	,777	87,3	8,8	s. e.	do.	,723	89,7	11,5	s. e.	do.	,702	88,3	9,6	s. e.	do.	,718	84,7	6,8	s. e.	do.	,844	79,5	7,5	s.	rn.		
19	,774	74,	4,5	s. e.	cl.	,868	82,3	4,8	s. e,	do.	,801	87,5	9,3	s. w.	cis.	,758	86,3	8,8	s. w.	cis.	,770	82,5	8,3	s.	do.	,840	79,2	3,6	s.	cis.		
20	,812	75,7	2,	n. w.	do.	,841	83,8	7,1	s.	do.	,729	91,3	12,8	s.	cu.	,709	90,	12,1	s.	cu.	,747	81,5	12,6	n. e.	n.	,749	76,2	6,7	s.	rn.		
21	,788	70,	2,3	n.e.	cu.	,800	83,5	6,5	s.	do.	,662	83,3	14,4	s.	n.	,669	86,3	12,1	s. e.	ci.	,673	82,	6,1	e.	cu.	,740	75,8	7,4	s. e.	n.		
22	,725	69,	2,1	cm.	cl.	,764	86,5	8,	s.	do.	,654	92,3	12,8	s.	cl.	,645	90,5	9,3	s. e.	cu.	,657	85,	7,5	s. e	cl.	,697	76,5	8,8	cm.	n.		
23	,761	71,	2,8	n. e.	do.	,769	81,5	6,	s.	do.	,688	90,7	10,	s.	cu.	,681	88,	8,3	s.	do.	,675	84,	5,8	e.	do.	,776	79,8	2,6	s.	cis.	0,60	0,50
24	,703	71,7	3,3	s.	cis.	,791	86,	10,3	s.	do.	,691	92,	12,1	s. w.	cis.	,672	91,3	10,6	s.	cl.	,675	83,7	6,5	s.	do.	,734	76,4	7,4	s.	rn.	0,53	0,49
25	,725	75,	2,3	s.	do.	,821	85,7	8,2	n. e.	do.	,737	91,7	12,5	s.	cu.	,723	90,8	14,1	s.	cu.	,716	84,5	9,6	s. e.	cis.	,773	79,8	3,0	s.	cl.		
26	,716	74,5	2,3	cm.	do.	,783	86,5	11,6	s.	ci.	,700	94,5	18,3	n. w.	do.	,677	93,5	15,1	s.	ci.	,671	88,5	11,8	s.	cl.	,756	80,0	1,8	s.	cl.		
27	,706	78,	1,5	cm.	cu.	,761	86,7	7,5	s.	cu.	,662	93,	11,3	s. e.	do.	,628	91,3	10,8	s.	cu.	.669	80,3	7,8	n. e.	cus.	,727	76,2	3,4	s.	cu.		
28	,683	76,3	2,4	s.	cl.	,747	88,	8,8	s.	do.	,656	95,5	13,	do.	do.	,639	93,3	12,1	s. e.	do.	,639	86,	6,5	s. e	cis.	,792	78,7	3,9	n.w.	rn.		
29	,752	78,	1,8	s. e.	do.	,785	88,7	9,2	s.	do.	,694	93,3	12,1	s	do.	,676	92,7	11,8	s.	do.	,981	85,7	7,	do.	do.	,776	75,8	2,8	w.	rn.	0,55	0,43
30	,742	74,5	2,3	cm.	cu.	,796	82,7	5,	n. e.	do.	,677	92,5	12,6	s. e.	do.	,646	91,7	11,2	s. e.	do.	,650	84,	6,3	do.	cu.	,714	80,8	1,8	s.	ci.	0,68	0,48
Mean	29,760	74,9	2,5			,814	85,4	8,6	-		,720	92,2	14,3			,702	90,7	12,9			,710	84,8	8,1			,760	78,6	4,2			2,36	1,90

Abbreviations. In the column "wind," small letters have been used instead of capitals; *cm:* means *calm.* In the column "aspect of the sky," *cy.* is *cloudy; cl. clear; rn. rain, ci. cirrus; cu. cumulus; cs. cirro-stratus; cus. cumulo-stratus; cc. cirro-cumulus; n. nimbus.*

JOURNAL

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No. 5.—*May*, 1832.

I.—*Some Account of the Lacquered or Japanned Ware of Ava.*

By Major H. Burney, *Resident at the Burmese Court.*

[Read at the meeting of the Phys. Cl. 4th March.]

This manufacture has been named lacquered ware from an idea, I suppose, that lac forms a part of it; but this is a mistake: no lac is used, and the bright red colour is given by vermilion, which is made by the Burmese from Cinnabar *(a-yain)*, imported by the Chinese caravans from Yunan.

The principal material is known to be the Burmese varnish, or *theet-tsee*, which means literally "wood oil." There must be a great abundance of it in the country, as the usual price at the capital is only ¾ of a *tical* per *viss*, or about 5 pence per lb.; but it is often much adulterated, and requires to be strained through a piece of cloth before being used. There are three descriptions of it at Ava. The first and purest is called *theet-tsee-ayoung-den*, from *ayoung* colour, forming of itself a beautiful black colour. The second is called *theet-tsee-anee-byau*, from *anee* red, being that commonly used with vermilion or red colour. This is said to have one-quarter of water mixed with it. The third and worst description is called *theet-tsee tha-yo-byau*, from *tha-yo*, a paste, which will hereafter be described, and to make which, this *theet-tsee* is generally used. This last kind has no less than one-half of water mixed with it, and there is said to be no difficulty in making water combine with the *theet-tsee*, by rubbing the two well together in the sun. The price of the best *theet-tsee* is just now at Ava 7 *ticals* for 10 *viss.*

The Burmese workmen declare, that the varnish will not *ait,* sleep or lie, or dry well, if collected from the tree when it is in fructification; which, they say, occurs during the three months of January, February, and March. Nor will the lacquered ware, during the process of manufacture, become soon and properly *ma*, or hard, in the dry hot months before the rains set in, or at any time so well, as when it is lodged, as Dr. Wallich understood, "in dark and cool subterraneous vaults." The varnish is placed in the sun for a few minutes before it is used, and being almost always applied with the hand, the smallest grain of sand or other extraneous substance is immediately detected and removed. When first applied, it looks of a light-brown colour, but as the hand is rubbing on the varnish, it becomes darker, until it attains a beautiful black colour. Sometimes, when the frame work is of wood, a piece of tow is used for rubbing the *theet-tsee* on, and generally, to save the hand, the first coat is applied with a rude brush made of the husk of the cocoa-nut. After using the varnish, the hand is cleaned with a little mustard-seed oil, and coarse cloth or tow. Upon asking the workmen if they do not suffer any bad effects from the varnish, as I recollect reading of some one at Edinburgh having suffered severely, they admitted that they often, and particularly when they first begin to work in it, find their hands blister and their arms and faces swell, but that some people are much more pre-disposed to suffer in this manner than others. Hence, they have a kind of proverb, *theet-tsee thek-sè thee* "varnish is a witness;" *loo-ma-then phyet-thee*, "it affects a man not true;" *loo-then atwama-shee*, "to a true man it matters not." About one in a hundred is said to be so predisposed. Some of the workmen told me, that they always use their left hands in taking their food, and that sometimes the deleterious effects of the varnish appear in blotches so much resembling leprosy, that other Burmese refuse to hold intercourse with workmen so affected. These effects however are removed by applying to the affected parts a lotion made of teak-wood rubbed on a stone with a little water. Sometimes sandal-wood as well as teak is used, but the latter is considered as the real specific. As a preventative, many workmen occasionally swallow a small quantity of the varnish.

The *theet-tsee* itself forms a beautiful black colour, but to improve its brilliancy and transparency, the article covered with it is often polished in the same manner as the Burmese polish the fine marble, with petrified wood powdered very fine, repeatedly washed, and then dried; and for this purpose, the petrified wood of a particular tree called *En-gyen** is esteemed. A little of some scented wood is added, but this, apparently, is not indispensable. This polishing powder is called *en-gyen-kyouk-tshowè amhoun.*

There are few colours which will preserve their tint when mixed with this varnish; vermilion answers best. The Burmese prefer a vermilion, which they make themselves, to that brought from China, and it is certainly of a much brighter scarlet. Only one man at the capital, and he is attached to the palace, is said to know how to make this vermilion, which is called *hen-za-pa-da yowè,* from the colour resembling that of the little scarlet seed with a black spot named *glycine abrus* or *abrus maculatus* in Marsden's Sumatra, 3rd edition, p. 171. There are two other descriptions of vermilion made at Ava, called respectively *hen-za-pa-da Awa* and *hen-za-pa-dah Gouk*, which last seem more like our red lead. The vermilion brought from China is called *hen-za-pa-da atshoun*, and the Burmese say that it is the refuse or grounds of the finest kind, and that it does not mix well with *theet-tsee.* Red ochre or Indian red, called *myè-nee*, red earth, gives a duller colour, and is used for lacquered ware of the coarsest description. It is sometimes used also as a first coat, over which the vermilion is applied. These paints, when used, are first made liquid with a very small quantity of an oil brought from Laos, called *Shan-zee* or *Shan* oil, and then mixed with *theet-tsee*, in the proportion of three parts of the varnish to five of the vermilion. This *Shan-zee* is said to be extracted from the fruit of the *kuniyen* tree, *(Dipterocarpus turbinatus,)* the trunk of which yields the common wood oil, used in the manufacture of torches at Tavoy and Mergui. The Burmese however say, that the Shans conceal the manner of making this oil, because if it could be manufactured in Ava, there would be no occasion for importing it from Laos. It sells at Ava for 4 ticals per viss. The *kuniyen* tree, which is so abundant to the southward, and which affords the inhabitants there so cheap a substitute for candles, cannot be very common near the capital, where I have never seen a torch, the petroleum only being used by all classes for lights. A mixture of this Shan oil and *theet-tsee*, ten parts of

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* The same tree is mentioned in the inscription on the Rangoon great bell; see Asiatic Researches, vol. xvi, p. 271 and 276.—Gaudama was born under this tree, and died between two of the same species. He was perfected into a Boodh under another tree, the *Nioung* or *Baudi beng*, the Ficus Religiosa. I have never been able to get a specimen of this *Engyen* tree, although I am assured that it is to be seen to the south-east of Ava, and even at Moulmien, and in a fossil state portions of it are to be found all over the country between Prome and Ava.

the latter to three of the former, is used as a semi-transparent varnish. When put over any other than black it darkens the colour a little, but adds much to its brilliancy and transparency. The Burmese possess no really transparent varnish, and it would be satisfactory to know, if any could be obtained from the *theet-tsee*, by distillation or other means.

There are three descriptions of lacquered ware in Ava. The first, and by far the best articles, are brought from the Shan countries—*Shan-pyee-ga;* and *Lè-gya*, Dr. Buchanan's Lækhia, a Shan province, situate to the S. E. of Ava, is the principal place of manufacture. The Shan ware may be distinguished by the lightness and elegance of the manufactures, and the superior brilliancy of the varnish and colors. The next are those manufactured at a place called *Nyoung-oo**, and its neighbourhood, near the ancient capital, *Pugan.* These are generally distinguished by their being of yellow or green colours ; and almost all the small betel boxes, *kwon-eet*, in use among the Burmese, are of this kind. The best of this kind are made at *Pugan* itself, and called after that town, but the larger proportion is named from *Nyoung-oo.* The last and worst description of articles is manufactured in the city of Ava and its environs, and these are to be distinguished by the coarseness of the work, its plain red colour, and the frame being generally of wood and not of basket-work. Most of the plain red large boxes with high conical covers, *thamen tsaouk-gyee*, and other vessels used by the Burmese for holding food, are of this description. The lacquered boxes from Laos have upon them tasteful figures and other ornaments of a beautiful black colour or of gold, and those from *Nyoung-oo*, have them of yellow or green colours. Many of these boxes are so thin that you may discern the basket work through the varnish. The best ware is tried by seeing whether the edges of two sides can be made to meet without cracking the colour or breaking the article. I believe none but a few Shan boxes will bear this test.

The different figures and ornaments on the lacquered ware are executed in the following manner, called *Yowon-tho*, or engraving after the manner of *Yowon*, which was the general term formerly applied by the Burmese to Northern Laos and Zenmay, but which, and some-

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* *Nyoung-oo* means Fig-tree Point. The name of this place, where Lieut. John North, one of our early envoys to Ava, died, and was buried on 30th August, 1755, has been strangely used. Capt. Baker writes it *Young-owe* and *Pegang Young-ue;* Symes, *Nioun-doh;* Cox, *Gneayan Gu-cayne* and *Gucayen;* Crawfurd *Nyaung-ngu;* and Wallich *Gnaunee.* The Burmese lower classes scarcely pronounce the *nung* of *Nyoung*, which has led a friend of mine to write the name *Gnee-a-oo.*

times with *gyee* or great added, is the name now given to Cochin China only. After the last coat of varnish has been applied, and it is thoroughly dry, figures, lines, &c. are described by the lacquered ware being scooped or scratched, just deep enough to remove two or three coats of the varnish, with rude steel tools, either sharp pointed or having the point slightly divided. This last described instrument is called *tsout:* it is used like a gouge, and guided by the thumb of the left hand whilst the right is scooping out the lines. The former instrument called *gouk*, is often nothing more than a broken needle tied to the end of a small piece of stick, and it is used to describe the circular lines; the lacquered ware being turned round with the help of the knees and left hand against the instrument held steadily in the right hand. It is surprizing how quickly the workmen use these rude gravers, which are sharpened with a piece of slate usually brought from *Shwè zettau* on the road to Arracan, and called *Shwè-zet-tau-Kyouk.* When being sharpened, the instrument is held against the forefinger of the left hand, and the slate, moistened with a little spittle, is rubbed against it. The edge also of the slate on one side is made fine, for the purpose of being rubbed within the divided point of the *tsout.* When the figures and ornaments are furnished, a coat of vermilion and *theet-see* is put over the whole surface of the ware, and allowed some days to dry. The ware is then placed on the lathe, and turned round against some wet bran pressed down upon it with the left hand, and occasionally washed in water. This process rubs off all the vermilion from those parts which are in relief. A second and a third coat of vermilion is applied, and partially removed in the same manner. It is then placed in the sun for a few minutes, and when perfectly dry, a coat of the semi-transparent mixture, before described, is put on, rubbed off with a piece of cloth, and a second coat put on, which is allowed some days to dry, for the Shan oil always takes a long time to dry. This kind of engraving is the most tedious and expensive, and it is called *Shan Yowon-tho*, the Shan *Yowon* engraving, from the circumstance of all Shan boxes being so ornamented. The *tsout* or *gouk*, somewhat in the manner of our wood engraving, scoops or cuts all the surface except the figures and ornaments required, which remain black, the colour of the original ground, whilst those parts only where the gravers have made hollows or incisions, are afterwards filled up with red. The *Shan Yowon-tho* executed by Burmese workmen can never be made to look so well as that done in the Shan countries, owing either to the *theet-tsee* not being so fresh and pure, as the workmen allege; or to the Shans making use of some other materials unknown to the Burmese, which last I am inclined to think is the more probable cause. The Burmese also state, that the Shans allow their lacquered ware several months to dry between each stage of the manufacture. But a much more easy and expeditious mode of engraving is the *Burma-dho*, or *Burma Yowon-tho.* It is usually executed over a coat of vermilion, but it may be done before that color is given, and upon a black ground. The figures and ornaments here are cut in the style of our line engraving, and when completed, some plain *theet-tsee* is rubbed over the whole, and immediately wiped off with a piece of cloth. A little Shan-zee or oil is then rubbed and wiped off in the same manner. Some yellow sulphuret of arsenic or orpiment, called by the Burmese *tshè-dan*, and by natives of India *hartal,* is powdered fine and rubbed dry over the surface of the lacquered ware. The mineral adheres only to the lines cut or scooped out, and displays at once in a bright yellow colour the figures and ornaments designed. Nothing further is done unless a finer polish is required, in which case the polishing powder before described is used some days after. Sometimes a little of the orpiment is mixed with Shan oil and *theet-tsee*, and a coat of it put over the whole ware and wiped off, and the powdered mineral then rubbed on. This process seems to be the best, as the hollows and incisions of the gravers are more filled up in this manner. The orpiment is powdered very fine, and large quantities of it rubbed on the ware with the fingers. Green *(atsein)* is put on in the same manner, the colour being previously made with the *tshè-dan*, and either the juice from the leaf of a plant called *gwè-douk-beng* or Indigo, ten parts of *tshè-dan* to one of Indigo. I have tried to use some English lamp black, prussian blue, and chrome, as this orpiment is used, but without success; probably other of our paints, or even these with some addition, might be employed in this simple and expeditious style of ornamenting wood work or lacquered ware with the aid of *theet-tsee.* The Burmese admire much these kinds of engraving, although I think the plain scarlet or black surfaces when polished look better. The different kinds of Japan work are always distinguished, if engraved, with the epithet *yowon-tho*, *yowon-tho tha-men-tsa ouk-kyee*, *yowon-tho*, *kwon-eet*, *&c. &c.*

As the best mode of ascertaining the manner in which this ware is manufactured, I engaged, at different times, two parties of Burmese workmen, to attend at my house, and prepare some cups in my presence, when I had an opportunity of daily watching their progress. The first party consisted of rather rude workmen, but the second was sent to me by the Burmese ministers, and some among this party prided themselves upon having made betel boxes for Her Majesty the Queen.

A frame of bamboo basket work, of the size and description required, was first made over a wooden form or *poun.* The finer the basket work, the lighter and finer will the lacquered ware appear when finished. There are two kinds of bamboo used, one called *myen-wa*, for the coarser kind of basket-work, and the other *ten-wa ;* and there are three kinds of weaving or *ayet* of the basket-work required for lacquering. The first and finest, and that of which all the smaller *nyoung-oo* boxes and almost all Shan-boxes are made, is called *kyoung-lein-yet.* The second, used chiefly for cups, except the rims, which are of the first pattern, is called *katein-gya-yet.* The third is used for the large round boxes, and for any coarse work ; and this is called *powet-kyoung-yet.* The frame work of the lacquered boxes with high conical tops is almost always of separate pieces of wood joined together.

Upon the outside only of this basket-work, with the wooden form inserted, a thin coat of *theet-tsee* was applied with a brush made of a piece of cocoanut husk. This was allowed three days to dry, not in the sun, but in a cool sheltered part of the house, within an old wine chest, which had a layer of earth at the bottom, and its inner sides covered with mud. The box was shut up also, so as to prevent any dust from falling upon the manufacture ; yet the workmen complained, that the varnish did not dry so hard, or quickly, as it would have done in a subterraneous vault. Every house in Ava, where this ware is manufactured, has a deep cellar or vault, in which the ware is lodged during the time the varnish is drying. In some Shan boxes parts of the basket work are left plain, and are not covered with *theet-tsee*, and of these the basket-work is very fine and delicate.

At the end of three days a kind of paste was made and put over the basket-work. There are several kinds of this paste, which is called *tha-yo*, probably from *tha-yowot*, mortar. One kind is made of bones calcined and pounded, sifted through a piece of cloth very finely, and then mixed with the *theet-tsee* into the consistence of paste. This is called *ngo-wa-yo-bya tha-yo*, " Cows' bone ashes *tha-yo*," or simply *amè* or *ayo-bya tha-yo*, " bone ashes *tha-yo*." Another kind, and which is most commonly used, is made of bran or husk of paddy, burnt, and the ashes sifted and mixed as before described. This is called *phwè-bya tha-yo*, " bran ashes *tha-yo*." A third kind is made of the saw dust of teak wood mixed, without being burnt, with *theet-tsee.* This is called *ky-won-theet-lhwa-za tha-yo*, " teak-wood saw-dust *tha-yo*," or simply *lhwa-za tha-yo*, " saw-dust *tha-yo* ;"—it is of a thicker consistence than the other two, more like mortar, and moistened with a little spittle as it is being applied. This paste is used in filling up any little holes, and joining on the stands or different pieces together, and the separate parts of the frame-work of the high conical boxes are fixed together with this cement, which becomes as hard as wood, and which would really assist the famous project of converting saw-dust into deal boards. The ornaments like little rails, fixed around the sides of some of the boxes, are made with this *tha-yo*, pressed with little tin moulds or stamps into the pattern required, and then fastened on. A fourth kind of paste is made with the ashes of cow-dung, *ngowa-gyee-bya*, sifted finely, and mixed with *theet-tsee*, which has been put over fire until beginning to boil. The two are then well mixed and beat together, whence this paste is called *tè tha-yo*, or "beaten *thayo*." This looks like putty, and is used principally by gilders in fixing flowers or other ornaments upon wood-work, to which it adheres very tenaciously ; and before it hardens, it is so pliable and elastic, that it may be drawn out into the finest lines and twisted into any shape. But much of the cheapest and coarsest description of Japanned ware manufactured at Nyoung-oo, is said to have the basket-work covered with a paste of cow's dung and mud only, over which one or two coats of *theet-tsee* are applied. This paste is always liable to crack and chip off the basket work, and the Burmese consider this kind of manufacture, in which very little *theet-tsee* is used, as an imposition.

All the above descriptions of paste form good cements for joining wood-work. For this purpose, the best kind is a mixture of the bone ashes *tha-yo* with a little teak saw-dust ; and I have found it answer as an excellent substitute for glue, not being so liable to be affected by damp weather. It is only longer drying, as much as five or six days. It answers very well also in filling up the cavities left in fine cabinet-work, when the thin black edging has broken or fallen off. When dry it must only be rubbed smooth and even with a stone, in the manner hereafter described.

To return to the cups, which the Burmese workmen prepared under my eye. On the second day, the rim of the cup was cut round smooth, and the fine description of basket-work at the top was scraped and thinned with a knife, so as to bring it more on a level with the other part. The hole at the bottom, where it is fixed to the form when being wove, was filled up with a little of the saw-dust *tha-yo*. The whole inside and outside, was then covered over with a paste made of *theet-tsee*, bone ashes, and saw-dust, three parts of bone ashes to one of saw-dust. The workmen called this the *tha-yo-gyan* or "coarse *tha-yo*," declaring that for this first coat of priming, this mixture of the two was best, as adhering most closely to the bamboo basket-work. It was applied with the fingers.

At the end of three or four more days the rim of the cup was cut still more even, and the cup was fastened to a lathe, called *tset-khoun*, and the inside was ground perfectly smooth and even in the manner hereafter described. A coat of *ayo-tha-yo*, "bone ashes *tha-yo*," or *tha-yo akhy-au*, "fine *tha-yo*," was then put on with the hand in the inside, and laid smooth with the finger, occasionally dipped in water. At the lathe the left hand is employed on the cup, whilst the machine is turned with the right hand, which moves to and from the workman a long stick tied to a leathern string, that has two turns around the lathe. Forms or chucks of the size required, are fixed to the spindle of the lathe with little pieces of bamboo; and when the outside of the cup is to be turned, the cup is fitted to these chucks, which enter about an inch and a half within it. But when the inside of the cup is to be turned, a cylinder of coarse basket-work open at both ends, called *tsee*, is fixed to the chucks, and within this cylinder, the whole of the cup is lodged, and fastened, if necessary, with little slips of bamboo at the sides. To make the coat of coarse *thayo* perfectly smooth and even, the cup is smeared over with a little water and a kind of red earth, and is then turned against a piece of pumice stone, and occasionally moistened with more water. The cup was placed in the sun to become perfectly dry, before the *thayo* was put on. The large boxes with high tops are fastened to a different kind of lathe, like our centre lathes. The upper end is either inserted into one side of the lathe, or fitted on a pin there; and to the bottom is fixed a piece of wood, which revolves around another piece fastened to the other side of the lathe. The two sides of the lathe may be made to approach or recede as required, to hold the ware between them. The string is put round the box, and the left hand usually moves the stick, whilst the right holds the pumice stone. Usually, one coat only of *thayo* is put on the wood work of these boxes; but they are rubbed smooth and even, three times, with the different kinds of stone; once after the *thayo*, once after the first coat of varnish, and the last time, after a second coat of the varnish. The *thayo* is put on at once over the wood, and there are three coats of varnish before the vermilion is applied.

At the end of three more days the cup was again fixed to the lathe, and the outside was treated in the same manner as the inside had been before, the coat of coarse *thayo* on the outside being rubbed smooth and even, and when perfectly dry, a coat of fine *thayo* put on. The workmen said that it is better to do only one side at a time.

At the end of three more days the cup was fixed to the lathe, and the inside made smooth and even with a kind of sandstone, called *kyouk-pyen-gwè*, and a little water; then with a rag, and a little fine powdered charcoal of teak-wood and water, and lastly with a moist piece of cloth. When perfectly dry in the sun, a coat of plain *theet-tsee* of the best kind, or *theet-tsee ayoung-den*, was put on in the inside with the finger. This was done in the sun, to which the cup was afterwards exposed for about a quarter of an hour. The workmen seem to prefer always to use the varnish in the sun. Besides the *kyouk-pyen-gwè*, which is the same kind of stone as that on which the Burmese grind sandal-wood to rub on their bodies, there is a stone of a finer grain sometimes used, called *shwè gan-gyouk*, from the circumstance, I am told, of gilders using it to polish the articles they desire to gild.

At the end of four more days, the cup was fixed to the lathe, and the outside was treated in exactly the same manner as the inside had been on the preceding day, ground smooth, and covered with a coat of fine *theet-tsee*.

At the end of five or six more days, for the varnish did not dry sufficiently before that time, a second coat of the fine varnish, or *theet-tsee ayoung-den*, was put on the outside and inside of the cup.

Before applying a coat of vermilion the cup was fixed to the lathe, and the polish of the two fine coats of *theet-tsee* was removed by turning the cup against the stone *kyouk-pyen-gwè* only, and afterwards against some bran and water pressed upon it with the left hand. The object of this operation, as well as that of grinding with some powdered teak-wood charcoal and water with a rag, was to remove the transparent effect of the fine *theet-tsee* before the polishing powder above described, *engyen kyouk-tshowè-amhoun*, was used. In doing which, the cup was turned against the palm of the left hand, smeared with a little of the powder.

In gilding, the wood-work is primed two or three times with the *ayo-bya* or *phwè-bya thayo*, and rubbed quite smooth and even with the stone and water, before the gold leaf is put on, which is done, as Dr. Wallich describes, " by besmearing the surface very thinly with the varnish, and then immediately applying the gold leaf." The priming is, of course, here necessary to fill up the cavities in the wood, and produce an equal surface before the gold leaf is put on. A little piece of cotton is dipped in the varnish, and before the surface is dry, the gold leaf is put on with the thumb and finger, and gently smoothed over with another clean piece of cotton. The gilders also use a brush of the thickness of a man's thumb, with which small pieces of gold leaf are taken up and introduced into cavities or hollow ornamental parts of the wood-work, in the same manner as our gilders use a squirrel's tail. This brush is made of the hair taken from the inside of cow's ears; and the workmen declared, that it requires an hundred cows to make one brush. I had a picture frame gilt, and although the gilding has not the lustre of one of our's, it has the advantage of remaining with the frame; for the Burmese priming does not break and chip off, as the coat of whiting over our picture-frame does. The Burmese have no idea of burnishing their gilding; and if their priming would take the burnisher, their gilding would not only equal our's in lustre, but being more durable, would be preferable. The workmen could make nothing of a dog's tooth, which I pointed out to them as a burnisher; but this was owing probably to our not knowing the exact time of applying it. The priming on their wood-work is about one-half the thickness of the coat of whiting on one of our picture-frames; but of course it could be made thicker if necessary, and it would be useful to know, if the gilding over their priming could be burnished. In Siam most of the gold leaf used for gilding is imported from China, but the Burmese prefer to make their own, and they beat it far too thin, for it is full of holes and so requires to be doubled in many places, which not only leads to much loss, but prevents the gilding so smooth as the Siamese gilding. They mix a great deal of alloy also with the gold of which they manufacture the leaf, contrary to what Colonel Symes was informed; and hence the gilding of all Burmese pagodas and public edifices soon looks dull and shabby, particularly where exposed to the weather. Few remains can be now traced of the gilded Kyoungs seen by Colonel Symes at Amarapoora, nor is there any gilding now to be seen on the great Arracan gun. The splendour of the king's palace at Ava, although the gilding has not been executed more than 8 or 9 years, is not so great as it must have been when Mr. Crawfurd visited this capital; and the gilding of the Shivedagon pagoda, at Rangoon, now looks very black and shabby; whereas at Bang-kok, I recollect the Portuguese consul pointing out to me the excellent state of preservation of the external gilding of a pagoda, which was described to have been gilded no less than sixty years before*.

All the different purposes to which the *theet-tsee* is applied in this country, can scarcely be enumerated. It is *boiled,* and used for writing on polished tables of wood or ivory, particularly in the Pali character.

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* Gold leaf is fixed on cloth or paper by the Burmese, in a very simple manner, with only the milky juice of the country fig, *Udambar* of Hindústan, (Ficus racemosa or glomerata,) called by the Burmese *Thaphanthee.*

The umbrellas of all classes are made with paper and two or three coats of varnish, over which, whenever required, gold leaf is easily put on in the manner above described. Almost all domestic utensils are made with this substance, and basket-work or wood. I should think very light portmanteaus or *pitarahs* might be made, by applying over a bamboo frame-work this varnish, and the *thayo*, which would fill up all the cavities, and render the articles impervious to water. Rattan might be too heavy, and the priming might not adhere so well to its polished surface. The *theet-tsee* would answer well as a preservative for the sides of ships and their standing rigging; I applied a coat of it, in the absence of paint, to the sides of some gun-boats, and found the material cheaper and much more durable than paint. By first applying a coat of the *thayo* or paste, the sides of a vessel might be made perfectly smooth and even, and impervious to water; and in this manner the Burmese finish their best war boats, which are afterwards gilded over if required*. It is necessary to mention, that the surface of the *theet-tsee*, when kept, is always covered with 2 or 3 inches of water, to prevent the varnish from drying or becoming hard.

Observing that Dr. Wallich had never seen the *theet-tsee* in flower, I requested Dr. Richardson, during his verland journey last year to the frontiers of Manipúr, to bring me a specimen. He passed through extensive forests of the tree, from a place called Mya-goo, about 5 days journey from Ava, to the Manipúr boundary. The trees were very large, and had a beautiful appearance from being covered with flowers so abundantly that the leaves were concealed, and the trees looked one mass of white. The bark appeared quite dry, and no juice was oozing at the little slips of bamboo which he saw sticking in the trunks of the trees. The flower has a fragrant scent, resembling that of apples, and the Burmese eat the young buds in *curries*. The wood of the *theet-tsee* is of the colour and appearance of the red wood of the Malay countries. It is much used, converted into charcoal, by blacksmiths and others requiring a very hot and quick fire; and it is used also for such little articles of furniture as the Burmese can boast of.

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* Most of the lacquered ware is made round, in consequence of the convenience of finding the surface smooth on a lathe, but I have lately induced Burmese workmen to prepare articles of other forms, and they have begun to make ladies' square work boxes, and gentlemens' hats; which last will be useful in wet weather.

The account given under the article Japanning in Rees's Cyclopedia of the *varnish* used in China and Japan, "composed of turpentine and a curious sort of oil," and "of the *lack*, sap, or juice of a tree, occasioning swellings in the hands and faces of the people who use it," answers a good deal to the *Shan* oil and *theet-tsee*, here described; yet the Burmese workmen, upon examining a piece of japanned-ware of China, considered it to be made of a different material, unknown to them.

I send with this paper, specimens of the lacquered ware, and the different materials used in the manufacture.

For the convenience of reference, I have numbered the whole as follows. [The specimens are deposited in the Society's museum.]

1.—Basket work of a cup completed.

2.—First coat of *theet-tsee* put on, rim cut, and fine basket-work on the top scraped.

3.—A coat of coarse *thayo* applied inside and outside.

4.—Inside and outside ground on the lathe.

5.—A coat of fine *thayo* applied inside and outside.

6.—Inside and outside ground again on the lathe.

7.—Two coats of plain *theet-tsee* applied.

8.—A coat of *Hen-za-pa-de Yowé*, or fine vermilion applied.

9.—Polished with *Engyen* powder, after two coats of *theet-tsee*, and gilded at the bottom, to shew the Burmese style of gilding.

10.—The *Yowon T,ho* engraving, according to the *Shan* style.

11.—The *Yowon T,ho* engraving, filled up with *Hen-za-pa-da Yowê*—A coat of the semi-transparent mixture applied, and the specimen of *Shan* ware completed. But there was too much *theet-tsee* in the semi-transparent mixture, and hence the colour is too dark. The circular lines are coloured with the worst sort of vermilion, or *Hen-za-pa-da Gouk.*

12.—The *Burma D,ho* or engraving, according to the Burmese style, upon a coat of *Hen-za-pa-da Yowé.*

13.—The *Burma D,ho*, or engraving, filled up with yellow sulphuret of arsenic, or *tshé-dan*, and the specimen of Burmese ware completed.

14.—The *Burma D,ho*, or engraving, after 3 coats of *theet-tsee.*

15.—The *Burma D,ho*, filled up with green, or *atsein*, a compound of indigo and yellow sulphuret of arsenic.

16.—The first or finest kind of basket-work, called *Kyoung-lein-yet.*

17.—The third or coarsest kind of basket-work, called *Powet-kyoung-yet.*

18.—The second or middling kind of basket-work, with the form, or *poun*, on which it is woven.

19.—A course *Nyoung-oo* made *kwon-eet* or beetle box, supposed to have a priming of mud and cow-dung only.

20.—A fine *Nyoung-oo* made *kwon-eet*, or beetle box, such as is used by men of rank.

21.—An Ava-made *t,hamen-tsa ouk galé*, or small sized dinner-box, with conical top, before any *theet-tsee* is applied.

21½.—A ditto ditto, with a coat of *thayo* put over the wood, and ground smooth on the lathe.

22.—A ditto ditto, after the *thayo* or paste has been applied and ground smooth, and a coat of *theet-tsee* over all.

23.—A ditto ditto, completed, with the *Hen-za-pa-da* or vermilion applied. These small sized boxes, with conical covers, are used by the Burmese women in carrying food to the pagodas on sabbaths and holidays.

24.—A *Shan*-made *thamen-tsa ouk gyee*, or large dinner box, with conical cover, completed.

24½ —A *Nyoung-oo thamen tsa ouk-gyee*, or Nyoung-oo large dinner box, showing the Burmese style of engraving.

25.—A *bhee-eet* or comb box, before any *theet-tsee* is applied, being a Burmese lady's toilet box, to contain combs, oils, scents and false hair, sandal wood, and Chinese white lead ; which last is used to put small round beauty spots on the face, like patches of our court plaister.

26.—A *tset-khoun* or lathe, with a form or chuck fixed on it.

27.—A *tsee* or cylinder form, with a chuck joined to it.

28 and 29.—Two bottles of *theet-tsee* of the first kind, or *Ayoung-den Theet-tsee.*

30 and 31.—Two bottles of the second quality, or *Theet-tsee-Anee-byau.*

32.—A bottle of *Shan-Zee*, or Shan Oil.

33.—A packet of *Hen-za-pa-da Yowê.*

34.—A ditto of *Hen-za-pa-da Awa.*

35.—A ditto of *Henza-pa-da Gouk.*

36.—A piece of *Shwé-gan-gouk*, or stone.

37.—A ditto of *Kyouk-pyen-gwé*, or stone.

38.—A piece of *Engyen-gyouk*, or fossil *Engyen* wood, used as a polishing powder.

39.—A piece of *Teng-wa* bamboo.

40.—A ditto of *Myen-wa* bamboo.

41.—A ditto of *Shwé-zettau-gyouk*, or stone.

42 and 43.—A *Tsout* and *Gouk*, engraving tools.

44.—A Shan-made *kwon-ouk*, or beetle box with high conical cover, such as ministers and men of rank use at Ava.

45.—A fine Shan-made *Eet-gyee*, or large round box, shewing the *Shan* style of engraving very perfectly.

46.—A common *Nyoung-oo* made *Eet-gyee*, or large round box.

47.—A parcel of Burmese gold leaf. The Burmese usually divide their gold according to a decimal scale of *moos*—ten *moo* gold is supposed to be purest, and the inferior qualities are termed 9, 8, 7, &c. *moo*, or this specimen is said to be 8 *moo* gold.

48.—A parcel of *Phwé-bya*, or paddy husk ashes.

49.—A parcel containing some *hartal tshé-dan*, or yellow sulphuret of arsenic.

50.—A piece of *theet-tsee* wood.

51.—An Ava-made *khwet-gyee*, or large cup, with a stand fixed to it.

52.—Pieces of bamboo, shewing how they are cut for weaving the basket-work.

II.—*Analysis of the Chinese Varnish. By* Mr. I. Macaire Prinsep.

[From the Memoirs of the Society of Physics and Natural History at Geneva, April, 1826.]

As a valuable appendix to Major Burney's account, we insert in this place, the translation of a memoir by Mons. I. Macaire, on the chemical nature of the Chinese varnish, which, if not identical with, does not much differ from that of Ava.

" The name of varnish was formerly given in the arts, to solutions of divers solid substances in appropriate liquids, susceptible of being spread easily over the surface of bodies, and by evaporation of the liquid of leaving a film of solid matter, more or less thick, to protect them from external influence. The essential qualities of a good varnish are, the formation of a continuous and smooth coat, not injurious to the texture or colour of a body; its rapidly drying and hardening, and finally its mixing well with different coloring ingredients. To these points artists have directed their attention; but although they may have succeeded well, their efforts have not yet surpassed nature, and the precious juice of which Eastern Asia possesses an inexhaustible supply, is as yet superior to the best artificial varnish.

The Chinese and Japanese had long employed this varnish, before we had any knowledge of it in Europe. The Missionaries sent to China, in the 15th century, were the first to give some crude notions of the nature of the coating found upon most of their works of art. In the 17th century, the Jesuits Martino, Martini and Kircher having spoken of it in more detail, a French hermit of the order of St. Augustin, father Jamart, found means to profit by the uncertainty of knowledge about Chinese varnish, and sold under this name a composition which he kept secret, and which, though certainly very different from the real varnish, had very much the appearance of it, and acquired general reputation in commerce. Many others sought to imitate or improve upon it, with combinations of balsams, gums, resins, volatile oils, &c., until at last father d'Incarville made known to the world, that the famous varnish employed by the Chinese to cover their furniture and utensils, was the natural product of a particular tree, which they called *Tsi-chu*, or varnish-tree.

Those who know with what vigilant jealousy the Chinese threw obstacles in the way of all intercourse with the people of Europe, will not be surprised at the uncertainty of data acquired by botanists, as to the name and locality of this precious tree, which has never yet been seen in Europe. Loureiro, who deserved the greatest confidence, because he alone had judged with his own eyes, inserted it as a new genus in his *Flora Cochin-Chinensis*, under the name of *Augia*, from *αυγη, splendor*. The generic characters given were, a small calix of a single piece, five oblong petals attached to the receptacle, a great number of stamina attached to the same point, ovary terminated by a style and an obtuse drupe flattened from the top, so as to resemble a lens, small, smooth, and enclosing within a pulpy envelope a similar flattened nut, having but one cell. Loureiro imagined there to be only one species, and that one the only tree which produced varnish; he called it A. Sinensis. It grows in Cochin-China, China, Siam,—of a moderate height, its branches rise vertically and are furnished with *pennated leaves,* consisting of five pair of folioles entire, placed along a common petiole, terminated by a single one; the flowers are disposed on the summits of the branches, where they form panniculæ. To obtain the varnish, the bark is pierced, and a thick resinous juice exudes from the wound: it is either used pure, or mixed with different coloring substances. It is employed in India as a medicine, after boiling to deprive it of a very acrid volatile principle.

The Cochin-Chinese medical men administer the resin in pills, as heating, resolutive, emmenagogue and vermifuge. Upon this description, M. de Jussieu classed the genus *Augia* among the *Guttiferæ,* but Professor De Candolle remarked, that of that family there was not a single species with pennated leaves. The last character classes it naturally with the *Terebinthaceæ,* to which the chemical qualities of its juice also assimilate it; but according to M. de Candolle, the *Terebinthaceæ* never have the petals and stamina inserted in the receptacle. Mr. Lamarck refers the varnish tree or *Tsi-chu* to the Badamier, *Terminalia vernix,* of the family of *Myrobalans*; its leaves oblong, linear and smooth, deprived of hair, distinguish it from the other *Badamiers.* It grows in China and the Moluccas, it contains in every part a milky juice, of so caustic a nature as to render its exhalations dangerous, and contact with the plant more so. When the trunk is of sufficient size, this juice exudes spontaneously, or through artificial fissures; it thickens and becomes brown and altogether black, when it has acquired its utmost consistence. While yet liquid, the natives apply it to the articles known in Europe, as " lacquered ware." The caustic principle volatilizes while the varnish is drying; so that the vessels coated with it may be used for drinking with impunity. The seeds are even eaten, when roasted.

This description will not apply to the Chinese varnish, since this latter substance does not blacken in the air, and it is probable, that M. de Lamarck may have confounded it with the varnish of Japan, which is produced (according to Adamson) from a species of the Sumach tree, *Rhus vernix.* " This tree," says the naturalist, " is poisonous, and produces on the skin, as does the *R. Toxycodendron,* effects analogous to the symptoms of eresypelas. A white viscous liquor runs down from incisions made in the tree, which is caught in wooden baskets, and blackens in the air. It may be preserved in vessels covered over with an oiled skin, but it is far from equalling the varnish of China*.

M. Perrotet, returning from a voyage round the world, in 1823, sent a specimen of the Chinese varnish to Professor de Candolle, who kindly favored me with a portion for chemical examination.

The Chinese varnish is of a yellow colour, slightly brown, of a peculiar aromatic smell, of a strong taste, slightly astringent, affecting the back of the mouth, persistent; nearly resembling that of the balsam of Mecca or Copahu:

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* Dr. Wallich has raised the Burmese varnish tree into a new genus, *Melanorrhœa,* and has pointed out the distinguishing characters of the several trees yielding varnish, (*Plantæ rariores* 12.) The coincidence of the Chinese, Japanese, and Burmese names *t,hi-tsi* need be no criterion of their identity, since the words merely signify *varnish-tree,* and would be applied to all that yield varnish. The resemblance between the *Angia* of Loureiro, the *Rhus Vernicifera* and the *Melanorrhœa,* are striking; it can hardly be said that the Burmese varnish turns black, it only appears so when very thick.—Ed.

its consistence is viscous, like thick turpentine. It orms, when spread, a brilliant even surface, drying easily, and assuming a fine polish. It fixes well the colors usually mixed with it, as minium, cinnabar, lamp-black ; and forms good colored varnishes, which do not scale off when dry. To mark its difference from turpentine, varnish, and balsam of copahu, whose physical and chemical properties are otherwise so analogous, I ground up with the latter some of the same colors, but found that the varnishes thus made would not dry ; and after three months' exposure to the air, they still yielded to the finger, so as to be totally useless.

Poured into a vessel of distilled water, the varnish spreads upon its surface, in the form of a yellowish film, which by degrees absorbs water in its pores, and becomes white and completely transparent ; so that it may be said to be *hydrophanous*, like some particular minerals. Turpentine has not the same property, but the balsam of copahu has it in some degree: on straining the varnish it becomes opake, and soon grows yellow from the evaporation of the water it had taken up: the water acquires a slightly bitter taste. The varnish dissolves gently, in cold, and more rapidly in hot alcohol ; water precipitates from it an abundant white resin. It is also soluble in ether and in cold spirits of turpentine.

Digested in boiling water, the varnish whitens and resembles curdled milk ; its own peculiar odour is disengaged, and after long boiling, there remains a white resin, solid, brittle when cold, softening and melting in hot water, soluble in alcohol, in all proportions—whence water precipitates it in a white powder—soluble in turpentine, caustic potash, &c. Heated in a tube gradually raised, the resin gives out much water which it had dissolved : this water is strongly acid, and contains benzoic acid, as will be presently noticed. The resin deprived thus of the water it had absorbed, remains transparent and yellowish : when cold it is hard and brittle, softens and melts at the fire, and under a graduated heat gives out by sublimation white silky flexible crystalline needles of benzoic acid. Soon after a very acid water is disengaged, (acetic acid,) the resin blackens, and decomposition commences.

On examination of the water in which the varnish was boiled, we find that it reddens litmus, and has a slightly sour taste. Evaporated, it leaves a light residue soluble in alcohol, whence it is precipitable partly by water. This acid saturated with ammonia, acts with re-agents like the benzoic ; it must have existed in the varnish in a free state to be thus separated by simple boiling ; gum benjamin also and balsam of Mecca, when boiled in water, impart a marked acidity and of the same nature. To assure myself, that the acids so dissolved was positively the benzoic, (for I remembered that the Italian chemists had proved the existence of succinic acid in turpentines, and this might therefore be the case with the varnish) :—I first sought to recognise the differences between the two, and was surprised to find, that it was almost impossible to distinguish them. In fact they both melt and volatilize, leaving a carbonaceous residue ; both sublime in white, flexible, silky needles; the remarkable property enjoyed by the succinates of precipitating iron of a yellow brown, and forming a soluble salt with manganese, which proves so useful in analysis, belongs also to the benzoates. They precipitate in the same manner the salts of lead, silver, tin, and neither of them affect antimonial solutions. These two only, of all the vegetable acids, dissolve without decomposition in nitric acid, and are recovered unaltered on evaporation. Sometimes, it is true, a few red vapours arise, and when benzoic acid is so treated, on evaporation of the nitric acid, a marked smell of bitter almonds is perceived, although on saturation with potash, no trace of prussic acid is found.

Many chemists have inclined to believe in the identity of the two acids, and have attributed the slight differences observable to the presence of foreign matter. Nevertheless in seeking some method of discrimination, I have observed two circumstances in which the benzoic and succinic acids behave in dissimilar ways. 1. With the salts of copper, a very neutral solution of benzoate of ammonia gives a pale blue ashy precipitate, while the succinate furnishes an abundant curdled deposit of a fine green; neither of the acids alone precipitating copper. 2. With the salts of cobalt, the succinate of ammonia hardly disturbs the liquid, and it is only after a day that a rose coloured deposit is perceived, while the benzoate throws down a copious flocculent precipitate of a pale rose colour.

By employing these two tests, I ascertained that the acid extracted from the varnish acted like the benzoic. I should add that, when I treated with nitric acid the residue left by the evaporation of the water in which the varnish had been boiled, I obtained, besides the unaltered benzoic acid, a small quantity of oxalic acid, which I attribute to the presence of the little gum which had rendered the alcoholic solution opalescent, but which was in too small a proportion to be separated.

If the varnish is distilled in a retort with water, there passes into the receiver an essential oil, white, transparent, swimming on the water, of a strong scent, similar to that of the varnish itself, of a very acrid taste, disagreeable and persistent, having all the properties of other essential oils, without any apparent peculiarity.

Boiled with dilute sulphuric acid, the pungent odour of the varnish disappears, and an iridescent white pellicule forms on the surface of the liquid, giving to the vessel and liquid, by reflection, a fine blood red or purple colour; but on removal from the fire, the liquid is seen to be colourless. The pellicule may be skimmed off in scales: it is dry, insipid, soluble in turpentine, which it colours yellow; insoluble in caustic potash; it becomes brown in alcohol and ether, by degrees losing this colour and imparting a milky tinge on solution: on the addition of a few drops of water, the alcohol becomes sensibly acid; heated *per se* the purple matter softens, melts, loses colour, turns black, and reddens litmus strongly; heated in boiling distilled water, it is also discoloured without imparting any tint to the water, which becomes strongly acid; and the residue dissolves entirely in alcohol with the aid of a gentle heat. Water renders this solution milky, and this residue appears to be nothing but resin little altered. The solution shewed indications of acid, which, saturated with potash, dried and strongly heated, gave out an odour of sulphurous acid, one of the characteristic marks of hyposulphuric acid; the residue was merely sulphate of potash.

The purple matter therefore appears to be a compound of resin and sulphuric acid modified in its composition, and to be nothing therefore but another form of artificial tannin. This led me to imagine, that the artificial tannin produced by the action of sulphuric acid on resin should give analogous results; and in fact, sulphuric acid diluted with twice its weight of water having been mixed with colophony (resin) in powder, the liquid took a brown colour, and by the gentle heat of the sun disengaged sulphurous acid: the filtered solution evaporated and washed, presented all the characters of tannin. The excess of sulphuric acid having been separated by barytes, the liquid was evaporated, and the salt disengaged by heat a smell of sulphurous acid, as an hyposulphate would have done. It appears to me, therefore, that we should consider artificial tannin as a combination of resin and hyposulphuric acid, which supposition is conformable enough with the facts that led to the discovery of this modification of sulphuric acid. Pounded resin digested with heat in very dilute sulphuric acid, does not however give rise to the purple matter: it merely takes a brown colour. Gum benjamin and balsam of copahu do produce it: turpentine does not: benzoic acid does not acquire a red colour under similar treatment.

It follows from the facts contained in this Memoir, that the Chinese varnish is composed, 1st, of benzoic acid; 2nd, of a resin; and 3rd, of a peculiar essential oil, and that it is only to the happy proportions of these three, and to the slight differences between their properties and those of analogous resins, that the Chinese varnish owes the superiority which renders it so precious in the arts."

III.—*Summation of Polynomial Co-efficients.* *By* Mr. W. Masters.

It is stated in most of the treatises on Algebra, that, if a binomial be raised to any power, the sum of the numeral co-efficients of the terms of that power is equal to 2 raised to the same power; but I have no where met with even a most distant hint of the proposition (which I am about to demonstrate) that, the sum of the numeral co-efficients of any power of a polynomial is equal to the number of terms in that polynomial raised to the same power. This is almost self-evident; for if a binomial $(x+a)$ be raised to any power, it is plain that the numeral co-efficients that appear in the developement originate not from x or a which are heterogeneous, compared with abstract numbers, but from $(1+1)$ the co-efficients of x and a; for while we develope $(x+a)$ we at the same time develope $(1+1)$, and the *figures* that appear represent a certain power of $(1+1)$.

(1) Let $(a+b+c+\&c.)$, $(a'+b'+c'+\&c.)$, $(a''+b''+c''+\&c.)$, be m sets consisting of n things each. If one set be taken, and one letter from it at a time, the number of combinations will be n; and as the numeral co-efficient of each combination is 1, n likewise represents the sum of the numeral co-efficients of the combinations. Next, if one letter be taken at a time and two sets be used, the number of combinations $= 2n$; and since the co-efficient of each combination is 1, $2n$ also represents the sum of their numeral co-efficients.

If one letter be taken and three sets used, Cns. $= 3n =$ S. N. Cts.

If one letter be taken and m sets used, C. $= mn =$ S. N. C.

The co-efficients of n form the following progression:

$1, 2, 3, 4, \ldots\ldots\ldots m.$

(2) Now take two sets, consisting each of n things; combine them by taking one letter at a time from each.

$a'a + a'b + a'c +$ &c. (to the nth term) $= n$ combinations.
$b'a + b'b + b'c +$ &c. $= n$ ditto.
$c'a + c'b + c'c +$ &c. $= n$ ditto.

that is, each of the n letters of one set forms n combinations with the letters of the other set: the number of combinations is $n \times n = n^2$. Since the numeral co-efficient of each combination is 1, n^2 likewise represents the sum of their numeral co-efficients.

Next, let there be three sets, each containing n letters, taking two sets at a time, and one letter from each of those two sets at a time.

$$\begin{array}{l|l|l|} a+b+c\ \&c. & a+b+c\ \&c. & a'+b'+c'\ \&c. \\ a'+b'+c'\ \&c. & a'+b'+c'\ \&c. & a''+b''+c''\&c. \end{array}$$

There are only three possible ways of arranging three sets taken two at a time $\frac{3.\ 2}{1.\ 2} = 3$.

The first arrangement according to (2) produces n^2 combinations of letters; the second n^2 combinations also, and the third n^2 combinations, the total number of combinations $= 3\ n^2$, and for the same reason specified above, $3\ n^2 =$ the sum of the numeral co-efficients of each combination.

Next, let there be four sets, taking two at a time, and one letter from each as before.

The number of possible arrangements of four sets taking two at a time $= \frac{4.\ 3}{1.\ 2} = 6$; according to (2), each of these six arrangements produces n^2 combinations; the total number $= 6\ n^2 =$ also the sum of the numeral co-efficients.

Next, let there be five sets; then $\frac{5.\ 4}{1.\ 2} = 10$ arrangements; each produces n^2 combinations, the total number of combinations $= 10\ n^2 =$ also S. of N. C.

Next, let there be six sets, &c. &c. then $\frac{6.\ 5}{2.} = 15 =$ number of arrangements; each produces n^2 combinations, total number of combinations $= 15\,n^2 =$ S. of N. C.

Next, let there be m sets of n things: then $m\,\frac{(m-1)}{1.\ 2} =$ number of arrangements, the number of combinations $= m\,\frac{(m-1)}{1.\ 2}\,n^2 =$ also S. of N. C.

Obs. The co-efficients of n^2 form the following progression:

Series..... 1, 3, 6, 10, 15, ... $\frac{m\,(m-1)}{1.\ 2.}$

Difference . 2, 3, 4, 5,

(3) Next, let three sets combine at a time, by taking one letter from each at a time. This is equivalent to combining two sets together, as was done in the preceding section, and then combining the result with the third set, thus,

1st set $a + b + c$ &c.

2d set $\underline{a' + b' + c'\ \text{\&c.}}$

Result $a'a + a'b + a'c +$ . . . (to the *nth* term) $+ b'a + b'b$ . . . (to the *nth* term) $+ c'a + c'b$ . . . (to the *nth* term), &c. $= n^2$, combinations;

3d set, $\underline{a'' + b'' + c'' +\ \text{\&c.}}$

$a'a''a + a'' a'b +$ &c. . . . . $= n^2$ combinations;

a'' forms with the result n^2 combinations; so does each of the n letters of the third set: therefore the total number of combinations formed $= n \times n^2 = n^3 =$ also sum of numeral co-efficients.

Next, let there be four sets; combine three at a time, by taking one letter from each of the three sets at a time.

$a + b$ &c., $a' + b'$ &c., $a'' + b''$ &c. the combinations to be formed thus—$a\,a'\,a''$, $a\,a''\,a'''$: since three sets out of four, are to be arranged together at a time, all the possible ways of effecting this, are $\frac{4\,.\,3\,.\,2\,.}{1.\ 2.\ 3.}$ = four arrangements; now each arrangement according to (3) produces n^3 combinations: the total number of C. in this case $= 4\,n^3 =$ S. of N. C.

If m sets be taken, $\frac{m.\,(m-1)\,(m-2)}{1.\ \ 2.\ \ 3.} =$ number of arrangements; and number of combinations $= \frac{m\,(m-1)\,(m-2)}{1.\ \ 2.\ \ 3.}\,n^3 =$ S. of N. C..

The co-efficients of n^3 form the following series:

Series 1, 4, 10, 20, 35, 56, ... $\frac{m\,(m-1)\,(m-2)}{1.\ \ 2.\ \ 3.}$

$$\text{Difference}\left\{\begin{array}{l} 3 \ldots. 6 \ldots. 10 \ldots 15 \ldots 21 \ldots.. \frac{m\,(m-1)}{1.\ 2.} \\ 3 \ldots. 4 \ldots. 5 \ldots 6 \ldots.\ \ m. \end{array}\right.$$

(5) Next, let four sets combine, taking one letter from each at a time, and forming combinations consisting each of four letters. This is equivalent to combining three sets, taking one letter from each at a time; forming combinations of three letters each, (as in the last section,) and then combining the result with the fourth set.

$(a+b+c+\ldots)(a'+b'+c'+\ldots)(a''+b''+c''+\ldots) = n^3$ combinations of three letters each, by combining $(a''+b''+c''+\ldots)$ with the preceding

a'' will form n^8 combinations of four letters each,

b'' will form n^8 ditto of ditto, ∴ then terms of the fourth factor will form $n \times n^3 = n^4$ combinations of four letters each = S. of N. C. of these combinations.

Next, let there be five sets or factors, combining four at a time, and taking four letters from each at a time, then

$\frac{5.\ 4.\ 3.\ 2}{1.\ 2.\ 3.\ 4}$ = five arrangements of which the five sets are susceptible upon the condition required: but by the preceding result, each is capable of n^4 combinations of four letters each; the total number of combinations $= 5\,n^4 =$ S. of N. C.

Next combine m sets: then $\frac{m\,(m-1)}{1\ .\ 2}\ .\ \frac{(m-2)}{3}\ .\ \frac{(m-3)}{4}$ = number of arrangements; total number of combinations $= \frac{m\,(m-1)}{1.\ 2.}\ \frac{(m-2)}{3.}\ \frac{(m-3)}{4}\,n^4 =$ S. of N. C.

The co-efficients of n^4 form the following series:

Series	1		5		15		35		70	$\frac{m\,(m-1)}{1.\ 2.}\ \frac{(m-2)}{3.}\ \frac{(m-3)}{4}$
Differences		4		10		20		35	....	$\frac{m\,(m-1)}{1.\ 2.}\ \frac{(m-2)}{3}$
			6		10		15		21	$\frac{m\,(m-1)}{1.\ 2}$
				4		5		6	$m.$	

Without going into any farther details, we may proceed to make deductions: arranging the results already obtained, they will form the following series:

$$\overset{1}{m\,n},\quad \overset{2}{\frac{m\,(m-1)}{1.\ 2}}\,n^2,\quad \overset{3}{\frac{m\,(m-1)}{1.\ 2.}\ \frac{(m-2)}{3}}\,n^3,\quad \overset{4}{\frac{m\,(m-1)(m-2)(m-3)}{1.\ 2.\ 3.\ 4}}\,n^4$$

$$\ldots\ldots\quad \overset{r\text{th}*}{\frac{m\,(m-1)\,(m-2)\ \ldots\ldots\ m-(r-1)}{1.\ 2.\ 3\ \ldots\ldots\ r}}\,n^r$$

The generating fraction is, for

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* rth means the rth term, as 2, 2, &c. mean the 1st, 2nd term, &c.

Term

2 .... $\frac{m-1}{2}n$

3 .... $\frac{m-2}{3}n$

4 .... $\frac{m-3}{4}n$

r .... $\frac{m-(r-1)}{r}n$

Let N be the number of terms; the generating fraction of the $\overline{N+1\text{th}}$ term $= \frac{m-\left\{(N+1)-1\right\}}{N}n$

Since the $\overline{N+1\text{th}}$ term $= o$, the generating fraction must $= o$,

Therefore

$$m-\left\{N+1)-1\right\} = O \therefore N = m.$$

That is, the number of terms is equal to the number of factors, or sets employed or developed.

The index of n therefore in the last term is m; i. e. in the last term n is n^m; as for the co-efficient of n^m, it is equal to the sum of the combinations that can be formed by combining m sets or factors, taking N sets at a time.

This sum is equal to $\frac{m\,(m-1)\ldots\ldots\ldots\ldots m-(N-1)}{1.\ 2.\ 3\ \ldots\ldots\ldots\ldots\ N} =$

(because $N = m$)

$$\frac{m\,(m-1)\ldots\ldots\ldots\ldots\ldots\ldots 1.\ 2.\ 3}{1.\ 2.\ 3\ \ldots\ldots\ldots\ldots\ldots\ldots (m-1)\,m} = 1$$

therefore the last term is n^m = (S. of N. Co-efficients of all its combinations. As the first term has n combinations and the last n^m, the last but one, or the N—1th term will have n^{m-1}, and its co-efficient will be equal to the sum of the combinations of m sets or factors taken N—1 sets at a time $= \frac{m\,(m-1)}{1.\ \ 2.}\ldots\ldots\ldots\ldots\frac{m-\left\{(m-1)-1\right\}}{(m-1)}$

$= \left\{\frac{m\,(m-1)\,(m-2}{1.\ \ 2.\ \ 3.\ \ 4}\ldots\ldots\ldots\frac{4.\ \ 3.\ \ 2}{(m-2\,(m-1)}\right\} = m =$ S. N. C. therefore the N—1th term $= m\ n^{m-1}$ = S. N. C.

$\overline{N-2}\ \ldots\ = \frac{m\,(m-1)}{1.\ \ 2}\,n^{m-2}$ &c. &c.

= S. N. C.

Since the foregoing formulæ for the number of combinations also represent the sum of the numeral co-efficients of each combination, these formulæ, considered as representing the sum of the combinations, will not at all be affected by the hypothesis that the n terms of each of the m sets or factors is the same, viz. that a', a'' &c. $= a$; b', b'' &c. $= b$; c', $c'' = c$ and so on: the formulæ will, under this supposition, continue to represent the sum of the numeral co-efficients.

Now let it be required to develope m sets or factors, each consisting of n things or terms; viz.

$(x + a + b + c \text{ \&c.})\ (x + a' + b' + c' + \text{\&c.})\ (x + a'' + b'' + \text{\&c.})$ (&c.) it is plain, that the developement will be

$X^m + A\,x^{m-1} + B\,x^{m-2} + C\,x^{m-3} + D\,x^{m-4}$ .... $Y\,x^2 + Y\,x + Z$. Here it is evident, that,

$A = (a + b + \text{\&c. } a' + b' + \text{\&c.} + a'' + b'' + \text{\&c.})$ = the sum of the combinations of m sets of n letters each, one set taken at a time, and one letter from that set at a time; = (as is shewn above) the sum of $m\,n$ combinations of one letter each.

$B = (a\,a' + a\,b' + \text{\&c. .. } a\,a'' + a\,b'' + \text{\&c. .. } a'\,a'' + a'\,b'' \text{ \&c.})$ = S. of the combinations of m sets of n letters each, two sets taken at a time, and one letter from each of these two sets taken at a time; = S. of $\frac{m\,(m-1)}{1.\ 2.}\,n^2$ combinations of two letters each.

$C = (a\,a'\,a'' + a\,b'\,b'' + \text{\&c. } b'\,a'\,a'' + \text{ .... } a'\,a''\,a''' \text{ ..\&c.})$ = S. of the combinations of m sets of n letters each; three sets taken at a time, and one letter from each of these three sets combined at a time) = S. of $\frac{m\,(m-1)\,(m-2)}{1.\ 2.\ 3}\,n^3$ combinations of three letters each.

D = S. of $\frac{m\,(m-1)\,(m-2)\,(m-3)}{1.\ 2.\ 3.\ 4}\,n^4$ combinations of four letters each.

Z = S. of the combinations of m sets of n letters each, taken m sets at a time, and one letter from each at a time $= 1 \times n^m = n^m$ combinations of m letters each.

Y = S. of the combinations of m sets of n letters; taken $(m-1)$ sets at a time, and one letter at a time $= m\,n^{m-1}$ combinations of $(m-1)$ letters each, &c.

Now, if we suppose $a = a' = a''$ &c. $b = b' = b''$ &c. $c = c' = c''$ &c. $m\,n$ will represent the sum of the numeral co-efficients in A; $\frac{m\,(m-1)}{1.\ 2.}\,n^2$ the sum of the numeral co-efficients in B; therefore the sum of the numeral co-efficients is in

X............ 1

$A\,x^{m-1}$ ...... $m\,n$

$B\,x^{m-2}$ .... $\frac{m\,(m-1)}{1.\ 2}\,n^2$

$C\,x^{m-3}$ .... $\frac{m\,(m-1)\,(m-2)}{1.\ 2.\ 3}\,n^3$

*. . . . .

Y x . . . . $m\,n^{m-1}$

Z . . . . n^{m}

therefore the sum of the numeral co-efficients in the expansion $x^{m} + A\,x^{n-1} + B\,x^{n-2} + C\,x^{n-3} + \ldots\ldots\ldots\, Y\,x + z'$ is

$$1 + m\,n + \frac{m\,(m-1)}{1.\;2.}\,n^{2} + \frac{m\,(m-1)\,(m-2)}{1.\;\;2.\;\;3} \ldots\ldots\, m\,n^{m-1} + n^{m}.$$

But this series is evidently the expansion of $(1 + n)^{m}$ = (number of terms in each factor)^{m} : therefore the sum of the numeral co-efficients of any power of a polynomial is equal to the number of terms in the polynomial raised to the same power.

IV.—*Geological Sketch of Masúrí and Landour in the Himalaya; together with an Abstract of the Thermometrical Register kept at Landour during the year* 1831. *By* F. H. Fisher, *Assistant Surgeon.*

The characteristic features of the primitive clayslate formation at Landour correspond so completely with those of similar districts in Europe, and tend so decidedly to favour the received geognostical arrangement of mountain rocks, that no one can survey them without strong feelings of interest and surprise; recognising at such remote distances the objects of early research and attention, and confirming as it were the result of former inquiry.

Viewing this mountain from the Dún, its general aspect at once determines its internal composition; the gentle acclivity, round-packed summit, and plentiful vegetation, indicating clayslate; its height, calculating above the level of the sea, is supposed to be about 7000 feet, and its length ranging from east to west may perhaps average a mile; seldom affording a breadth on cleared sites of more than 100 feet.

Throughout this range, instances of some of the accidental rocks, peculiar to the primitive clayslate formation generally, occur.

Before describing these intruders, which appear to have thrust themselves perversely across the regularly disposed strata of the clayslate, it may not be foreign to note, as briefly as opportunity has afforded, the rocks which appear in the hilly route from Rajpúr to the Landour bazar[†], assuming the site of the latter to be somewhat above the acclivity of the mountain.

[†] The convenience of geologists having been considered as little as others in the plan and construction of this route, any attempt at systematic arrangement must

Ascending from Rajpúr the road is cut through a bed of bituminous slate, passing through alum slate of a bluish green colour, both of which are much decayed, and then traverses clayslate of a faded red colour; black limestone next appears, frequently intersected by flinty slate and Lydian stone: about a quarter of a mile below Jerìpanì large beds of primitive gypsum* with earthy sulphate of lime occur, and this may be considered the commencement of the Masúrì limestone formation. The road continues with slight variations in a westerly direction, and displays huge beds of grey limestone with one remarkable tract of calcareous tufa; after which clayslate re-appears, generally much indurated, iron-shot, and containing beds of flinty slate, with irregular nodules and schistose veins of brown clay iron ore. The colour of the clayslate now passes into faded red, and running in a northerly direction the road leads to Landour, leaving the Masúrì range to the westward.

The whole of this Masúrì range is composed of huge masses of stratified limestone, inclining at a gentle angle to the east, presenting occaionally considerable breadth of summit, but never approaching the height of Landour. In colour it is of a bluish grey, passing into black and white, highly crystallized, and well suited for ornamental purposes; it yields excellent lime, but the natives are careless in the preparation of it.

The aspect of Masúrì may still assert its claim to the picturesque, notwithstanding the merciless ravages of the woodman's axe amongst its withering beauties; precipices abrupt and imposing, moss-grown cliffs luxuriating in foliage, or nourishing creepers of the most lovely hue, must ever arrest attention, and steal admiration from the idlest observer. The simple minerals discoverable in this formation, are calcareous tufa, frequently iron-shot; calcareous sinter, white, brown, and yellow; calcareous spar in the primitive form; and sulphate of barytes; nodules of noble serpentine associated with hornblende slate, glassy actynolite, and earthy gypsum.

Leaving Masúrì and passing through the Landour bazar by the road

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necessarily be abandoned; mention therefore can be merely made of the various rocks as they occur in succession, without reference to strict geognostical situation. The distance included in the route is about five miles.

* I consider this to be primitive from the considerable masses which occur; it varies in colour from brown to the purest white, the latter variety being highly crystalline; emits a strong smell of sulphuretted hydrogen when fractured; the same odour is perceptible in the water drawn from the stalactitic cave near Rajpùr. In large doses this water is but slightly cathartic.

above alluded to, we ascend by a small patch of grey limestone, and set foot on the clay slate of Landour*.

It is of a faded red colour, frequently passing into black, bluish black, greenish grey, and light brown, disposed in large slates, inclining at a considerable angle in an easterly direction ; it is occasionally waved in its structure, and in the red varieties cleaves easily in the parallel of the stratum, presenting a glittering surface, owing to small particles of imbedded mica. The black and bluish black varieties do not yield so readily to the hammer ; they are tough, afford irregular fragments, and cannot be adapted to the purposes of roofing. The accidental rocks which occur in this formation may be thus enumerated : granular quartz rock† ; felspar ‡ ; flinty slate and limestone §.

They are all unconformable, crossing the clay slate at right angles, and dipping to the north.

Abstract of a Thermometrical Register kept at Landour from the 1*st of January to the* 31*st Dec.* 1831. *Thermometer kept in an open verandah facing the N.*

	Jan.	Feb.	Mar.	Apr.	May.	Jun.	Jul.	Aug.	Sept.	Oct.	Nov.	Dec.
Max.	47°	48°	64°	76°	85°	86°	70°	72°	69°	70°	62°	50°
Min.	31	31	40	44	60	60	61	59	54	51	42	30

V.— *On Modes of obtaining Important Results by Simple Means.*

By Capt. G. Twemlow, *Bombay Artillery.*

[Continued from page 70.]

2.—*Easy mode of casting masses of simple metals without the aid of furnaces.*

The native mode is to surround the mould (sunk in the earth) by a fire capable of keeping it hot, then to employ as many assistants with their small earthen pans, and hand-bellows, as may be necessary to fuse the requisite quantity of metal ; in this way it would not be difficult to cast a pillar of large dimensions, taking the precaution to have the mould strong, well bound and supported, the fire around it sufficiently intense, although properly covered in, and the assistants in sufficient numbers to melt the metal, and pour it into the mould, kept hot as long as requir-

* Landour is separated from the snowy range by intermediate zones ; they all run parallel.

† Concretions not exceeding the size of a pigeon's egg, and of a milky hue, as seen on the site of the new Hospital.

‡ Compact felspar of a greyish colour, distinctly stratified, slaty in the small, and by the aid of a glass small acicular crystals of hornblende may be sometimes discerned ;—cleared site near Mr. J. Lloyd's grass hut.

§ But sparingly found of a pink colour, coarse in structure, and rather tough ; —site of the tennis court.

ed, to enable them to fill it. This mode it is evident would not answer well for mixed metals, nor for metals difficult to fuse. The writer casts his 18 pr. brass naves in this mode, each man bringing his seer of molten metal and pouring it out of earthen pans into the mould, kept surrounded by fire; and he has no doubt but a brass pillar or statue of one thousand seers in weight, might be cast in the same simple mode, by a series of circles of a thousand pans and a thousand bellows surrounding the fire-embedded mould,—not that we would adopt the pans, having a knowledge of furnaces.

3.—*Strength of powder may be too great in mining.*

A curious instance of simplicity on the part of natives, leading to useful results, may be mentioned relative to the operation of blasting rocks: the miners represented, that the government powder was not of the proper kind; that it blew out the tamping, without moving the rock, or if a very small quantity were put in, no effect was produced; whereas the common country powder was excellent; with it they could make great progress, but not so with the government powder. On going to the spot, this was speedily remedied by mixing one handful of saw-dust with each charge or handful of powder, so as to decrease the velocity of ignition, and to admit of the expansive fluid acting on greater space. It is believed that in mining operations generally it would be well to mix saw-dust with the powder, when a sufficient chamber can be formed, *or to adopt some other* mode of producing gradual expansion and reiterated concussion.

4.—*Mode of boucheing iron Guns, at a siege, or on emergency, without the aid of a regular drill lathe.*

Should the vent of an iron gun become so much enlarged as to be unserviceable, before a siege has been brought to a favorable termination, a new vent may be applied on the spot, thus; let the gun be withdrawn from the battery, and be thrown down close to the nearest convenient tree; and fixed on a block at the proper angle: insert a stout trunk of another tree in the ground six feet apart from the standing tree; pass a stout flat lever bar from one to the other, fixing one end to the standing tree, but so as to move up and down on the smoothed front of the other or inserted trunk: thus we have a simple boucheing machine or drill lathe.

In the mean time, the train artificers will have bent an axletree, or any other convenient piece of iron, into the shape and form of a brace, whilst other smiths will have forged out a four-cornered square cutting tap; with this square tap inserted in the brace, the artillery men may be set to work to enlarge the injured vent. The smiths mean time are to be set to work to forge the screw tap for cutting out the female screw. Others will beat out the cold iron rod for the male screw, which is to form the vent.

When after successive enlargements of the female screw in the gun metal, it is brought to fit exactly the male, the latter is to be turned in, screws with the requisite force to make it amalgamate with the gun metal, particularly in the lower two-tenths, which should purposely be left rather tight.

It is believed, that the chief thing to be looked to in boucheing iron guns, is to secure a very firm fixture below, by leaving the last two-tenths of the female screw tighter rather than the rest, so that force may be used to make the male screw bite into it.

We are told that guns have now spare screw vents for insertion on demand ; but is it not probable that if the first screw is destroyed by intense heat, that the gun metal around it will have run, proportionately ? In fact it admits of doubt, whether when a screw vent is destroyed by hard firing, it can be extracted by other mode than boring it out with taps and a brace.

5.—*To make fuzes on emergency.*

It has occurred that a bombardment has been stopped for want of fuzes in the shells, and that have been sent for, express, from the nearest magazine—the following plan of making fuzes on emergency might be of use in such a dilemma.

Procure some battery planks or any thick wood of two or more inches in thickness, according to the length of the fuze required ;—stretch a carpenter's marking line along the centre of the smooth plank, and mark a line the whole length ; parallel to that line, and on each side of it, draw other lines at the requisite distances for the thickness of the fuzes—on those lines bore holes (with a brace, auger or *burma*) as deep as the fuzes are required to be long ; and having the fuze composition ready, drive it into the holes ; cut off the fuzes, wrasp them, and send them into battery for use ; there is no reason why they should not be as good fuzes as need be, provided the composition is properly prepared and driven.—Persons who have to blast rocks may in this way make fuzes, wherewith to ignite their mines ; for composition they should use mealed powder and charcoal.

6.—*Simple mode of quickly obtaining a light on service.*

Tear off a bit of cloth, moisten it in your mouth, put it into a pistol over a small charge of loose powder, fire the cloth against a bank, or ground, and the rag will give you a light.

7.—*To set fire to combustibles with musketry.*

Cast (in a greased piece of old musket barrel) solid cylinders of lead. Cut them into lengths of one inch; bore a hole in each to within two-tenths of an inch of the opposite end. Drive meal powder or other composition (according as the burning is required to be quick or slow) into the holes after the manner of fuzes, and when the composition has been driven to within one-tenth of an inch of the top, pass a strand of quick match transversely through the sides, as is done with fuzes.

These fire slugs fired horizontally will set fire *to whatever retains them;* or if fired at an angle will fall burning, if the composition is appropriate.

In Europe, rifle shells and other inventions are under trial, for setting fire to artillery ammunition waggons, and to other combustible machines. It is probable that the above is as simple and effectual a mode as could be managed with infantry; and in street combats might be made very formidable. If such weapons come into general use, artillery will be obliged to have their ammunition boxes made (as in fact it might be well if they were now made) *cellaret fashion**, to admit of the interior tier or row of holes being filled with shot or other resisting non-combustible material (even earth would do), to protect the powder which would be placed in the centre.

8.—*Simple Alarm bell for private treasure or plate chest; or for public treasure tumbrils, to prevent the necessity for double sentries.*

Sling a bell inside the chest, so attached to the lid that it cannot be got at from the out-side, and may have room to swing free. An attempt to force the chest or remove it will inevitably cause the bell to sound an alarm, and if it does not deter the depredators will give the master time to defend his property, or the guard to turn out.

VI.—*State of Science in England.*

To the Editor of the Journal of the Asiatic Society.

Sir,

Having felt much interested in the discussion which has for some time been maintained in the scientific journals at home, respecting the decline of science in England, I take the liberty of sending you a few observations on the subject; which, if they should not be deemed too presumptuous, you would oblige me by inserting in your valuable Journal.

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* In making cellaret fashion ammunition boxes, the partitions should be put in from below in grooves; the bottom of the box to be afterwards screwed over them and well clamped—it is a safe mode of carrying fixed ammunition.

In Dr. Brewster's Journal for October, which I have just received, there is a somewhat tart critique upon a pamphlet written by a foreigner, and prefaced by Mr. Faraday, on the subject I have mentioned; and by it my attention has been particularly excited. This foreigner comes forward in defence of the scientific men of England, against the allegations of Sir H. Davy, Messrs. Babbage and Herschel, Sir J. South, and others: and it seems sufficiently rash for a foreigner to enter the lists with natives, or for any man to dispute the testimony of witnesses so competent, upon such a subject. Indeed it appears absurd to impugn their evidence upon any ground whatever, whether of motive, capacity, or actual information. Yet there may be no absurdity in inquiring, what the real amount of their testimony is. And I cannot but think there is something radically delusive in the phrase, "*Decline of Science in England*," which has been adopted to express the conclusion to which their depositions lead. For surely it could not be intended, that there is a literal decline of science in England, in such a manner that any thing previously known or acquired has been lost, or is beyond the reach and attainment of the present generation of our scientific men; or that the circle illuminated by scientific information and accomplishments is contracted, and the votaries of science in England are decreasing in numbers. No one would credit such testimony, by whomsoever it was advanced. But in what other sense can there be said to have been a decline of science in England, unless it be that there is not the same progressive activity in science which there was some little time ago? Now if this be the decline of science meant, we may—nay, I suppose, we must—admit it. But in what is it either wonderful or alarming? It is in strict analogy with all other strenuous movements. They have their irresistible impulses with succeeding pauses, in which strength is gathered for new and still stronger efforts. What have we lost that has brought us up to the present point of scientific progression? The human mind in Great Britain has not yet given any symptoms of dotage. Its powers remain in their full strength. And there are now multitudes in their cradles, and multitudes more unborn, who will bring to scientific inquiry as acute penetration, as profound abstraction, and as inventive a genius as any of their forefathers. The original faculties, by the exercise of which science is to prosper, are unscathed; and the facts which we are now slumbering over, will, in due time, strike on the minds of those who are to be our future Newtons, or Davys, or Herschels, or Babbages, or Brewsters, and enkindle glorious conceptions to dazzle succeeding generations by their splendour and majesty.

When thought is free, these are things that will neither come nor go at the bidding of state patronage.

I would not question a single fact alleged by the eminent men who originated this controversy. Nor can they be blamed for calling public attention to the decline, (if it must be called so,) which they deplore. On the contrary, they are much to be praised, and some of the admonitions they have given, deserve the most attentive consideration. Yet the general scope of their remonstrances and their recommendations does appear not a little at variance with philosophical character. "Science languishes for want of royal patronage, rich emoluments, and ribbons; stars, garters, and noble titles: let it have these, and it will be sure to prosper." Such is, I think, no unfair representation of much that they have advanced. Now these gentlemen are not of opinion, that England is in a state of original ignorance and destitution of science, but that it has merely sustained a relapse from allowed and indubitable eminence. They feel that but a short time ago, she possessed a galaxy of great men, which enabled her to enter into no dishonorable or unequal competition with all the science of the world; and their wish simply is to see her again invested with an equal glory. Upon the principle, that like causes produce like effects, one would have thought they would not have propounded the notions they have. For, observe the names which are adduced as lately the glory of England, and the loss of which has been the "death-blow to English science." They are "Sir H. Davy, Dr. Wollaston, Dr. Young, Mr. Watt, Dr. Marcet, Mr. Gregor, Dr. John Murray, Mr. Chenevix, and Mr. Smithson Tennant." And which single individual of all these was indebted in the slightest degree to royal patronage, or public endowments, or the ambition of rank and titles, for one tittle of his fame or usefulness? Indeed the inquiry, applied to them singly, becomes absolutely ludicrous.

We have had science then, by the safe and sure operation of knowledge gradually spreading over the minds of our countrymen. We have already by experiment ascertained the natural history of scientific discovery; the causes and the developments of its growth. We know it to be certain, that if the seeds of science be freely scattered by the winds, they will find their proper soils and localities, and come forth in a rich and natural harvest.

Why then should we reject or despise what has been established by such proof? and still more strange it is, to recommend the cultivation of science, by means with which it has no affinity. What kind of genius is it that is to be expanded by places, pensions, and titles? Are scientific men envious of the brilliancy of Poet Laureate rhymes? Or worse, would they have science, too, oppressed with the administration of a plethoric hierarchy? Would they fatten it into indolence by inalienable endowments? Or would they disturb its serene atmosphere by the storms of rivalry and ambition after secular preferments and distinctions? It is most marvellous, that of the two noblest and purest things in the earth, religion and science, we should be told, on such high authority as Lord Plunkett in the one case, and Mr. Babbage in the other, that they will not exist unless nourished with *money*—they will have no brightness, unless tinselled with the gewgaws of a vain life. Such a sentiment ought to be scorned.

No civilized government can carry on its operations without patronizing science, for the single reason that it needs both its men and its materials. They are indispensable in innumerable ways for the efficiency of its army and its navy, for its surveys at home and abroad, for its mint, and for many other purposes: and in these things all kinds of science are brought into requisition. This sort of patronage is wholesome; and we have only to wish that it were more wisely distributed. But there appear to be some who would attach rather curious functions to Government, as the great patrons of Science and Art; functions which would require a peculiar Board for the purpose of pensioning all savans, painters, and poets, whose wits cannot keep them; and investing with baronetcies, or lordships, or earldoms, or dukedoms, men who ought to thirst for such things as the glory of discovering the alcaline metals, or shewing a list of 700 double or treble stars, or producing the calculating machine. As I have said, a civilized Government must of necessity patronise science, and Governments must likewise be the greatest patrons of science; but I cannot see that they are under any obligation to dispense a gratuitous patronage, or that they would do any thing but harm by such a thing. Because of their responsibility to those whose money they spend, they are bound to require a *quid pro quo* in every part of their expenditure. Government is the greatest individual patron of science, but if the community do their duty, their combined patronage will throw that of the most liberal Government almost into insignificance; and it will flow through a thousand channels which no state patronage could have reached, and where alone the coming Davys, and Watts, and Murrays, and Tennants, are to be found and nourished.

Let scientific knowledge continue to be industriously diffused; and it will awaken the energies of such men as Sir James Hall and Sir J. South, and many others who might be mentioned, whose place it is to patronize, not to ask patronage: or if it fails to do this generally, it will at least produce in men of property that sympathy for the objects of scientific men, which will ensure them the means of applying all their faculties to the best advantage. All wealthy men are as much bound to dispense a portion of their revenues in the promotion of science, and in every other noble and generous enterprize, as the Government under which they live. Let them therefore be called upon to rouse themselves for the more extended performance of this duty. And let those who enjoy such honours and emoluments as science already possesses, shew by their superior diligence and success, that there is some virtue in the secular advantages which they possess, raising them as scientific men above those who are destitute of them, before the dangerous experiment be made of increasing such stalls and dormitories.

There appears to me something so portentous in this matter, that I should like to see it fully discussed upon principles that approve themselves to sound reason. But I must leave it to abler hands.

I am, Sir, &c. &c.

J. MACK.

[On this subject we refer our readers to the valuable remarks of M. Biot, inserted among the Scientific Intelligence of the present number.—ED.]

VII.—*Memoranda regarding the Difference between Morning and Evening Altitudes, for Ascertaining the Apparent Time on board ship.* By Captain D. Ross, *Marine Surveyor General.*

With most navigators, when quitting a port, it is usual to ascertain the deviation of the chronometer from mean time by altitudes of the sun taken either on shore with an artificial horizon, or by that of the sea from on board ship. These altitudes are generally taken before noon, and seldom, I believe, is the deviation of the chronometer ascertained by altitudes taken in the afternoon; but from the long experience I have had, I am led to believe, that to approximate to accuracy, it is right that altitudes should be taken on each side of the meridian at the place of departure; for it will be found that in cases where the difference of longitude between it and a distant station is to be measured, if the result of altitudes taken at the latter in the afternoon be compared with those taken in the forenoon at the point of departure, they will frequently give a longitude differing two or three miles from a deduction of the same measurement made by comparing two forenoon observations together, and in such cases, there may be an uncertainty to that amount, in fixing the position of a rock or other danger. If at the point of departure the deviation of the chronometer is ascertained by both morning and evening observations, and these be compared with altitudes taken at the new station, corresponding as to the time of the day, the results if not agreeing will differ but little.

On one occasion I found a difference of the nature alluded to above amounting to eight miles; for I anchored off one of the Piscadare Islands, near Formosa, and at about 8 h. A. M. took several altitudes for the chronometers, after which we proceeded nearly west from the anchorage, apparently 16 miles both by log and by the distance of the Island from us; we then anchored, and at 3. 30 P. M. the result of several observations taken and compared with those taken at 8 A. M. placed the ship but 8 miles west of the anchorage, when it was quite evident we were at least double that distance. Thinking these observations might be faulty, I took several others, but at about 5 P. M. and the results of the latter corresponded so nearly with those taken at 3h. 30m. P. M. as to satisfy me that the difference did not depend on error in the observations, and made me continue at anchor until the next morning, when observations were again taken and compared with those made the previous morning at the anchorage near the Island; they gave our difference of longitude 16 miles, agreeing with the log and apparent distance of the Island from us; here was an instance in which had not the island been in sight, I should have laid down a danger 8 miles short of what it should be, and should undoubtedly have attributed the difference to the effect of a current setting against us.

It is well known that in straits or confined navigation, owing to the changes which take place in the horizon, correctness is scarcely attainable in observations taken on board ship: I have often found it so, and am of opinion, that in the vicinity of shallow banks, the result of observations taken on ship board will be also generally found much at variance.

In the instance I have just stated, the bottom to the westward of the ship was formed by several ridges of sand lying in a north and south direction, having 7 or 8 fathoms water on them, with deeper channels between.

The part of the horizon above which the sun's altitude was measured was remarkably bright, and I have thought that some unequal evaporation might have caused the horizon to appear higher in that quarter.

I have found that observations taken in the vicinity of Ságar were not to be depended on, although there is apparently a clear horizon before you.

Latitudes taken afloat with much care will never agree with those taken on shore with an artificial horizon, and when the sun is to the southward, will always be found more southerly by a mile or perhaps two.

I think there is little doubt, but that we need some correction for the mutability of the horizon at sea, and that probably its amount might be ascertained by a series of observations with the dip sector, and a close attention to the state of the atmosphere : my own experience leads me to the conclusion, that equal altitudes observed by the horizon of the sea without this check on board ship, are always subject to errors of an irregular nature.

VIII.—SCIENTIFIC INTELLIGENCE.

1.—*Mr. Alexander Ksoma de Körös.*

The Viceroy and several noblemen of the Hungarian dominions, having learnt that Mr. de Körös, their countryman, was travelling in the East for the prosecution of researches connected principally with the origin of the language and people of Hungary, voluntarily subscribed £140 for the furtherance of his enterprising object. The money has just been received through a mercantile house in Calcutta, along with a handsome letter from the Baron Niumann, Secretary of the Austrian Legation at London. Mr. de Körös however has declined accepting it in the shape of pecuniary assistance to himself, and has been only induced to retain it, on the persuasion of his friends, for the purchase of Oriental manuscripts for the library of one of the principal universities of his native country.

2.—*Húglí Ice Manufactory.*

It may not perhaps be uninteresting to some of your readers to know the result of the experiment for keeping ice, and the reason of the late sudden failure of the supply. This is in part to be explained by the last having been an unfavourable season for the manufacture, so that although great preparations were made, the quantity obtained was by no means commensurate with the money expended ; and so peculiar are the agents to be provided against, in this hot climate, that in our present state of knowledge, experience alone can guard against their influence. That experience in a certain degree may be supposed to have now been obtained, and next year it is hoped, from additional preparations for its production, and precautions for keeping it, a supply of ice may be expected during a much longer period than has hitherto been known in Calcutta. The advantage that ice affords for cooling water, wine, &c. and the simplicity of the means to be employed for obtaining its full effect, must be already known to most of your readers ; but I suspect the cheapness of the luxury has not been properly appreciated, from the ignorance or carelessness of servants to whom its management is too often left. I have frequently had opportunities of observing this, and even the possibility of its not always accomplishing the object becomes apparent, when I have found servants, who had observed that it ought to be kept *warm* (surrounded with blankets), thrust it into warm water, the better to insure the keeping of the precious deposit. If care be taken to have it kept in a hard lump, and surrounded with blankets, it keeps very well for 12 hours, during a hot day; and when used skilfully, the following I find to be the quantity required for reducing the temperature.

	Ice.	
Claret, French bottle	3 chitaks.	as cold as can be drunk.
Water, ditto		
Soda Water, stone ditto		
Sherry, in English ditto,	4 chitaks.	
Jelly, in a large wide mouthed glass bottle	4 ditto	hard.
Butter, 1 chitak to 4 of butter		ditto.

W.

3.—*Mergui Dye Wood.*

Several specimens of a red wood were lately sent to Mr. G. Swinton, by Mr. Maingy, Commissioner on the Tenasserim coast, with a view to its examination as a dye wood. The *Rebecca*, on which the first samples of the plant were shipped, having been burned, nothing was then known of the tree. It was stated by Mr. Maingy, to differ from the *Theet-tsee* or Burmese varnish tree, which is also used in dying clothes of a red color. The effects of the juice of the red wood tree were described as similar to those occasioned by the *Theet-tsee.* The Burmese were said, when employed in collecting the wood, never to fell a tree for that purpose, but to search for trees that have been blown down, and in which no sap is to be found. It only bears seed once in 7 or 8 years: the Burmese do not extract the dye (probably from their having another tree which yields it in great abundance). The same tree is said to abound in Penang, but there the wood is red throughout, and is constantly employed as a dye by the Malays and Chinese.

A number of experiments made at the request of Mr. G. Swinton, by Mr. Thomas Speir, upon the Mergui dye wood, prove that it affords, with the mordants commonly used by dyers, colors equally bright and of a more permanent nature than those of most other dye woods. On the other hand, there seems a material objection to its success in the small quantity of coloring principle it contains, as compared with the generality of other woods and roots now in use: and it appears that the color is only found in trees of full growth, and only in the heart of the wood; the young trees are of a white or light straw color: indeed the branches of grown trees are white and the stems also, until their size exceeds that of the human body. The colors imparted to silk with different mordants were as follows:

1.—*Muriate of tin, sp. gr.* 1.185, *with* 5 *parts water.* Three shades of orange, varying with the temperature of the bath and the time of immersion.

2.—*Acetate of alumina, sp. gr.* 12. *of Twaddle's Hydrom.* Two shades of flame color.

3.—*Acetate of iron,* 7½ of ditto. Two shades of drab.

4.—*Ditto, with a weak decoction of galls.* A fine black, two shades.

5.—Mixed with *manjit*, a variety of red and pinks are obtained, but not perhaps equal in intensity to those of the *manjit* alone. The chief attraction of this wood as a dye, is the orange color which it yields with the aid of muriate of tin and acetate of alumina, of a great variety of shades.

These results shew that the Mergui wood is deserving of further attention, and that it may become eventually an important article of commerce with our possessions on the Tenasserim coast. A small quantity of the wood has, we understand, been sent home to the Honorable the Court of Directors, for the purpose of being examined as to its dying properties, compared with other known dye woods.

[From duplicate specimens of the wood, leaves, and seed just received, it turns out that the tree in question is the *thit-tsi* or varnish tree, *melanorrhœa usitata* of Wallich: the above notice of its properties as a dye forms however an addition to our knowledge of the tree.—Ed.]

4.—*Decline of Science in France.*

In the *Journal des Savans,* Jan. 1831, is a note by Professor Biot on the subject of Mr. Babbage's reflections on the supposed decline of science in England. He deprecates the fatal example which has been set by a man of such distinguished talent, in decrying the institutions of his country, and introducing dissentions among those who should be occupied in fortifying the bulwarks of science, while he gives arms to her numerous enemies, always ready to ridicule and undermine her jealous ascendancy. The example has already been followed by other illustrious men, with the augmented bitterness of personal controversy; and a torch of discord is introduced among the combustible materials of our scientific bodies, which neither the late distribution of titles and pensions by the Government, nor the establishment of Associations for the promotion of science in different parts of the kingdom, can now extinguish*.

M. Biot concurs in lamenting the neglect which such men as Dalton, Ivory, Young, Brewster, and Herschell, have suffered from their country; and grants that the abstract sciences have with us been abandoned for the more attractive paths of popular knowledge, the sure roads in England to preferment in the church, the law, the shipping and manufacturing lines: but in drawing a parallel between England and France, Mr. Babbage is thought to have laid too much stress upon the political honors and distinctions lavished upon men of science in the latter country. "It is," says M. Biot, "a remarkable moral effect of the distinction of ranks so strongly defined and so continually felt in England, that an abstract philosopher like Mr. Babbage, should be brought to confess honorary titles to be satisfactory and grateful to the intellectual class! Doubtless when such distinctions are accorded to merit, the intention should be duly appreciated, but the idea of any precedent or right should not for a moment be entertained." M. Biot makes the following just reflections on the French system of education.

"The immense development of the sciences in France, during the last 40 years, appears to us to have been produced by two causes very different from those pointed out by M. Babbage: two potent causes, of which one exists still, but the other has long ceased to act.

"The *still existing* cause is, the publicity of our higher grades of instruction, and its perfect independence of all pecuniary contributions paid by the auditors. It is thus open to every intelligent mind in a state competent to profit by it. The endowments, liberally assigned by the country, allow the

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* We observe in the Philosophical Magazine, that at the grand scientific Reunion at York, committees were established for the promotion of science, and that Major Benson, (W. H. Benson, Esq. C. S.?) Sir Edward Ryan, Mr. Calder, Mr. J. D. Herbert, (Captain Herbert?) and Mr. J. Prinsep, were appointed a sub-committee for India. No diploma has however yet reached Calcutta, and we trust that the increasing contributions to our Journal are the best guarantee of the non-decline of science in this part of the world!—Ed.

professors full liberty to consult only the wants of science, in the tenor and depth of their lectures.

"The lectures delivered at the *College de France*, the *Jardin des Plantes*, and at the *Bibliotheque Royale*, have thus no need of a large audience; and with most of them, if a crowd were attracted, it would be the best proof that their object was not attained. It is far otherwise in England, even in the most recent and liberal institutions. Take as an example the London University: its buildings are superb; its scale of studies is drawn out on the most elevated views; the chairs are occupied by very able men; the auditory is numerous; but the emoluments of the professors depend chiefly on the fees of the scholars, whom it becomes necessary to please by suiting the grade of lectures to the capacity of the majority. This system may be very well for the elementary courses, but it interdicts all attempts at the more refined branches. A professor must be warmed by super-natural zeal, or nobleness of mind, to work at once against his popularity and his interest! and experience in fact shews that even the most distinguished men will rather condescend to lower their powers and become intelligible to the multitude. This general want of elevated courses, accessible to the talented few, and consecrated exclusively to the highest branches of abstract science, forms a void in England, a sort of precipice which arrests the progress of the master spirits by whom otherwise the sciences would be cultivated most successfully.

"The second cause which in our opinion gave a stimulus to sciences among us, was the political and moral state of the public mind at the renovation of order in 1794.

"A mad and atrocious revolution had destroyed our universities, academies, and other establishments of instruction. When the reign of terror subsided, some men devoted to science, and who had continued to cherish her in secret, Monge, Berthollet, Fourcroy, and Guyton, undertook to restore her temples, and they did it with a grandeur of conception which some may think gigantic, but which was admirably fitted to produce a great excitation in men's minds. A normal school was designed, to which pupils should be sent from all parts of France; the professors named were LaGrange and Laplace, who never would have been heard delivering their thoughts in public, had it not been for this revolution; with them were associated Berthollet, Haüy, and Monge himself, whose zeal had kindled general enthusiasm. In these unusual *comitia* of the sciences, philosophical discussions were opened on certain days, and such pupils as Fourrier then started individual doubts to men whose genius had hitherto but spoken in general terms to Europe at large: at the same time Monge, the indefatigable Monge, set up a Polytechnic School, on an extensive and liberal plan, where, animated by his presence and impulse, the youth of France heard with an indescribable enthusiasm, lectures delivered on all parts of the Physical, Mathematical, and Military Sciences, by the first men of those days.

"Moreover these fundamental institutions were followed up by a general system of open public schools through the departments; where professors, occupied solely with such objects, spread around them the knowledge required by the generality of the population. These appointments, paid but poorly, brought nevertheless a feeling of independence and consideration:—they were then honorable; and this sentiment, joined to the complete liberty they enjoyed, fired the professors with the ambition of distinguishing themselves by works of instruction or research in the line of study they had embraced. Hence arose the multitude of first-rate elementary books we now possess, to which is mainly owing the renovation of scientific education among us.

"These, in our opinion, are the true causes which reanimated the sciences in France after the storms of 1793, and which have contributed to raise them to the eminence they now enjoy, much more than all the decorations, duchies, ambassadorships, and marquisates ever lavished on their professors."

We must conclude our extracts with the professor's mortifying picture of the reverse now manifest in the state of French education.

"The central schools exist no more: the hand of power has broken them up, as too active instruments of intellectual development. From motives much the same, the system of education at the Polytechnic School has become less elevated and less general. These two blows at progressive improvement, have already enfeebled the study of the higher mathematics, which now only languishes in a few chairs in the *College de France;* so that unless measures be promptly applied, in a short time hence English savans will no longer say that they have abandoned the field of competition in *the calcul* without hope!"

5.—*Letter from Abdúl Mojíd on the subject of the Arbelon Problem.*

[*Literally translated.*]

"I have heard that a certain talented individual was attracted by my demonstration relative to the Arbelon, and approved the reasoning, but being anxious to render it clearer, he came forward with amendments, and said out his say. I shall therefore acquaint him with a piece of my condition; that from the commencement of my youth, after picking up into my mantle the gleanings of dates and grapes from the gardens of science, I became a lecturer on traditional and intellectual sciences to the wits and the knowing ones of brilliant genius. I conversed with the generous sages, and repulsed him who was destitute of steadiness, so that it was my custom to move my tongue only when necessary, and to alter my conversation according to the condition of him whom I addressed, agreeably to the alteration of manner. Woe is me, then, that that knowing genius did not direct his view to the qualities of him to whom I had addressed myself, whose exalted name is indicated by this enigmatical symbol. He was satisfied without my multiplying or amplifying words to his lofty dignity and his enlightened sagacity; and this eloquent sage and perspicacious preceptor, through the perfection of his genius, by a mere glance at my abbreviated paper, made himself acquainted with its essence, and requited me above what I deserved. Now necessity calls upon me to gallop the horse of my pen into the hippodrome of explanation, as I before interpreted it to his excellency, the centre of the circle of science and politeness, the circumference of the diameters of dignity and generosity, the learned, the intelligent editor. I shall therefore first recite the enunciation of this figure, and secondly the first abbreviated explanation, and thirdly its clear and detailed explanation, and if (your correspondent) is satisfied with what I say, shall have attained that which is the object of my hopes, and the end of my labors. Deo adjectori gloria.

COUPLET.

Be gracious; to the uninformed your pardon free present,
For clemency in mighty men is surely excellent."

Note.—We thank the learned author for the above complimentary epistle, and for his revised solution of the problem, which in its new shape is sufficiently clear for the most rigid demonstrator; but having published already a second version of the problem, we trust our limited space may be pleaded as an excuse for omitting his present demonstration.—ED.

IX.—*Proceedings of Societies.*

1.—ASIATIC SOCIETY.

Wednesday, the 2nd May, 1832.

The Hon'ble Sir C. E. Grey, President, in the chair.

1.—Mr. Pearson was proposed as a member by Mr. J. Prinsep, seconded by Mr. Wilson.

2.—The secretary submitted Bills for Rs. 346. 1., the amount of sundry Books purchased for the Society.—*Ordered,* that the amount be discharged.

3.—Read a letter from Dr. Royle, acknowledging the receipt of a letter addressed to the Court of Directors by the President on the part of the Society.

4.—The Secretary reported that difficulties had arisen with regard to the payment of Mr. Bruce's legacy, and recommended that the Treasurers, Messrs Mackintosh and Co. be authorised to apply for and receive the sum, which was accordingly resolved.

5.—Mr. Calder offered to the Society for purchase, a copy of the Baron Cuvier's last edition of the *Regne Animal* and *Histoire des Poissons,* at the invoice cost and charges.—*Resolved,* that the offer be accepted.

6.—Submitted an estimate from Mr. J. Prinsep of the expence of relaying the lower floor of the Society's house.—*Resolved,* that the measure be carried into effect under the supervision of a committee of the Society of the following Gentlemen—Mr. Gordon, Captain Forbes, Captain Jenkins, and Mr. J. Prinsep.

7.—*For the Library.*—Extracts from the Proceedings of the Society of Natural History in the Mauritius, presented through Dr. Casanova.

A copy of India's Cries to British Humanity, presented by the author.

Meteorological Registers for the months of January, February, and March, 1832, presented by the Surveyor General.

Resolved, that the thanks of the Society be presented to the Donors of the above.

8.—*Literary.*—A paper was read by the Secretary, entitled "Notices of the Life of Budd'ha."

[We hope in a subsequent number to present our readers with this interesting paper at length, and shall not therefore here attempt an analysis of its contents.—ED.]

2.—MEDICAL AND PHYSICAL SOCIETY.

The 5th May, 1832.

Assistant Surgeon J. T. Pearson, Bengal Service, stated his wish to return to the Society, and have his name replaced in the List of Members, in conformity to the resolution passed on the 4th April, 1829, which was complied with accordingly. D. McLeod, Esq. Deputy Inspector General of Hospitals of H. M. Service at Bombay, and John Stokes, Esq. Surgeon in His Highness the Nizam's Service, were proposed as Members by Messrs. Wilson and Twining. S. Ludlow, Esq. Superintending Surgeon, Bengal Service, was proposed by Messrs. Hutchinson and Egerton, and O. Wray, Esq. Surgeon, Bengal Service, proposed by Messrs. Garden and Tytler. Dr. W. C. Blest, President of the Medical Board of Chili, and Dr. Joseph Passaman, of Chili, were proposed as Corresponding Members, by Dr. Casanova and Mr. Twining.

The following communications were then laid before the Society.

1. Remarks on Cholera, by T. E. Baker, Esq.

2. A letter from Mons. Desjardins, Secretary to the Society of Natural History of the Mauritius, inclosing the proceedings of that Society up to 23rd November, 1831.

3. A communication on Vaccination, from Dr. Casanova.

4. A second report on varioloid Diseases, by H. S. Mercer, Esq.

5. A letter from F. P. Strong, Esq. presenting a work, published in 1653, by Dr. Hermannus Vander Heyden, of Ghent; containing an account of Cholera Morbus, and several other diseases then prevalent in Holland.

6. Dr. Hennen's Work on the Medical Topography of the Mediterranean; presented by Dr. Burke, for the Society's Library.

7. Mr. Corbyn's work on Cholera; presented by the author.

8. A short statement drawn up by a native, relative to an injury of the hip joint, of 10 months duration; and the patient whose case was related, came before the Society for examination.

9. A letter from M. Tierney, Esq. inclosing a copy of a communication from Sir M. Tierney, relative to the efficacy of Cajeputi Oil in Cholera; 50 drops are recommended to be administered in half a wine-glass of tepid water, and repeated every half-hour, until 250 or 300 drops have been taken. Sir M. Tierney states this remedy to have been used successfully in the severest cases of Cholera; and that two or three doses, if given early, are usually sufficient to arrest the disease. The statements of the effects of Cajeputi Oil, in Cholera occurring in Calcutta, do not correspond with the good effects, which by the above account appear to have followed its use in England; that medicine having proved entirely inert when administered under circumstances which authorised expectation of the patient's recovery by the uses of ordinary remedies; as much as six drachms by measure having been given to one patient in the course of five hours without the least effect. By a report published at Madras, it appears that Cajeputi Oil has been recently tried in H. M. 54th Reg. at Trichinopoly, during a severe epidemic visitation of Cholera; the effects of that remedy are stated to be very temporary, and by no means so beneficial as Mr. Hamiltom, the Surgeon of the Regiment, had been led to expect.

The following papers were then read and discussed by the meeting.

Dr. Casanova's replies to the questions proposed by the President at the last meeting of the Society; namely—1st. Whether natural small-pox ever succeeds to a vaccination, in which the specific characters of the vaccine disease have been developed.—2nd. Whether a person having had the true vaccine disease, and having been thereby protected from variola for a certain time, may become afterwards liable to contract the natural small-pox.—3rd. Whether the true vaccine disease, by transmission through numerous individuals, be preserved unchanged, or be capable of undergoing any particular alteration, whereby its prophylactic properties are diminished; or if the virus be deteriorated or capable of change in different climates.

The author observes, " This is the question which agitates the public mind; shall we be safe from small-pox, if we are vaccinated ?" He then offers the following replies to the queries; 1st, he has sufficient reasons for asserting, that in general the individuals reported to have had variola after vaccination, have in fact either had spurious cow-pox; or that the disease which has supervened after vaccination, instead of being variola, was merely one of the numerous exanthemata which resemble variola in some respects, but are exceedingly different in many of the essential characters. He goes on to state, that vaccine lymph taken from a perfect vesicle, and used at the same time in several subjects, is liable to produce genuine vaccine in some, while an imperfect vaccine may be developed in others; and supports this statement by reference to printed reports of numerous experiments made by Dr. Romay and himself at the Havannah, in 1825; which authorise him to say, that spurious vaccine may repeatedly affect the same person, but when the true vaccine has been developed and gone through its regular course, the person is during the rest of his life insusceptible of either true or false vaccine disease, or of the natural small-pox. He farther refers to experiments made in various countries, which tend to confirm his opinions: the most remarkable statement which he points out is the summary of observations made by 43 medical men at Philadelphia in 1828, relative to a variolous epidemic, which raged in that city; where 80,000 vaccinated persons resided; and it appeared that only one death from variola took place on that occasion, among the above number of vaccinated persons.

With respect to the 2nd question, Dr. C. does not consider that his opportunities for investigation authorise the expression of a positive opinion; but he has never met with a single case that would support the conjecture of some physicians, that the security afforded by vaccination against variola is liable to wear out. He proposes that the subject should be submitted to the test of experiments; but as several years would be requisite to settle the question in this way, he observes, that so many medical men must now exist, who having been vaccinated formerly, and afterwards repeatedly exposed to variolous contagion annually, he thinks an appeal to our professional brethren in this country may be at once conclusive. With respect to Mr. Mercer's seven cases reported at the former meeting of the Society, he only acknowledges one to be variola (case 4), and that there is no evidence of the true vaccine having been previously developed in that case: moreover, as there is no proof that any of the cases had ever been exposed to variolous contagion, in the interval between their alleged vaccination and the appearance of the eruptive disease which formed the subject of report at the last meeting; there is no reason to believe, that those individuals were ever insusceptible of suffering from variolous or varioloid contagion; he contends that we have no reason to believe, if susceptibility to variola be once destroyed by true vaccination, that persons are ever afterwards liable to suffer from variola. Dr. Casanova further says, that before we can acknowledge a renewed susceptibility to variola, in a person who has been once protected, we should ask two questions; 1st, What reason have you for believing that this person has gone through the regular course of true vaccination? 2nd, What reason have you for believing that this person has subsequently to vaccination been exposed to variolous contagion, without contracting small-pox?

In reply to the 3rd question the author states, that either vaccine virus taken from an unhealthy person; or lymph from a perfect pustule used to vaccinate an unhealthy person; may certainly degenerate into an humor *sui generis,* and produce a disease which affords no protection against small-pox. The particular disease stated as likely to influence the character of the vaccine, and to impair its prophylactic properties, are various cutaneous affections, which have been generally acknowledged to be adverse to successful vaccination; and some disordered conditions of the absorbent system, which do not appear to have been before particularly alluded to; but which the author asserts, have an unfavorable influence, in as much as we are protected against variola, only by the vaccine producing a constitutional as well as a local affection, which specific constitutional affection may be frustrated by a disordered condition of the absorbent system. The author also states, that cases have occurred, which render it probable, that the influence of vaccination is altered when several diseases of the mucous membranes occur during its progress, namely, aphthæ, chronic gastro-enteritis, and gonorrhœa. The author having, in concert with Dr. Romay, been engaged in making numerous experiments relative to the vaccine disease, thinks he is authorised to say, that he does not see any reason to acknowledge that vaccine matter is capable of decomposition or change, except from the effects of exposure to air, humidity, or light; and he considers that with due care in its transmission, the specific properties of vaccine remain unaltered.

Mr. Mercer's paper is in continuation of his report read at the former Meeting. He observes that small-pox has been frequent and fatal among both Europeans and Natives; and a large proportion of the mortality has occurred in persons advanced in years, and comparatively few in children. The author alludes to the frequency of rubeola and varicella, as well as of small-pox, this season, and gives a sketch of the distinctive characters of the two latter diseases, according to the best authors, which must be familiar to the profession. Three cases are there detailed, which may be numbered in continuation from those stated in the last month's circular.

Case VIII. A woman of European parents, 26 years of age, had fever on the 28th March; vomiting took place, and the face was flushed. On the 30th an eruption of numerous small pimples appeared; on the 5th April the face was swollen, and the pustules very numerous, and filled with a thick opaque fluid; many of them coalesced: there was slight soreness of the throat, but no salivation, and no fever after the eruption appeared. On the 10th day of the eruption and 12th of the disease, the pustules were drying quickly on the face and some parts of the arms; and on the 19th day of the eruption a second set of crusts fell off. This person had been vaccinated by Mr. Shoolbred when an infant; one vaccine cicatrix is visible, of the size of a garden pea, imperfectly marked with central depressions.

Case IX. An Indo-Briton, 26 years of age, had fever on the 4th April, which increased till the 7th, unattended with vomiting, except when medicine was taken. On the 7th April an eruption of numerous small papulæ appeared, some of which on the 8th contained an opaque fluid, and on the 10th some of them on the hands coalesced; on the 12th desiccation commenced, and on the 14th the scabs began to fall off. This person had been vaccinated at the age of 4 or 5 months by Dr. Hare; there is a small superficial cicatrix on the left arm slightly pitted.

Case X. An European man, 26 years of age, became feverish on the 8th April; the pyrexia increased, and on the 11th, an eruption of small red pimples appeared and the fever subsided. On the 12th there were about 160 small pustules over the body, those on the face containing a yellow fluid. On the 17th April, some of the pustules had dried, and on the 18th most of the scabs had fallen off from the face, but some of the eruptions on the feet then contained a bluish-colored fluid, and were surrounded by a light red circle about ¼ of an inch broad. This person was vaccinated in England when an infant, and has on his left arm an oblong cicatrix ½ an inch in length, the surface of which is pitted. All the cases mentioned in Mr. Mercer's former report recovered.

The author is inclined to think from the cases he has met with, that the opinions of some medical men may be in some degree confirmed, viz. "that no greater security is afforded against a 2nd attack of variolous disease by inoculation of small-pox, than by vaccination; and that after a certain lapse of time, the cow-pox loses its power as a preventive of small-pox;" yet, he says, in the greater number of instances of variola supervening on vaccination, the disease is much modified and of a mild character. The author mentions the experiments of Dr. Wolde, reported in the 109th No. of the Edinburgh Medical and Surgical Journal for 1831. Dr. W. had re-vaccinated 100 persons of various ages in Hanover, of whom 20 are represented to have had a perfect vaccine vesicle. Mr. Mercer's report concludes with a very copious extract from the same Journal, relative to the identity of Variola, and the Vaccine disease. The author of that article, Dr. Sonderland, of Barmen, states that the Vaccine disease may be produced in the cow, by covering the animal with a blanket that has been on the bed of a patient who has suffered severely from small-pox, placing another blanket similarly exposed to the variolous contagion, in the stall, so that the animal shall breathe the exhalation from the infected blanket. In a few days the animal is stated to be seized with fever, and on the 4th or 5th day the udders and other parts covered with a hard skin, are said to be affected with an eruption that assumes the appearance of cow-pox, and becomes filled with lymph, which on being used to inoculate the human subject, will produce the vaccine or protective pock. It is but justice to this very interesting subject to state, that Mr. Mercer has made the experiment of covering two cows with cotton clothes that had been on the persons of small-pox patients, but the animals have neither had fever, variola, nor the vaccine disease. In this country it is of vast importance to have the experiment repeated, to verify the fact, that we may always be able to produce the Vaccine disease when it is most required.

A letter from Mr. Mercer, subsequent to this report, mentions two additional cases of varioloid disease, viz. a man aged 27, and a woman aged 24, both born of European parents. The man is stated to have a well-defined vaccine cicatrix on each arm: the woman also bears an imperfect vaccine cicatrix on each arm, both these patients having been vaccinated in infancy. They have a numerous eruption, which in some places is confluent; but they are going through the disease favorably.

Dr. Baikie's observations on the climate of the Neelgherry Hills; and its effects on the sound, and on the impaired European constitution, are prefaced by an account of the weather at Ootacamund. The extreme annual range of the thermometer in the shade is stated to be between 42° and 73° Fahrenheit, but the diurnal range is rarely so much as 11° or 12°. The annual fall of rain does not exceed 42½ inches, and the Barometer's annual range is not great. The elevation of Ootacamund is stated to be 7,197 feet above the level of the sea, and the highest summit of the Neelgherry range is 8,429, being not very different from that of the convent of the Great St. Bernard, in the Alps, and the city of Quito, on the Andes. The S. W. monsoon sets in about the end of May, and lasts till the end of August. The N. E. monsoon begins late in October, and is usually attended with high wind and rain. The greatest heat is experienced in April and May, when however the mean monthly temperature is from 60 to 63. The atmosphere generally, is stated to be remarkably dry, elastic, and exhilarating; highly favorable to European constitutions; consequently the station is deemed an excellent residence for invalids, from the plains of the Deckan, or from the damp hot climate of Bengal. When invalids can choose the time they will proceed to the Neelgherries, April is considered the best month to arrive there ; as the transition of temperature from that of the plains is then less than at other seasons of the year. On first arrival at that temperate district, some persons experience slight embarrassment of respiration, and occasional dyspeptic symptoms ; which are in some measure ascribed to the elevation of the station ; but principally to a slight degree of congestion of internal organs ; especially the lungs and liver ; arising from the abrupt change of temperature. The climate is stated to be especially favonrable to children, who quickly acquire all that alertness, activity, and rosy complexion, so remarkable in the most healthy parts of Europe.

The author next proceeds to specify in detail the effects of the climate on convalescents, and those who were labouring under the chronic stages of several of the more important diseases of India ; numbers of whom have been sent to that station. In convalescents from dysentery, and those who had long suffered from the most obstinate chronic dysenteric affections ; the best effects were experienced from a residence at Ootacamund : convalescents deriving early and decided benefit from the change ; and many inveterate chronic affections which could not be cured at other stations, were soon restored to health by the aid of medicines. The treatment to which Dr. Baikie, from experience, gives a decided preference, is the combination of Ipecacuanha and Extract of Gentian, sometimes united with Blue Pill, and aided by application of leeches when any acute local symptoms required their use : and *a very careful attention to regulated diet, in small quantity.* By these means, the more distressing symptoms were often mitigated after the second dose of medicine ; and a week's perseverance in the same remedies, generally sufficed to overcome the most obstinate attacks. Dr. B. has nearly abandoned the exclusive use of Calomel, since this plan of treatment was brought to his notice ; he states, that the treatment now followed is more efficacious, more speedy, and more certain than any other ; the patients being less liable to relapses than when the mercurial plan of treatment was trusted to. The author mentions, particularly, an inveterate case of chronic dysentery, in which repeated relapses had occurred ; and almost every article in the materia medica used in such complaints had been employed in vain ; at last, Ipecacuanha and Extract of Gentian were tried, and quickly checked the disease. The patient, who had been long in a most wretched condition, was soon restored to the state of a healthy and robust man. In this case even the Blue Pill proved injurious.

Convalescents from fever derive benefit on arrival at that station almost equal to that experienced by those who have suffered from dysentery. Those persons who were attacked with fever and sufficiently near to be removed to Ootacamund during the progress of the disease, or at its commencement, derived the utmost benefit from the change of climate.

Pulmonary affections, when not so far advanced as to preclude reasonable hope from change to any good climate, find great benefit from residence at this station. And in fact, all cases where debility and exhaustion are the principal affections to be removed : and an uniform elastic, cool, dry, and bracing atmosphere the principal desideratum, the climate of the Neelgherries may be recommended with the utmost confidence.

The diseases which derived comparatively less benefit from the climate of the Neelgherries, are Intermittent Fevers and Hepatic diseases ; in which a favorable change is neither so certainly, nor so generally, to be expected ; unless the patients be in a very advanced stage of convalescence, and in fact, suffering chiefly from debility ; in such cases, and especially after a short sea voyage, these patients recover rapidly : but if they arrive at the hills with much remains of active disease, they become the subjects of tedious medical treatment : the causes of which are clearly shewn to be the internal congestion inseparable from abrupt transition to an elevated and cool climate.

Mercurial Rheumatism, after the treatment of various acute diseases by Calomel, appears to have been a frequent ailment among the convalescents sent to the station at Ootacamund. Dr. Baikie's favorite prescription is Infusion of Sarsaparilla in lime-water, as recommended by Mr. Brodie, according to the following formula.

Sarsaparilla Root, bruised, ℥iiss. Sassafras Root ; Guaiacum Wood, rasped, each ʒii. Liquorice Root ʒi. Recent lime-water, 18 ounces, macerated for 24 hours, near the fire, and then strained. The whole of this infusion to be drank in the course of the day, at three doses.

The Report concludes with a Table, shewing the ailments of 155 convalescents and sick, who had been under treatment at the Neelgherries; viz. Hepatic diseases 49—Dysentery 28—Fever 23—Mercurial Rheumatism 10—Cephalalgia 5—Various other maladies 40. These had been under treatment between the 1st March, and 1st December, and only six cases are reported "*not better;*" these were 1 Dropsy—2 Hepatitis—1 Rheumatism—1 Intermittent Fever, and 1 Cephalalgia. Of the 155 cases, some of whom were in a most lamentable state from protracted Chronic disease, 80 were cured, and 13 died. Among the deaths were six of Hepatic disease.

3.—Agricultural and Horticultural Society.

Meeting of the 3rd *May*, 1832, *at the Townhall.*

Sir Edward Ryan in the Chair.

Mr. John Willis Alexander was admitted a member of the Society.

The following letters and papers were read:

From Mr. Swinton, Chief Secretary to Government, forwarding another and larger sample of the foreign or ship-borne cotton, found by Major Burney at Yandaboo in Ava.

From Mr. Willis, reporting on this sample. The thanks of the Society were voted to Mr. Swinton, and the Secretary was requested to forward to him a copy of Mr. Willis' report.

The Secretary was also requested to have the cotton carefully separated from the seed, and retained as a specimen, while the seed itself should be forwarded to Mr. De Verine to be sown at Akra.

From Mr. Truscott, Officiating Commercial Resident, Culpee, requesting to be supplied with foreign cotton seed for the purpose of introducing its cultivation largely into Bundlecund.

From Dr. Carey, on the native method of manufacturing paper in India, as requested by the last meeting of the Society.

Resolved, that so soon as Baboo Ram Comul Sen furnishes his paper on the same subject, both essays be sent to Government, for the purpose of being transmitted to Bombay.

From Captain Richmond, Secretary to the Garden Committee, on the cultivation of the *Asparagus officinalis* at Alipore.

The thanks of the meeting were offered to Captain Richmond.

From Mr. Calder, presenting to the Society an extensive collection of samples of Mauritius sugar, collected by him while lately at that place, with accurate notes of the estates where the sugar was produced, degree of refining, mode of effecting it; and the market price of each, extending to 35 samples, in glass and tin.

The thanks of the meeting were offered to Mr. Calder for his valuable donation.

From Mr. Henly, presenting four samples of sugar manufactured by him at Barripore.

The thanks of the meeting were offered to Mr. Henly.

The President, in the name of Colonel Bazetta, presented a packet of fresh Manilla Tobacco seed, the first which had been received by the Society.

The thanks of the meeting were voted to Colonel Bazetta, for this valuable present, and the packet was directed to be forwarded to Akra Farm, for the purpose of immediate experiment, and also of retaining a portion in well secured bottles, till a more favorable season for sowing it.

Mr. Ballard submitted on the part of Mr. D. W. H. Speed, a paper by that gentleman on the culture of silkworms, manufacture of silk, and expense incurred therein, with the view of pointing out the inferiority and dearness of the article at present, arising from the grower of the mulberry, rearer of the cocoons, and reeling of the silk, being wholly distinct and independant individuals. And presenting to the Society, four skeins or hanks of silk produced in his experimental factory, where the whole process, from the growing of the mulberry to the reeling of the silk, was performed by himself.

The thanks of the meeting were voted to Mr. Speed.

Messrs Willis and Earl presented selected samples of all cottons in the Liverpool market in December, 1831, with the prices of each correctly labelled thereon, for reference by the Society.

The thanks of the meeting were offered to Messrs. Willis and Earl for this very valuable present.

Mr. De Verine, superintendant of the Society's Experimental Farm, at Akra, submitted various papers relative thereto ; including a tabular statement of the cotton cultivation there from its commencement to the present period, on which to ground assurances of the best season for sowing, of the most suitable seed, soil, and mode of cultivation, with an account of the expense of raising three biggahs of Maranta Arundinacea, (or West India Arrow-root,) and manufacturing the same into farina ; and also some observations on the storms of 31st October, and 26th March last.

Mr. De Verine also submitted several specimens of tobacco, cotton, and arrow-root, all reared at the Farm. Mr. Piddington submitted the form of a circular, which he thought if translated into the native languages would remove prejudices, and encourage the ryots to undertake the cultivation of seeds distributed by the Society.

Resolved, that Mr. Piddington be authorized to get his circular translated, and printed on common paper, for distribution.

The Secretary informed the meeting, that he had received only four parcels of silk, with corresponding sealed letters, as competing for the prizes of the Society ; and that he had received no samples of sugar and cotton, nor any letters announcing their being on the way.

Resolved, that as the reception of samples of silk, cotton, and sugar was limited to 1st May last, no more samples of silk be now received ; and that the competition for the cotton and sugar prizes lie postponed to the season of 1833, it being understood that the prizes for silk and tobacco will be adjudged on the 1st June next, as originally intended.

On the Burmese cotton, received by Mr. Swinton from Major Burney, Mr. Willis reports that he considers it of the same description as that received under Major Burney's previous dispatch, and considered by the Burmese as of foreign origin, with this difference that one-half of the seed when divested of the cotton is quite bald, having a smooth black, or rather brownish coloured skin, while the other half is furred all over with a green fur, very tenaciously adhering. This diversity and peculiarity in the seed, Mr. Willis considers worthy of remark, as it is not to be found in any of the North American kinds, nor in those of Pernambuco, Bourbon, the Seychelles, Tenasserim, or lower Bengal. The cotton is however separated from the seed, both from the bald and furred parts of it, with great and almost equal facility. The fibre is long, fine, and good in strength, and exceedingly suitable for the machine spinner.

Founding his estimate of its English value by the current prices of such sort of cotton in Liverpool in the month of December, 1831, Mr. Willis states this cotton would be worth in England from seven to eight *d.* per lb., at which rate a wide field would appear open to remunerate the cultivator, the merchant, and the ship's owner, if this description of cotton be found capable of having a successful cultivation in this country.

Meteorological Register kept at the Surveyor General's Office, Calcutta, for the Month of May, 1832.

Days of the Month.	Minimum Temperature observed at sunrise.					Maximum Pressure observed at 9h. 50m.					Max. Temp. and Dryness observed at 2h. 40m.					Minimum Pressure observed at 4h. 0m.					Observations made at sunset.					Observations at 10½ P. M. in Calcutta.					Rain Gauge, No. 1.	Rain Gauge, No. 2.
	Barometer reduced to 32°.	Temper. of the air.	Depres. of M.B.Ther.	Wind.	Aspect of the sky.	Barom. red. to 32°.	Temper. of the air.	Depres. of M.B.Ther.	Wind.	Aspect of the sky.	Barom. red. to 32°.	Temper. of the air.	Depres. of M.B.Ther.	Wind.	Aspect of the sky.	Barom. red. to 32°.	Temper. of the air.	Depres. of M.B.Ther.	Wind.	Aspect of the sky.	Barom. red. to 32°.	Temper. of the air.	Depres. of M.B.Ther.	Wind.	Aspect of the sky.	Barom. red. to 32°.	Temper. of the air.	Depres. of M.B.Ther.	Wind.	Aspect of the sky.		
1	29,688	78,7	1,2	cm.	ci.	,744	87,	6,5	s. e.	cu.	,646	93,	12,1	s.	cu.	,616	89,3	9,8	s.	cu.	,621	85,3	8,3	e.	cl.	,710	78,7	5,9	s.	cl.		
2	,696	78,3	1,8	s.	cl.	,739	86,3	7,1	s.	do.	,689	91,7	12,2	do.	do.	,676	90,	10,8	do.	do.	,703	85,7	8,2	s.	do.	,732	81,5	3,5	s.	str.		
3	,742	79,	2,3	s.	do.	,799	88,7	9,	s.	cl.	,717	90,7	14,5	do.	cl.	,694	89,5	12,	do.	cl.	,711	84,5	6,6	do.	do.	,749	81,8	3,6	s.	cl.		
4	,702	79,3	2,4	s.	do.	,735	89,	9,5	s.	cu.	,603	91,	12,5	do.	cu.	,570	88,3	9,6	do.	cis.	,565	79,5	9,8	do.	cu.	,697	76,8	4,2	s.	cl.		
5	,621	78,	2,1	s. e.	do.	,662	88,3	8,8	s.	do.	,568	90,	9,8	do.	do.	,571	87,3	8,1	do.	cu.	,587	86,5	7,	do.	do.	,668	83,7	5,7	s.	cl.		
6	,641	81,	3,3	s. e.	cu.	,678	88,7	7,8	s.	do.	,578	90,7	11,	s. e.	do.	,560	89,	8,8	s. e.	do.	,599	85,5	6,3	s. e.	cus.	,697	83,3	4,5	s.	cus.		
7	,668	81,3	3,4	s. e.	do.	,687	86,7	8,	s.	do.	,618	90,3	9,8	s.	do.	,587	89,	8,1	s.	do.	,626	86,5	7,8	do.	cu.	,692	81,8	3,0	s.	cl.		
8	,676	80,3	2,3	s.	do.	,723	89,3	9,6	s. w.	cl.	,664	92,7	12,7	do.	do.	,640	91,5	11,	do.	do.	,656	85,6	8,7	s.	ci.	,739	82,	3,8	s.	cl.		
9	,712	79,	1,8	s.	do.	,789	88,5	8,5	s.	cu.	,710	95,	14,8	do	do.	,698	94,	13,8	do.	cl.	,708	86,5	8,3	do.	do.	,756	81,7	3,7	s.	cl.		
10	,742	78,5	1,3	cm.	cl.	,781	89,5	7,6	s.	do.	,688	95,5	15,5	do.	do.	,681	93,7	12,2	s. e.	cu.	,697	87,5	7,8	s. e.	cu.	,738	83,2	5,0	s.	cl.		
11	,679	80,3	2,3	cm.	cu.	,719	90,5	11,3	s.	do.	,569	94,5	16,	s. e.	do.	,551	91,5	12,	s. w.	cis.	,561	86,7	8,2	do.	cis.	,637	79,5	4,8	e.	rn.		
12	,626	71,	2,3	w.	rn.	,643	74,	4,3	w.	cus.	,566	88,	12,8	w.	cl.	,541	87,	12,1	w.	cl.	,542	83,3	7,8	cm.	cl.	,613	78,8	3,2	s.	cl.	1,35	1,04
13	,637	80,3	1,6	s.	cu.	,675	87,	6,3	s.	cu.	,605	93,5	10,3	s.	cu.	,594	92,	9,5	s.	cu.	,605	87,5	5,8	s. e.	cis.	,667	83,2	3,3	s.	str.		
14	,656	79,5	1,3	s.	do.	,737	88,5	6,3	s. e.	do.	,658	96,	12,	do.	do.	,654	91,3	9,8	do.	do.	,675	87,5	7,	s.	cu.	,775	84,	3,8	s.	n.		
15	,740	80,5	1,8	cm.	cl.	,807	88,5	7,3	n. e.	do.	,670	98,3	15,4	e.	do.	,644	96,	14,5	e.	do.	,674	89,	7,3	do.	cis.	,756	78,8	5,6	s.	rn.	0,80	0,62
16	,764	72,5	1,8	s. e.	ci.	,802	86,3	10,2	s.	ci.	,706	97,5	18,5	n. w.	cl.	,680	96,	16,8	s.	cl.	,673	88,7	10,5	do.	cl.	,722	81,9	3,7	cm.	cl.		
17	,730	79,5	2,	cm.	cu.	,747	92,3	15,8	s. w.	cl.	,665	99,3	20,6	s.	do.	,635	98,	18,8	do.	do.	,662	89,3	11,6	do.	cis.	,703	83,8	2,8	s.	cl.		
18	,688	79,3	2,1	cm.	do.	,739	90,	8,8	s. w.	do.	,665	97,	14,8	do.	do.	,647	96,5	15,5	do.	do.	,675	88,5	7,3	do.	do.	,751	83,6	3,1	s.	cl.		
19	,725	80,7	3,	cm.	ci.	,770	89,3	7,8	s.	cu.	,687	95,3	12,	do.	cu.	,667	95,	12,1	do.	do.	,674	88,3	6,8	do.	do.	,734	78,2	6,4	n.w.	rn.		
20	,723	81,5	1,8	s. w.	cu.	,767	93,5	8,8	s. w.	do.	,682	86,7	7,5	do.	n.	,669	85,3	8,8	do.	cis.	,692	81,5	4,3	do.	cl.	,706	80,7	3,9	s.	cl.	1,10	10,5
21	,694	79,5	1,3	cm.	cl.	,731	91,7	9,	s. w.	cl.	,641	01,5	21,8	do.	cl.	,524	100,3	27,1	do.	cl.	,629	91,	15,8	do.	do.	,675	84,	2,5	s.	cl.		
22	,655	80,5	2,6	s. e.	do.	,707	91,5	8,3	s. w.	cu.	,602	98,3	15,6	do.	do.	,585	97,7	16,2	do.	do.	,588	89,5	7,	do.	ci.	,646	84,3	3,1	cm.	cl.		
23	,634	81,5	2,8	s.	do.	,675	93,	10,3	s. w.	cl.	,605	97,	14,	s. w.	do.	,595	96,	11,3	s. w.	do.	,623	87,5	5,3	do.	cl.	,706	84,	4,0	w.	cus.		
24	,642	82,5	2,8	s.	cu.	,685	91,3	9,6	s. w.	cu.	,605	95,3	12,6	n. e.	do.	,587	93,	12,3	n. e.	cis.	,629	83,	7,8	n. e.	cis.	,684	81,	6,3	e.	cu.		
25	,647	77,5	2,6	s.	cl.	,712	91,5	8,6	s. e.	do.	,622	99,	16,5	s. e.	cis.	,628	78,3	2,6	s.	rn.	,644	80,	6,8	s. w.	do.	,706	78,8	4,5	s.	cl.		
26	,682	78,	1,8	s. e.	do.	,721	92,	8,8	s. e.	cl.	,648	103,	22,3	do.	cu.	,629	101,7	22,5	s. e.	cu.	,667	87,	9,8	s. e.	cu.	,740	84,5	3,1	s.	cl.	0,20	0,15
27	,678	79,5	1,8	s. e.	do.	,725	90,	10,3	s. e.	do.	,630	105,	22,8	s.	cl.	,584	102,1	22,3	cm.	cl.	,594	95,	14,3	cm.	cl.	,674	85,	2,7	s.	cl.		
28	,635	81,5	2,	s.	do.	,685	95,	14,6	s.	do.	,585	106,8	32,8	w.	do.	,569	106,	22,8	w.	do.	,559	94,5	17,8	do.	do.	,631	86,2	3,0	s.	cl.		
29	,576	81,	2,	s. w.	do.	,625	95,	15,	s. w.	do.	,526	109,3	32,6	n.	do.	,503	108,8	32,6	n. w.	do.	,481	94,	15,3	do.	do.	,589	86,8	3,6	s.	cl		
30	,546	82,	1,8	s.	do.	,582	97,3	16,6	s.	do.	,510	110,7	34,8	w.	cu.	,477	109,5	34,	do.	cu.	,464	96,	14,1	n. w.	cu.	,583	86,5	3,1	s.	cl.		
31	,548	82,	2,8	s. w.	do.	,593	97,3	17,8	s. w.	do.	,483	110,5	34,	do.	cl.	,466	110,3	33,8	w.	cl.	,442	94,	10,3	s. w.	cl.	,599	85,4	3,2	s.	ci.		
Mean,	29,664	79,5	2,1			,716	89,9	9,6			,626	96,9	16,9			,604	94,6	15,2			,620	87,6	9,			,692	82,3	3,9			3,45	2,88

Abbreviations. In the column "wind," small letters have been used instead of capitals; *cm.* means *calm.* In the column "aspect of the sky," *cy.* is *cloudy; cl. clear; rn. rain, ci. cirrus ; cu. cumulus ; cs. cirro-stratus ; cus. cumulo-stratus ; cc. cirro-cumulus ; n. nimbus;*

JOURNAL

OF

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I.—*Analysis of the Puránas.* *By* H. H. Wilson, *Sec. As. Soc.*

[Read at the Meetings of the Society.]

2. THE BRAHMÁ VAIVERTTA PURÁNA.

The *Brahmá Vaivertta Purána* is perhaps the most decidedly sectarian work of the whole collection, and has no other object than to recommend faith in KRISHNA and RÁDHÁ: subservient to this purpose, it records a great variety of legends, of which no traces can be found, in any of the other *Puránas*, and it deals but sparingly in those which are common to all. It is of little value as a collateral authority, therefore, and most of the stories, it contains, are too insipid and absurd to deserve investigation. It contains, however, a few remarkable passages, that bear an ancient character, and it throws more light than any similar work upon the worship of the female principle or *Prakriti*, as well as of KRISHNA and RÁDHÁ.

The *Brahma Vaivertta* is supposed to be communicated by SAUTI, the son of SU'TA, the original narrator of the *Puránas*, to SAUNAKA, a sage, at an assembly of similar characters, at the forest of *Naimisha*, whom he happens to visit, and who ask him to relate the work. This commencement opens several of the *Puránas*, and more especially the *Máhátmyas* or chapters, descriptive of the virtues of some place or person, said to be taken from some *Purána*. In this case, the *Rishis* state, as the motive of their inquiry, their dread of the evil tendency of the present age, and their desire for emancipation; and their hope to be secured in the one, and defended from the other, by being imbued with *Bhakti*, or faith in HARI, through the medium of the *Purána*, which they style the essence of the *Puránas*, the source of faith, felicity, and final liberation, and the dissipator of the errors of the *Puránas*, and the *Upapuránas*, and even of the *Vedas!*

Sauti acquired his knowledge of this work from Vyása, by whom it was arranged in its present form, to the extent of eighteen thousand *Slokas*. Vyása received the *Sutra*, the thread or outline of it, from Náreda, who had learnt it from Náráyana *Rishi*, the son of D'herma, to whom it had been communicated by his father. D'herma had been made acquainted with it by Brahmá, who had been taught it by Krishna himself, in his peculiar and deathless sphere, the celestial *Goloka*:—a paradise, it may be observed, of which no trace occurs in any other *Purána*. The *Brahma Vaivertta* is so named, because it records the manifestations of the Supreme Being in worldly forms, by the interposition of Krishna, who is himself the Supreme Spirit, the *Parabrahma* or *Paramátmá*, from whom *Prakriti*, Brahmá, Vishnu, S'iva, and the rest proceeded.

The *Brahma Vaivertta Purána* is divided into four books or *K'handas*, the *Brahmá K'handa*, the *Prakriti K'handa*, the *Ganes'a K'handa*, and the *Krishna Janma K'handa*, treating separately of the nature and acts of the supreme; of the female personification of matter; of the birth and adventures of *Ganes'a*; and of the birth and actions of *Krishna*. We shall notice the principal subjects of each division.

The *Brahma K'handa* begins with the creation of the universe, as taking place after an interval of universal destruction. The world is described as waste and void, but the Supreme Krishna, the sole existent and eternal Being, is supposed to be present, in the centre of a luminous sphere of immeasurable extent, and inconceivable splendor. From him the three qualities, crude matter, individuality, and the elements proceed; also Náráyana or the four-armed Vishnu, in his ordinary garb and decorations, and Sankara, smeared with ashes, and armed with a trident. Náráyana or Vishnu comes from the right, and Siva from the left side of the primeval Krishna, and Brahmá springs from his navel: all the gods and goddesses in like manner proceed from his person, and each upon his or her birth utters a short prayer or hymn in honour of him: the following are the salutations of the three principal persons of the *Hindu* pantheon.

Náráyana's *address to* Krishna.

"I pay reverence to the cause of causes, to him who is at once the act and the object, the superior boon, the giver and meriter, and source of blessings; who is religious austerity, and its everlasting fruit, and himself the eternal ascetic; who is beautiful, black as a new cloud; delighted in his own spirit; who is void of desire, who assumes forms at will, who annihilates the five desires, and who is the cause of desire; who is all things, the lord of all things, and the unsurpassed form, which is the seed of all things; who is embodied in the *Vedas*, who is the seed of them, the fruit of the *Vedas*, and its bestower; who is learned in the *Vedas*, the ritual they enjoin, and the best of all who are conversant with their doctrines."

SIVA's *address.*

"I adore him, the invincible, the giver, the lord and cause of victory, the best of the bestowers of victory, and victory itself; who is the lord and cause of all things, lord of the lord of all things, and cause of the cause of all things; who is present in all, who upholds all, who destroys all, generates all, who is the cause of the preservation of all, who is all things; who is the fruit, the giver of the fruit, its seed, and its support; who is identical with light, the irradiator of all, and supreme of all those who shine with divine radiance."

BRAHMÁ's *address.*

"I adore KRISHNA, who is free from the three qualities, the one imperishable GOVINDA, who is invisible and void of form, who is visible and assumed the shape of a cowherd, who seems a youth in years, who is of mild deportment, the beloved of the *Gopis*, of lovely aspect, black as a new cloud, and beautiful as a myriad of KANDERPAS. Inhabiting the place of the *Rása* in his sojourn in the groves of *Vrindávan*, the lord of the mystic dance, and its performer, and the delighter in the graces of its evolutions."

The other divinities continue in the same strain, and the tendency of the hymns furnishes a key to the whole work, the object of which is to identify the cowherd of *Vrindavan*, with the supreme cause of the world, or to claim for KRISHNA a rank which the followers of VISHNU and SIVA demand, exclusively, for the object of their respective adoration: with much more reason it must be confessed; for the actions of KRISHNA are even still more preposterously incompatible with a divine character than those of his competitors for pre-eminence.

After the several deities are produced from various parts of KRISHNA's person, he retires into the *Rásamandala*, a chamber or stage for the performance of a kind of dance, to which the followers of this divinity attach much importance, although it seems to be no more than a kind of dramatic representation of KRISHNA's dancing and sporting with the *Gopis*. There, RÁDHÁ, his favourite mistress, proceeds from his heart; from the pores of her skin spring three hundred millions of *Gopis*, or nymphs of *Vrindávan*; and an equal number of *Gopas*, the swains of the preceding, originate from the pores of Krishna's skin ; the herds they are to attend owe their existence to the same inexhaustible source. The *Rása* and Rádhá, and the origin of the kine, and their keepers, male or female, are amongst the chief characteristic peculiarities of the *Brahma Vaivertta Purána.*

After Krishna's thus evolving the different orders of subordinate deities, the work proceeds to describe the devotion of Siva towards his creator, and takes this opportunity of expatiating upon the different degrees of *Bhakti*, or faith, and the various kinds of *Mukti*, or salvation.

The work of creation is then resumed by Brahmá, who begets by his wife Sávitri', a various and odd progeny, as, the science of logic, the modes of music, days, years, and ages, religious rites, diseases, time, and death. He has also an independent offspring of his own, or Viswakermá, from his navel; the sage Sánanda, and his three brothers, from his heart ; the eleven *Ru'dras* from his forehead, and sundry sages from his ears, mouth, &c.

The legends that follow relating to the daughters of Dharma, and their marriages with various patriarchs, from whom terrestrial objects proceeded, are told in the usual strain. In describing the origin of the mixed classes of mankind, this work contains a peculiar legend, which makes a certain number of them, the issue of the divine architect Viswakermá by Ghritáchi', a nymph of heaven. The chapter often occurs as a separate treatise under the title of *Játi Nirnaya*, and is considered as an authority of some weight, with respect to the descent of the mixed tribes, although of a purely legendary character.

The succeeding sections contain some legends of little importance, until the 16th, which is occupied with a short, but curious list of medical writers and writings. The first work on medical science entitled the *A'yur Veda* was, like the other *Vedas*, the work of Brahmá, but he gave it to *Súrya*, the sun, who, like the *Phœbus* of the Greeks, is the fountain of medical knowledge amongst the *Hindus.* He had sixteen scholars, to each of whom a *Sanhitá* or compendium is ascribed : none of the works attributed to them are now to be procured.

The chapters that next follow, relate a legendary story of the wife of a *Gandherva* named Málavatí', the efficacy of various *Mantras*, the story of Náreda, the sage, and rules for the performance of daily purificatory and religious rites. The 28th and 29th chapters, the last of the book, are occupied with the description of Krishna, of his peculiar heaven or *Goloka*, of the holy *Rishi* NÁRÁYANA, and of his residence. The style and purport of the whole are peculiar to this *Purána*, and similar to the address of the deities, cited above. *Goloka* is said to be situated 500 millions of *Yojanas* above the *Lokas* of SIVA and VISHNU. It is a sphere of light, tenanted by *Gopas*, *Gopis*, and cows; the only human persons admissible to its delights are pure *Vaishnavas*, the faithful votaries of KRISHNA. It appears, however, that the author of this *Purána*, who in all probability is the inventor of *Goloka*, had no very precise notions of his own work, as he calls it in one place square, and in another round; and whilst he is content in one passage to give it the moderate diameter of 30 millions of *Yojanas*, he extends its circumference in another to a thousand millions.

The next section of this *Purána*, is also of a peculiar character. It relates to *Prakriti*, the passive agent in creation, personified matter, or the goddess nature. The *Puránas*, in general, follow in regard to their cosmogony the *Sánkhya* school of philosophy, in which *Prakriti* is thus described: *Prakriti* or *Múla Prakriti* is the root or plastic origin of all, termed *Pradhána*, the chief one, the universal material cause. It is eternal matter, undiscrete, undistinguishable as destitute of parts, inferrible from its effects, being productive, but no production.

According to the same system, the soul is termed *Purush* or *Pumán*, which means man or male; but the *Sánkhya* doctrine is twofold, one atheistical, the other theistical. The former defines the soul to be neither produced nor productive, not operating upon matter, but independent and co-existent; the latter identifies soul with *Iswara*, or God, who is infinite and eternal, and who rules over the world: and it is to this latter system, that the *Puránas* appertain, only in this *Iswara* they recognise the peculiar object of their devotion, whichever of the *Hindú* triad that may be, or even as in the work before us, superadding a fourth in KRISHNA, who is every where else regarded but as a manifestation of VISHNU, and in a remarkable passage of the *Mahábhárat* is said to be no more than an *Avatár* of a hair plucked from the head of that divinity.

In the true spirit of mythology, which is fully as much poetical as religious, the figure of prosopopeia is carried by the Hindus to its utmost verge; and we need not wonder therefore to find spirit and matter converted by the *Pauránic* bards into male and female personifications, with the attributes adapted to either sex, or derived from the original source of either representation. *Prakriti* is consequently held to be not only the productive agent in the creation of the world, but she is regarded as *Máyá*, the goddess of delusion, the suggester of that mistaken estimate of human existence, which is referable to the gross perceptions of our elementary construction. With this character the *Pauránics* have combined another, and confounding the instrument with the action, matter with the impulse by which it was animated, they have chosen to consider *Prakriti* also as the embodied manifestation of the divine will, as the act of creation, or the inherent power of creating, co-existing with the supreme. This seems to be the ruling idea in the *Brahma Vaivertta*, in which the meaning of the word *Prakriti*, and the origin of this agent in creation, are thus explained :—

"The prefix *Pra* means pre-eminent, *Kriti* means creating; that goddess who was pre-eminent in creation, is termed *Prakriti:* again, *Pra* means best, or is equivalent to the term *Satwa*, the quality of purity, *Kri* implies middling, the quality of passion, and *Ti* means worse or that of ignorance. She who is invested with all power is identifiable with the three properties, and is the principal in creation, and is therefore termed *Prakriti. Pra* also signifies first or foremost, and *Kriti* creation; she who was the beginning of creation, is called *Prakriti.*"

"The supreme spirit in the act of creation became by *Yoga* twofold, the right side was male, the left was *Prakriti.* She is of one form with *Brahme.* She is *Máyá*, eternal and imperishable. Such as the spirit, such is the inherent energy (the *Sákti*), as the faculty of burning is inherent in fire."

The idea of personifying the divine agency, being once conceived, was extended by an obvious analogy to similar cases, and the persons of the *Hindú* triad, being equally susceptible of active energies, their energies were embodied as their respective *Prakritis, Saktis,* or goddesses. From them the like accompaniment was conferred upon the whole pantheon, and finally upon man; women being regarded as portions of the primeval *Prakriti.* The whole being evidently a clumsy attempt to graft the distinction of the sexes as prevailing in earth, hell, and heaven, upon a metaphysical theory of the origin of the universe.

The primeval *Prakriti,* according to our authority, which now becomes wholly mythological, resolved herself, by command of Krishna, into five primitive portions. These were Durgá, the *Sakti* of Mahádeva; Lakshmi, the *Sakti* of Vishnu; Saraswatí the goddess of language; Sávitri, the mother of the *Vedas,* and Rádhá, the favourite of Krishna.

In the same manner as the primary creator of the world multiplies his appearances, and without losing any of his individual substance, occupies by various emanations from it different frames, so the radical *Prakriti* exists in different shapes, and in various proportions, distinguished as *Ansas*, portions, *Kalás*, divisions, and *Kalánsas* and *Ansánsas*, or subdivisions, or portions of portions. Thus *Gangá*, *Tulasi*, *Manasá*, *Shasht'hí*, and *Kálí*, are *Ansarúpas*, or forms having a portion of the original *Prakriti ; Swáhá*, *Swadhá*, *Dakshiná*, *Swasti*, a host of virtues and vices, excellences and defects, and all the wives of the inferior deities are *Kalárúpas*, forms constituted of a minor division of *Prakriti ;* whilst all the female race are animated by her minuter portions, or subdivisions, and they are virtuous or vicious, according as the quality of goodness, passion, or ignorance, derived from their great original, predominates, in the portion of which they are respectively constituted. Women who go astray, therefore, have by this system, a better excuse than the stars.

The compiler of this *Purána* is very little scrupulous as to the consistency of his narrative, and assigns to the principal goddesses other origins than that which he gives in the beginning of the *Brahmá K'handa*, or in the first chapter of this section. Thus Saraswati', who came out from the mouth of Krishna in the former, and in the latter, is said to be one of the five subdivisions of *Prakriti*, is now described as proceeding from the tongue of Rádhá ; and Lakhsmi', who in one place is also a portion of *Prakriti*, and in another issues from the mind of Krishna, is described in this part of the work, as one of two goddesses, into which the first Saraswati' was divided ; the two being Saraswati' proper, and Kamalá or Lakshmi'. These incoherencies are quite characterstic of this *Purána*, which from first to last is full of contradictory repetitions, as if the writer was determined to make a large book out of a few ideas, the precise nature of which he forgot as fast as he committed them to paper.

After this account of the origin of the principal female forms, the third chapter contains a more particular description of the sphere of Krishna or *Goloka*. It then repeats an account of the creation of the world, through the agency of Brahmá ; and the following chapters of the section, are devoted to legendary stories of the principal *Prakritis*, or Saraswati', Gangá, Tulasi, Sávitri, Lakshmi, Swáhá, Swadhá, Dakshiná, Shasht'hi', Mangalá, Chandi', Manasá, Surabhi, Rádhiká and Durgá. In the course of these narratives various others are introduced, illustrative of the characters of gods, saints, heroes, and heroines, all tending to show the fervour with which they worshipped Krishna. Accounts of *Goloka*, a description of hell, and an explanation of the chronological system of the *Puránas*, are interwoven; besides other subjects of a peculiar and legendary nature, conveying little information or amusement.

The third section of the *Brahma Vaivertta Purána* is the *Ganes'a K'handa*, giving an account of the birth and actions of that deity, in a series of legends, which are not of frequent occurrence, and are in a great degree, if not altogether, peculiar to the work.

Párvati after her marriage with Siva, being without a child, and being desirous to obtain one, is desired by her husband to perform the *Punyaka Vrata.* This is the worship of Vishnu, to be begun on the thirteenth day of the bright fortnight of *Mágha*, and continued for a year, on every day of which, flowers, fruits, cates, vessels, gems, gold, &c. are to be presented, and a thousand *Bráhmans* fed, and the performer of the rite is to observe most carefully a life of outward and inward purity, and to fix his mind on Hari or Vishnu. Párvati having with the aid of Sanatkumára, as directing priest, accomplished the ceremony on the banks of the Ganges, returns after some interval, in which she sees Krishna, first as a body of light, and afterwards as an old *Bráhmana*, come to her dwelling. The reward of her religious zeal being delayed, she is plunged in grief, when a viewless voice tells her to go to her apartment where she will find a son, who is the lord of *Goloka*, or Krishna, that deity having assumed the semblance of her son, in recompence of her devotions.

In compliment to this occasion, all the gods came to congratulate Siva and Párvati, and were severally admitted to see the infant: amidst the splendid cohort was Sani, the planet Saturn; who although anxious to pay his homage to the child, kept his eyes stedfastly fixed on the ground. Párvati asking him the cause of this, he told her, that being immersed in meditation upon Vishnu, he had disregarded the caresses of his wife, and in resentment of his neglect, she had denounced upon him the curse that whomever he gazed upon he should destroy: to obviate the evil consequences of this imprecation he avoided looking any one in the face. Párvati having heard his story paid no regard to it, but considering, that what must be, must be, gave him permission to look at her son. Sani calling Dherma to witness his having leave, took a peep at Gane'sa, on which the child's head was severed from the body, and flew away to the heaven of Krishna, where it reunited with the substance of him, of whom it was part. Durga' taking the headless trunk in her arms, cast herself, weeping on the ground, and the gods thought it decent to imitate her example, all except Vishnu, who mounted *Garura*, and flew off to the river *Pushpabhadra'*, where finding an elephant asleep he took off his head, and flying back with it, clapped it on the body of Gane'sa; hence the body of that deity is crowned with its present uncouth capital. On the restoration of Gane'sa to life, valuable gifts were made to the gods and *bra'hmans*, by the parents, and by Párvati's father, the personified *Himálaya.* The unfortunate Sani was again anathematised, and in consequence of the curse of Párvati, has limped ever since.

These legends and others of minor importance, with the various prayers and addresses of the deities, occupy the first 13 chapters. The next five give an account of the birth of Kartikeya. In the 19th and 21st chapters the reason why Gane'sa's head was lopped off is given. Sivá offended with Aditya, the sun, slew him, and although he restored him to life, incurred the wrath of the sage Ka'syapa, who doomed his (Siva's) son to lose his head. The elephant was Indra's elephant, and was decapitated because Indra threw over his neck the garland of flowers, which the sage Durvásas gave him, and the disrespect of which, with the consequent degradation of Indra, is noticed in various *Purúnas*, although in all other respects with different results. Indra was no loser of an elephant by his decapitation, as Vishnu, moved by the prayers of his mate, gave him another head in place of that which he took away. The humiliation of Indra, and his recovery of Lakshmi' or glory, are the subjects of the next five chapters, and the remaining half of this section is occupied with the story of Gane'sa's losing one of his tusks. It was broken off by Parasuráma, and the occurrence therefore involves his history, and that of his ancestor Bhrigu, the possession of the all-bestowing cow by Jámadagni, the attempt t carry her off by the king Kártavirya'rjuna; the conflict that ensued, and the death of the sage; Parasuráma's avenging his father's loss, by slaying Kártaviryárjuna; his combats with the kings, who came to the aid of that prince; and the destruction of the military race.

After this last exploit, Parasuráma, who was a favourite disciple of Siva, went to *Kaila'sa* to visit his master; on arriving at the inner apartments, his entrance was opposed by Gane'sa, as his father was asleep. Parasuráma nevertheless urged his way, and after a long and absurd dialogue, in which devotion to Krishna is most abruptly and diffusely introduced, the parties came to blows. Gane'sa had at first the advantage, seizing Parasura'ma in his trunk, and giving him a twirl that left him sick and senseless ; on recovering, RÁMA threw his axe at GANE'SA, who recognizing it as his father's weapon (SIVA having given it to PARASURÁMA), received it with all humility upon one of his tusks, which it immediately severed, and hence GANE'SA has but one tusk, and is known by the names *Ekadanta* and *Ekadantashtra*, (the single-tusked.) PÁRVATI was highly incensed with PARASURÁMA, and was about to curse him, when KRISHNA, of whom he was the worshipper, appeared as a boy and appeased her indignation. This part of the work ends with a recapitulation of the names of GANE'SA, his quarrel with TULASI, in consequence of an imprecation from whom it was, that he lost one of his tusks ; PARASURÁMA's adoration of him, and retiring to lead an ascetic life.

The last section, the *Krishna Janma K'handa*, is very voluminous, containing 132 chapters. It gives an account of KRISHNÁ's birth and adventures, as narrated by NÁRÁYANA to NARE'DA.

The narrative is introduced by a panegyric of the individual, who is a real *Vaishnava*, or thoroughly devoted to KRISHNA : and who consequently becomes endowed with all knowledge and virtue, acquires superhuman faculties on earth, is elevated to the region of KRISHNA after death, and liberates himself, and seven generations above and below him, from the penalty of regeneration. All crimes avoid him, or are consumed in his purity, like moths in a lamp ; and any one meeting him on the road, is thereby cleansed of the sins he may have contracted for seven preceding lives ; no course of religious practices, or devout penances is necessary to the attainment of such miraculous excellence, and the love of HARI or KRISHNA is the only condition required. He who has received the initiatory *mantra*, who repeats the name of that divinity constantly, who transfers to him every worldly desire and possession, whose thoughts ever dwell upon him in prosperity or distress, and the hair of whose body stands erect with rapture on his simply hearing any of the appellations of KRISHNA articulated, has fulfilled every obligation, and merits the designation of a *Vaishnava*.

According to this *Purána*, and this only, the original cause of KRISHNA's incarnation, was his love of RÁDHÁ. The RÁDHÁ of the *Goloka* had been compelled to assume a mortal body, by the imprecation of a *Gopa* of that region, KRIDAMA, the minister of his master's pleasures, and the object of RÁDHÁ's anger. Him she condemned in a fit of jealous indignation to become the *Asura* SANKHÁCHU'RA, and he in retaliation sentenced her to become a nymph of *Vrindávan*. To console her in this condition KRISHNA also came down to this world, as her lover; at the same time, however, granting the prayers of Brahmá and the gods, who solicited his appearance to relieve the earth from the burthen of the iniquities under which she laboured, the legitimate purpose of every descent or *Avatára.* In order to provide Krishna and Rádhá with suitable associates, all the gods and goddesses also assumed their respective characters as *Gopas* and *Gopis*, or members of the family of Yadu, and the heroes of the *Mahábhárat.* Vasudeva, the father of Krishna, was an incarnation of Kasyapa, and De'vaki, his mother, of Aditi. Nanda was an incarnation of one of the *Vasus*, and Yasodá of his spouse Dhará. Durgá was incarnate as the daughter of the bear Jámbaván. Jambavaiti one of Krishna's brides, and Lakshmi', multiplied herself into the sixteen thousand princesses, whom Krishna enumerated amongst his wives.

The story of Vasudeva and De'vaki, and the birth of Krishna are narrated in the usual manner, which gives occasion to directions for the celebration of the *Janmáshthami*, or festival in commemoration of the birth-day of Krishna on the 8th lunation of the month *Srávan*, and the *Purána* authorises its observance agreeably to the practice of the *Sáktas*, which allows it to be independent of the moon's entering into the asterism *Rohini*, although should the position of the moon and the lunation occur together, the festival is the more holy, and is termed *Jayantí* or triumphant. The festival is on no account to commence on that day, in which a part of the 7th lunation may occur. The variety of doctrine and observance on this head is explained in the Asiatic Researches (vol. xvi. page 92, note.) To omit the observance altogether is a crime not to be expiated, and is equal in atrocity to the murder of a hundred *brahmans.*

The infant exploits of Krishna are next related, and require no particular comment. Garga, the *Muni*, points out Rádhá, the daughter of Vrishabha'nu, as an eligible bride for the youth, and acquaints Nanda, Krishna's foster father, of the secret of her divinity, in which he thus expounds her name.

" The letter *R* preserves persons from sin, the vowel *A* obviates regeneration, *D'h* shortens the period of mortal existence, and the second long vowel sunders all worldly bonds." The marriage was accordingly celebrated with great rejoicing, and the distribution of viands in large quantities, and the donation of immense treasures. The incompatibility of such profusion, with the condition of Nanda, the cowherd, is of no consideration to the author of this work, although it has saved the author of the *Bhágavat*, the original of the greater part of the story, from any such gross extravagancies.

The hero of the festivities, steals the curds in the next chapter, for which he is tied to a tree, and gets a whipping from his foster mother YASODÁ. After she leaves him, the tree falls, and from it emerges NALAKUVERA, the son of KUVERA, condemned to this metamorphosis, for indecent behaviour in the presence of DEVALA* *Muni.*

A long chapter is next occupied with the praises of RA'DHA' by KRISHNA and BRAHMA', which inculcate her supremacy over all other divinities, male or female, and her being inseparable from and one with KRISHNA. The sports of the juvenile god are then related, and his destruction of the demons VAKA, KESI, and PRALAMBA; the construction of palaces at *Gokula*, for all its inhabitants, by VISWAKERMA', the divine architect, of whose architectural exploits, the village of *Gokula* now offers no vestiges. This part of the work comprises the history of VRISHABHÁNU, and his wife KALÁ'VATI, the parents of RÁDHÁ, and who were rewarded by her birth, for the virtues of their former existence, as SUCHANDRA, a king of the family of MENU, and KALA'VATI, a will-born daughter of the *Pitris* or progenitors of mankind. This story includes a dissertation upon the virtues of women.

Several chapters follow, partly describing the actions of KRISHNA, and partly expatiating upon his excellencies and those of RÁDHÁ.

A legend of SÁHASIKA, the son of the son of BALI, follows, who was turned into an ass, by the curse of DURVÁSAS, for having disturbed the meditation of that sage, in the prosecution of his amours with TILOTTAMÁ, a nymph of heaven. On the penitence of the couple, DURVÁSAS announced to them, that the ass should be destroyed by the discus of KRISHNA, in consequence of which, the spirit of SÁHASIKA should receive final emancipation, and that TILOTTAMÁ should be born the daughter of BÁNÁSURA, in which capacity, she should become the bride of ANIRUDDHA, the grandson of KRISHNA.

The marriage of DURVÁSAS with KADÁLI, the daughter of AURVA *Muni*, is the next legend; in this, the violent temper of his wife excites the sage's wrath, and he reduces her to ashes. Repenting subsequently of his anger, and soothed by the appearance of BRAHMÁ, he changes the remains of his wife into a plantain tree. The same sage is the subject of another legend of great celebrity amongst the *Vaishnavas*, as illustrating KRISHNA's superiority over SIVA. DURVÁSAS, a votary of that deity, being offended with AMBARI'SHA a devout worshipper of VISHNU, attempted to destroy him, but was repelled, and narrowly

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* One place has Galava.

escaped destruction himself by the *Chakra* or discus of Vishnu, which came to the assistance of the king. The merits of fasting on the eleventh day of the fortnight, are the subject of the next chapter, and they are followed by an explanation of the eight names of Durgá, which again is relieved by a story of Krishna, carrying away and hiding the clothes of the nymphs of *Gokula*, whilst they were bathing in the *Jumna*. He gives up his booty upon being prayed to by Rádhá, in the usual strain, eulogising his divine supremacy, and identification with all things known or unknown. Several legends of minor importance follow, to the 32nd chapter, when that, and the two following, are occupied with the advances made by Mohini, a heavenly nymph to Brahmá, and his insensibility, in resentment of which she curses him, that he shall not receive any adoration from mankind; the effects of which malediction are said to be evinced in the neglect which Brahmá experienced from the professors of the *Hindú* faith.

The attention of the work is next directed, through a series of chapters, to the legends of the *Saiva* faith, or Brahmá's discomfiture by Siva, the asceticism of the latter, his marriage with Sati, the daughter of Daksha, her burning herself, and Siva's second marriage with Párvati the daughter of Himálaya. Stories of Vrishaspati, Indra, Vahni, Dúrvásas, and Dhanwantari then follow. All these legends are supposed to be narrated by Krishna to Rádhá, for her entertainment; and their general purport is to shew, that the personages to whom they refer, are immeasurably inferior to Krishna, and his votaries.

Some cases are then recorded of the humiliation of the leading personages of the *Hindú* Pantheon, in consequence of their incurring the displeasure of Krishna or some of his followers. Vishnu, whilst boasting himself the god of all, was swallowed by Krishna in the form of a *Bhairava*, all but his head, and was restored to his form, on recovering his senses. Brahmá, whilst making a similar vaunt, was surprised to behold multitudes of *Brahmás* and *Brahmándas*, or creations distinct from himself and his works; and Siva was condemned to pay the penalty of his pride, by his marriage with Sati, and distraction for her loss, which were the delusions of Krishna.

The 62nd chapter contains a summary account of Rámachandra, and the next ten proceed with an account of the transactions that immediately preceded Krishna's departure from *Vrindávan* for *Mathurá*, whether he was attracted, with his supposed father Nanda, by a special invitation from Kansá, his uncle, with a view to his destruction, at a sacrifice offered to Siva. The result of this visit is the death of Kansá, as described in other *Puránas*; but there is no detail of the previous wrestling, which occurs in the *Bhágavat.* On taking final leave of his foster father Nanda, Krishna favours him with a code of regulations, for his moral and religious conduct: he is not to look at a single star, nor the setting sun or moon; not to keep company with the wicked, nor to injure or insult *Bráhmans*, cows, and *Vaishnavas;* not to delay payment of the due fees to the priest who officiates at a ceremony; not to eat flesh or fish; not to vilify Siva, Durgá, or Ganapati; and on no account to omit every possible demonstration of his love for Hari. These injunctions extend to a great length, and are all of as little importance as the above. There are some curious denunciations, however, against acts which are lawful in the institutes of Menu; and no distinction is here made between a *Bráhman* who follows the profession of arms, and one who marries a woman of the *Súdra* caste. There is also a singular leaning shown to the *Saiva* faith, and the man who forms a single *Siva-linga* of clay, is said to reside in heaven for 100 *Kalpas.* The following scale is given of Krishna's affections: "Of all tribes the *Bráhman* is most esteemed by me, Lakshmí is still more beloved than a *Bráhman*, Rádhá is dearer to me than Lakshmí, a faithful worshipper is dearer than Rádhá, and Sankara is the best beloved of all." The instructions to Nanda comprise also a dissertation upon dreams, upon knowledge of the divine nature, and on the duties of the different castes and orders of the *Hindús*, on the duties of women, and the expiation of offences. This division of the work extends from the 75th to the 85th chapter.

A legend of the birth of Vrindá, the daughter of Kedára, next follows: from her, *Vrindávan*, or as usually termed *Bindrában*, derives its appellation, she being identified with Rádhá in her birth at that place. This chapter is followed by several others of a very miscellaneous character, in which Brahmá, Siva, and the *Munis* eulogise Krishna's power. The next sections are occupied with the mission of Uddhava from Krishna to *Gokula*, to bear intelligence of the latter to his parents and his mistresses; and we have then a short detail of the usual *Pauranik* chronology: Uddhava returns to Krishna, and we have then a narrative of Krishna's being invested with the thread of his tribe; he then prosecutes his studies under Sandípani *Muni*, and at their close relinquishes the garb of a cowherd for the robes of a king, presenting to his *Guru* four lacs of diamonds, an equal number of other sorts of gems, five lacs of pearls, a necklace worn by Durgá, dresses worth all the treasures of the world, and ten crores of *Suvarnás*, or certain measures of gold:—puerile exaggerations, which although not unknown to the other *Puránas*, are most lavishly multiplied in the work under review.

Although assuming a royal character, this work describes Krishna as resigning the supremacy to Ugrase'na, and directing *Dwáraká* to be built for him, by the divine architect Viswase'na—a wide departure from the account every where else given of the circumstances, under which *Dwáraká* became the capital of Krishna. He having been driven from *Mathurá* by Jarásandha, the father-in-law of Kansa, whom Krishna had deposed and slain; Krishna and his tribe, on their expulsion from *Mathurá*, fled to the west coast of the peninsula, and there founded a new city. No notice whatever is taken of these revolutions in this work, although they are told at some length, in the *Mahábhárat*, *Vishnu Purána*, and *Bhágavat*. In a subsequent chapter indeed, this *Purána* refers to the same events, although it does not particularise them; and Rukmi the brother of Rukmini' reproaches Krishna with having fled to *Dwáraká* through fear of Jarásandha.

Krishna's marriage with Rukmini' is next narrated, but he does not carry her off, as in other authorities. Her brother opposes his entrance into the city, but is defeated by Baladeva, and then Krishna enters, and is duly married to the princess in her father's presence. Every where else, he runs away with her before the marriage, and Baladeva checks the pursuit.

In the next chapters, a conversation between Rádhá and Yasodá, expounds the purport of eleven names of Krishna, and these are succeeded by an account of the birth of Rukmini''s son Pradyumna, his being carried off by a demon, and his recovery, the birth of other sons of Krishna, and marriage of the sage Durvásas to a daughter of Ugrase'na. Krishna's share in the war of the *Mahábhárat* is very briefly dispatched, except a long hymn to him by Sisupála, whom he slew. The intrigue of Aniruddha, Krishna's grandson, with Ushá, the daughter of Vána, is narrated at some length, in the usual style, and the unsuccessful contest waged by that prince against Krishna is protracted by the episodical insertion of a variety of stale legends, to a disproportionate extent; these stories are related alternately by Aniruddha and Vána, as they stand prepared to engage in single combat for the purpose of proclaiming the respective might of Krishna and Siva, Vána being devoted to the worship of the latter divinity. Siva however, after vainly attempting to dissuade him from the conflict, is obliged to witness his votary's defeat, with that of Skanda and Bhadrakáli, who had gone to his succour; and Vána becoming sensible of Krishna's supremacy, consents to his daughter's union with Aniruddha.

The next chapters relate to the origin of the *Bindusára Tirtha*, from the tears of Krishna; the reason why it is sinful to look at the moon on the 4th day of *Bhádra*, and Satrajit's obtaining that gem, whose presence in a country insures its fertility. The adoration of Gane'sa by Rádhá, in the presence of the assembled deities, is the subject of the 122nd and 123rd chapters, and as acknowledged in the text, is one rarely treated of in other *Puránas.* Gane'sa, not to be outdone, eulogises Rádhá in his turn, and is followed by Brahmá and Ananta. The worship of Gane'sa by Rádhá marked the termination of the curse, which had sentenced her to a mortal existence; and she was then restored to her celestial nature, in which Durgá is made to declare that there is no difference between Rádhá and herself, and whoever speaks in a depreciating manner of either, is equally punished in hell.

Krishna, having also offered worship to Gane'sa, returns to *Dwáraká*, and resumes his lessons to Nanda and his family; he also prophesies the depravity of the world in the succeeding or *Kali* age, in which men will abstain from venerating *Sálagrám* stones and *Tulasi* plants, and attach themselves assiduously to the service of *Mlechhas*, barbarians and outcastes, who it is said also, shall become the rulers of the country:—expressions indicative of the prevalence of the *Mohammedan* authority, when the *Purána* was compiled.

Rádhá after this returns to *Goloka*, with all the *Gopas* and *Gopís* of divine origin, Krishna creating others to supply their place at *Vrindávan.* The circumstances of Krishna's death, by a wound from a hunter, the destruction of his tribe, and the submersion of *Dwáraká* by the sea, are next alluded to, in so brief and obscure a manner, that without a previous knowledge of what is intended the notice would be quite unintelligible; and these events are lost sight of amidst the much more detailed addresses of the gods and goddesses, the ocean, the rivers, and particularly the Ganges, in which the sufferings of the earth, in consequence of Krishna's departure, are most pathetically lamented. After Krishna's death, the form that proceeded from his person, went to the *Sweta Dwípa*, where it became two: one-half was Náráyana, the lord of *Vaikuntha;* the other was Krishna, the deity of *Goloka*, the supreme indescribable source of all, who ascended to his original seat, and was reunited to Rádhá.

The *Purána* properly closes here, at the end of the 128th chapter; but Náreda, who has been its auditor, now hears from the narrator Náráyana, that he, Náreda, was in his former life, a *Gandharva*, the husband of 50 wives, one of whom is reborn, as well as himself, and by the boon of Siva, is to be once more his bride. Náreda submits rather reluctantly, and shortly after his marriage with the daughter of Srinjaya, who is declared to be one with Máyá, run away from his wife to perform penance, through which he is united with Hári.

A supplementary chapter, the 130th, follows, in which Su'ta, the ordinary narrator or recapitulator of the *Puránas*, relates two legends, explaining the birth of Fire from Brahmá, and of gold from Fire. Chapter 131 is a short index to the *Puránas*. The last chapter, 132, enumerates the different *Puránas* and *Upapuránas*, the five works called *Pancharátra*, and the five *Sanhitás* or compendia of the *Vaishnava* faith. It is also remarkable for its definition of the *Mahábhárat*, and the *Rámáyana*, the former of which it terms a *Itihása*, or history, and the latter a *Kávya*, or poem : the work terminates with a eulogium on itself; the attentively hearing of one quarter of a verse of which, is equal in merit to the gift of the heaven of Krishna.

The preceding sketch of the contents and character of this work will probably have furnished sufficient evidence of its modern origin. It is clearly subsequent to the great body of *Hindú* literature, not only by the enumeration just noticed, but by reference to the several philosophical systems, the *Terka*, *Vaisheshika*, *Sánkhya*, *Pátanjala*, *Memánsa*, and *Vedánta*, which occurs in a preceding passage. Its being the latest of the *Puránas* is also apparent from its own avowal of its being intended to clear up the discrepancies observable in those works, and by the frequent assertion, that the legends it gives, particularly those respecting Gane'sa, are not to be met with in the other *Puránas*. That it was compiled subsequent to the *Mohammedan* invasion, is very probable, from the allusions it contains to the supremacy of *Mlechha* rulers; and the particular branch of the *Hindú* system which it advocates, renders it likely to have emanated from a sect, which there is reason to imagine originated about four centuries ago with Vallabháchárya and the *Gosains* of *Gokula*.

II.—*Some observations on the Quantity of Earthy Matter brought down by the Ganges River. By the Rev.* R. Everest.

[Read before the Physical Class, 13th June, 1832.]

In the course of last summer, I made some attempts to ascertain the weight of solid matter contained in a given quantity of Ganges water, both in the dry and rainy season, but I found the weight so variable on different days (when little difference might have been expected) that I can hardly consider the observations numerous enough to give a correct average. Such as they are, however, they may not be without interest in the absence of other information on the subject. I therefore take the liberty of laying them before the Society, and shall, if opportunity offers, endeavour to add some further data, both for the weight of solid matter, and also for the rise and velocity of the river.

1. A quantity of Ganges' water taken 27th May, 1831, gave when evaporated, a solid residuum of 1.084 grains per wine quart.

2. July 21st. There had been little rain for some days, and the river was low for the season: a wine quart contained of soluble matter 2.0 grains; of insoluble, 16.2;—total 18.2.

3. August 2nd. The river being much higher, the same quantity of water gave insoluble matter 28.7, soluble 3. 0;—total 31.7.

4. August 13th. The river had reached its maximum, and gave from the same quantity of water, insoluble matter 73.5 grains; soluble 2.7;—total 76.2.

5. August 20th. The water had hitherto been taken from the side, but as it was evident that the quantity of matter held in suspension in the middle of the current was much greater than towards the bank, where the water was nearly still, I took two separate portions as before, and obtained, from the middle, 40 grs. of insoluble residuum; from the side 20 grains ditto: add for soluble matter, suppose two grains to each, the middle gives 42, the side 22 grs. The river to-day was at the same height as on the 13th.

6. Sept. 7th. Two portions taken this day, as before, gave for the middle 19, the side 15.

7. Sept. 21st. The middle gave 22, the side 20.

The different proportion in this case was occasioned by a strong east wind agitating the water near the shore.

8. Oct. 4th. The middle gave 9.6, the side 5.1.

The numbers therefore stand thus:

	Middle.	Side.
20th August,	42	22
7th Sept.	19	15
21st,	22	20
4th Oct.	9.6	5.1
Average	23.1	15.5

These numbers are to each other nearly as 3 to 2, so that we may correct the previous observations as follows:

21st July	27.3
2nd August	47.5
13th———	114.3

The first rain fell on the afternoon of the 14th June, and we have unfortunately no observation for the first month of their duration, but I think 27.3, the quantity on the 21st July, would be rather a low than a high average for it. For the second month, viz. from the 15th July to the 15th August, we have three observations, which give an average of 63 grs. For the third month, we have two, with an average of 30.5 grs. For the fourth month we have two, giving an average of 15.8. So that the average for the whole period, from the 15th June to the 15th October, would be 34 grs. On the 15th March, 1832, a quantity of water taken in the middle of the stream gave 6 grains per quart: a mean between this and 9.6 (the weight obtained on the 4th October), or 7.8 grs., may be taken as the average from the 15th October to the 15th March, or for five months.

1.084 per quart was the weight obtained on the 27th May, from water taken at the side. If we correct this as before, it gives 1.63, and the mean between this and 6, or 3.8 will be the average for the remaining three months, from the 15th March to the 15th June.

I will here add such data as I possess respecting the breadth, depth, and velocity of the stream.

I found the breadth on the 15th March 1832, to be 660 yards. The distance up the bank to the maximum height of the rains was 158 yards more on the southern shore, and 38 yards on the northern; which reduced to a level, would give a total breadth of 2563 feet, for the maximum breadth of the rains; 1980 feet, being the least breadth in the dry weather.

On the same day, the total perpendicular fall from the maximum height of the rains was 28 feet. The whole breadth of 1980 feet, sounded at intervals of 300 feet, gave an average of 17 feet 8 inches, which added to 28, gives 45 feet 8 inches for the maximum depth in the rains. The river had reached this maximum on the 13th August, and continued at the same until the 20th. After that it subsided as follows:

	ft.	in.
On the 26th August the fall was	7	6
7th Sept.	5	2
21st Sept.	5	6
27th Sept.	13	0
4th Oct.	15	4
25th Oct.	22	10

So that we may call the average depth for the third month of the rains 4 feet 3 inches below maximum, or in round numbers 41 feet. For the fourth month, viz. from the 15th Sept. to 15th Oct. the average depth would be 11 feet 3 inches below maximum, or 34 feet. For the first two months of the rains, the rise of the river was not measured, but from the quantity of rain that fell and the apparent increase, I cannot believe that the average depth would be less than the average for the fourth month, viz. 34 feet. If then we assume this number for the first two months, we have an average depth of 36 feet for the four months of the rains. A mean between 22 feet 10 inches (the fall measured on the 25th Oct.), and 28 feet (the fall measured on the 15th March), gives 24 feet 11 inches for the fall below the maximum in the intervening period, or in round numbers 20 feet for the actual depth during that period. For the three months of dry weather ensuing, 17 feet 8 inches may be taken as the depth.—We have seen that the least breadth in the dry weather was 1980 feet, and the greatest in the rains 2563 feet; leaving a difference of 583 feet. So that while the depth diminished 28 feet, the breadth diminished 583 feet, or 21 feet of breadth nearly for one of level. This proportion gives us 2383 feet for the average breadth during the four rainy months. Owing to the diminished velocity near the bank, and the diminished quantity of matter held in suspension there, this excess must be again reduced. Probably 2080 feet may be reckoned as the fair average breadth for the rainy months, 1780 for the winter, and 1730 for the hot months. The velocity, by the mean of two measurements on the 2nd and 14th April, 1832, at the surface, was 4425 feet per hour. I have no similar measurement for the maximum velocity in the rains, but while the river was at its greatest height I came a computed distance of 10 miles in an hour and a half, and from other observations of the same kind, both by myself and others, I am induced to estimate the maximum velocity at 6½ miles, or 34320 feet per hour. Assuming that the velocity varies as the depth, we have 23,800 feet for the average velocity during the rains, 7435 feet for the winter, and 4425 feet for the hot months. I make no allowance for the decreased velocity of the stream near the bottom, because it is in all probability compensated by the increased weight of matter held in suspension there ; for the decreased velocity at the sides I have allowed by reducing the breadth. Our whole data therefore stands thus :

Season.	Depth. ft. in.	Average breadth as reduced.	Velocity. ft. per hour.	Cubic feet discharged per second.
Rains, 4 months,..	36	2080	23800	494,208
Winter, 5 months, ...	20	1780	7435	71,200
Hot weather, 3 months,..	176	1730	4445	36,330

34 grains per wine quart was found to be the average for the rains. Now as a wine quart of water weighs 14544 grains, we have about $\frac{1}{428}$th part of solid matter by weight. But as the specific gravity of this cannot be stated at less than 2, we have $\frac{1}{856}$th part in bulk for the solid matter discharged, or 577 cubic feet per second. This gives a total of 6,082,041,600 cubic feet for the discharge in the 122 days of the rains :—7.8 grains per wine quart was the weight determined for the five winter months or $\frac{1}{1838}$th part in weight, and $\frac{1}{3676}$th part in bulk, which gives 19 cubic feet per second, or a total of 247,881,600 cubic feet for the whole 151 days of that period :—3.8 grains per wine quart was the weight allowed for the three hot months, which gives a $\frac{1}{3827}$th part by weight, and a $\frac{1}{7654}$th part by bulk, or about 4.8 cubic feet per second for the discharge of solid matter, and a total of 38,154,240 cubic feet for the discharge during the 92 days. The total annual discharge then would be 6,368,077,440 cubic feet.

In comparing these observations with some previous ones, I was glad to find that my average for the rains of $\frac{1}{856}$th part in bulk is nearly the same as that obtained by Captain Forbes, viz. 2 cubic inches in 1728, or 1 cubic foot.

I have stated the discharge for the hot months at 36,330 c. f. It is stated in the Gleanings at 20,000 at Benares. On looking over the data from which the estimates are drawn, I see that the product of the breadth and depth there given is greater than my own, the two products being to each other nearly as 5 to 8, but that the velocity I have found is to what is there given, nearly as 15 to 5. My measurements were made with care, and as I have been unable to detect any mistake in them, I have given the result of them in the hope that some one may be induced either to verify or contradict them. Again, there is a great difference between the discharge there estimated for the rains and my own results.

The former amounts to 1,372,500, or nearly three times mine, which is only 494,208. Had I made the estimate for three months of rain instead of four, my average of course would have been larger. There is too another reason why my estimate may be considered as lower than the truth. There is in the rains a small back stream, which forms an island of the opposite shore here. I examined this in the rains, but found the velocity of it so trifling, that I was induced to pass it over. Neither of these causes could raise mine to within one half of the Benares estimate.

III. *Note on the Magic Mirrors of Japan.* *By* James Prinsep, *Sec. Ph. Cl. As. Soc.*

[Read before the Physical Class, 13th June.]

The Japanese have long been celebrated for the manufactory of metallic mirrors, in which they carry on a considerable trade with China. They are ornamented with different devices on the back, and are well polished on the reflecting surface; but what constitutes their chief interest among Europeans is an adventitious property possessed by them, which must have originally been discovered by chance, although it is not certain at what period it became known, or whether the manufacturers, once apprized of the secret, have purposely cultivated its principle in the fabrication of their mirrors to give them an additional value in the market: the fact is known in China and among the English, but I believe no explanation has hitherto been suggested.

One of these mirrors was lately brought to Calcutta, and most of those whom I have the honor to address have had an opportunity of witnessing its effects ; I have therefore the less cause to regret that its transmission to England has prevented my exhibiting it this evening. It has been sent home to a gentleman with whom its mysterious qualities will soon cease to be an enigma, if indeed they excite a moment's curiosity in his mind ; but we have been surely a little hasty in allowing it to go from among ourselves, before we have attempted an explanation of the phenomenon it exhibited, as though we feared to hazard the investigation of so very simple a problem in optics, or have failed to discover its solution. To avert a suspicion of so derogatory a nature either to our zeal or to our optical acumen, I beg leave to offer the following explanation of the phenomenon to the consideration of the Society :

The Japanese mirror is a slightly convex disc of bell-metal, about six inches in diameter, and a quarter of an inch in thickness on the edge, ground and polished on the convex face, and covered with a thin coating of silver to give it a white colour. The back of the mirror is deeply carved or indented with ornamental work in circles and festoons, and it bears an inscription in the Japanese character in high relief upon what may be termed the tympanum of the disc : in the centre there is a projecting knob perforated laterally to receive a string for suspending the mirror : the metal is highly sonorous when struck as a bell, and is so soft as easily to be indented or scratched on contact with any hard substance. I found its composition to be

Copper..	80
Tin.....	20
	100

with no traces of silver or arsenic, and a very slight indication of zinc. When a strong ray of light, as from the sun, is reflected from the polished surface of the mirror upon a screen, instead of a clear bright disc, as would naturally be expected, the spectrum is found to exhibit a tolerably clear delineation of the ornamental pattern on the back of the mirror: the outer circles; the festooned ring ; the magical inscription, are all seen depicted with fidelity ; and it certainly does stagger an observer for the first time to witness an image shadowed forth, without any visible origin ; for the back of the mirror may be covered or concealed in any way without diminishing the effect.

No irregularity of surface was perceptible on the face of the mirror. It had been scratched in one or two places, and I put it into the hands of a silversmith to be repolished : in effecting this he rubbed off the plating in several places, and exposed the surface of the bell-metal : this, although in some respects a blemish, was one step in a *negative* investigation of the cause of the phenomenon, for the reflected image continued just as marked as before, merely being of a red colour where the silvering was removed ; thus showing that the cause was unconnected with the nature of the reflecting surface.

As it was seen that the thick parts, the rim, the festoon, and the letters, were those which appeared most illuminated in the spectrum, an obvious explanation occurred, that the light was more perfectly reflected from thick surfaces than from thin ones, however such an assertion might militate against the known laws of metallic reflection, which all experiments have proved to be purely superficial or confined to an infinitely small depth below the surface : this hypothesis was easily put to the test of experiment, by casting some specula of very unequal thickness, and then grinding and polishing the upper surface : but when the mirrors were thus made, the image reflected from them was found to be altogether smooth and natural, and the first supposition of course was no longer tenable. It then occurred, that the various parts of the Japan mirror might be of different *density*, supposing the pattern to be made by stamping, and that either the rays of light might be more forcibly repelled by the denser metal than by the lighter, or that parts of the surface would acquire different degrees of polish, sufficient to cause the illusion, although imperceptible to the eye. But in such case the thin parts, from being the hardest, should give the stronger reflection. This supposition was also overthrown by experiment. A disc of silver having been annealed at a red heat, so as to be quite soft, was stamped on the back with a circular ring, deeply indented, so as to harden the silver in that part only. The opposite surface was then ground and polished, when it was found to give a clear and uniformly reflected spectrum.

The third and, I believe, the true explanation was suggested by the well known phenomenon of the reflection from a brass button, which every school boy has remarked when sporting his Sunday "blue coat with metal buttons" in the sunshine of his tutor's parlour window. The button throws a radiated irregular image on the wall, exhibiting two bright concentric circles, one on the edge, and another about one-third within it: and there is generally a bright spot in the centre; all of this seems but the picture of the stamp on the back of the button: the radii resemble, and indeed coincide with the letters of "superfine" or "trebly gilt" inscribed within a double circle, and the central spot represents the shank: there can be little doubt, that the principle is in this case precisely that of the Japan mirror, and on cursory view, the surface looks equally smooth and unsuspicious. On minute examination, however, of several buttons, I found them to be by no means plane; their general surface is slightly convex; there is a hollow in the centre, and a projection in the position of the inscription behind, caused no doubt by the blow necessary in stamping it—the polish is probably given by a rotatory motion, and consequently does not remove these very small irregularities. To follow up the experimental investigation, I selected one of the buttons, which gave a good image; ground it on a flat hone, and polished it: all of the magical figures vanished in a moment, and a plain bright disc appeared in their stead! Here then may be a key to the mystery of the mirror: the deception is entirely produced by irregularities on the surface, which are rendered the less perceptible to the eye, because the surface is convex instead of being plane.

But it may be objected, that the two circles which appear bright in the reflected spectrum of the button, represent the *indented* or thin parts

Japanese Mirror

Fig. 3.

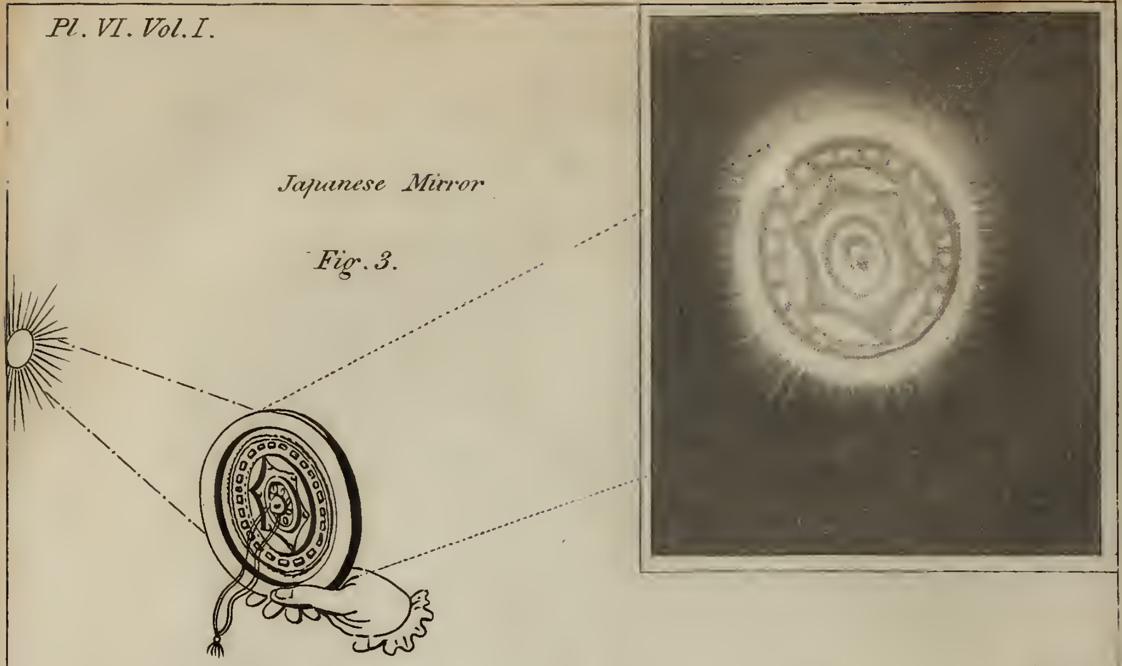


Fig. 1.

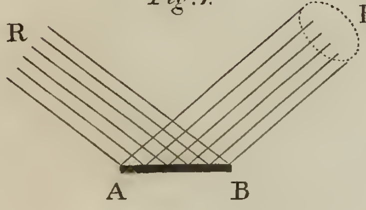
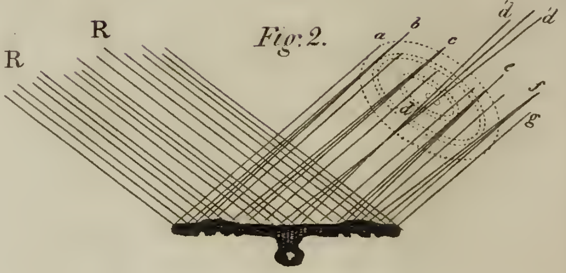


Fig. 2.

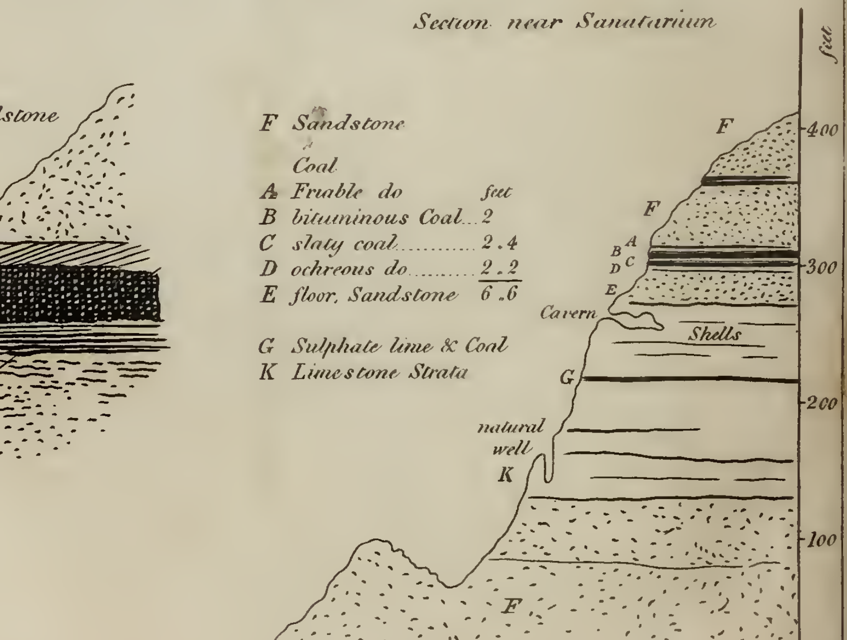


Chirra Púnjí Coal Strata.

Fig. 4.

Fig. 5.

Section near Sanatarium



J. Prinsep del
Kasinath Sculps

of the metal, whereas the *thick* parts of the Japan mirror are those which appear illuminated. A short analysis of the facts in either case will readily explain to what these discrepancies are attributable, but it will be necessary to have recourse to a diagram.

Let A B Pl. VI. *fig.* 1, be a plane mirror, upon which the rays of light R impinge : they will be reflected uniformly in R′ forming a clear image.

Now let A B C D E F G be another reflecting surface, having two convexities, B C, E F; and one concavity in the centre, D; (the conditions nearly of the brass button.) In this case the light R R reflected from the outer concave flexures of the protruding portions of the surfaces B C, E F, will converge in the foci *b*, *c*, and *e, f*, respectively, at distances corresponding to the radius of their curvature : the effect will of course be visible within wide limits of the actual focus. In most of the buttons however the central depression is so great, that it collects the rays in a focus *d*, a few inches only in front of the surface; and when the spectrum is thrown farther off, the rays, crossing, form two less distinct luminous foci at *d′ d″.*

It follows from analogy that the thin parts, or tympanum, of the Japanese mirror, are slightly convex with reference to the rest of the reflecting surface, which may have been caused either by the ornamental work having been stamped, or partially carved with the hammer and chisel on its back ; or, which is more probable, that part of the metal was by this stamping rendered in a degree harder than the rest, so that in polishing it was not worn away to the same extent. That the curvature is extremely small, is proved by the circumstance of the image being nearly equally well defined at the distance of two or twenty feet, or within all the limits at which I had an opportunity of trying it.

Advantage might be taken of this exceedingly simple principle, to produce a multitude of curious effects ; and I have little doubt that, in the skilful hands of an English artist, it will be converted into a philosophical toy, as amusing as the optical paradox, or even the far-famed kaleidoscope itself.

IV.—*Description of the Native Manufacture of Steel in Southern India.*

[Extracted from the manuscript journals of the late Dr. Voysey.]

Kona samundram, (corner of the sea,) situated about 12 miles south of the Godaveri, and 25 from Nirmul, is celebrated for its manufacture of steel, the chief part of which goes to Persia ; the following are the chief details of this manufacture, collected by repeated visits to the place, and personal inspection of the process.

The furnace is a temporary circular structure of clay, from four to five feet in height, and five feet in diameter. It is sunk two feet below the surface of the ground. The fuel is charcoal, and the fire is kept up by a blast from four bullock skins, placed at right angles to each other: the muzzles resting on the upper edge of the furnace, so as to force the blast downwards. The granitic clay of the furnace is highly infusible; it is found in the neighbourhood, and is formed of the decomposition of granite rock with small pieces of quartz and felspar, and is so valued for its refractory qualities, that it is exported for the manufacture of crucibles, &c. After some days, however, if a considerable heat has been maintained, the furnace becomes semi-vitrified, and requires renewal; the cost of a furnace is from two to three rupees.

The bellows are plied incessantly day and night: during the operation, the men are relieved every four hours, each being engaged to work 12 out of the 24. They are partly protected by a screen of mud placed between them and the furnace, but the heat and exertion render their task sufficiently laborious.

The iron is converted into steel in pine-shaped crucibles, made of the same clay as the furnace, and of various sizes, according to the purpose for which the steel is to be applied, whether for the fabrication of swords, or knives, or other articles.

In making the crucibles, the granitic clay above described is ground to a fine powder along with the fragments of old furnaces and crucibles, and the whole kneaded together with the chaff of rice and oil. The vessels are defended by a luting of the same, they are covered with a similar top, but a perforation is made in the latter. No charcoal is put into the crucible, but small pieces of *kanch*, or the glass formed in the process, are put at the bottom of them along with the ore, and serve of course as a flux. The crucibles are arranged and steadied in the furnace occasionally by the superintendent, with a long and stout rod of iron.

The materials used in the preparation ofthe steel are two different kinds of iron; one from *Mirtpalli*—the other from *Kondapur*, in the proportion of three parts of the former to two of the latter. The *Mirtpalli* iron is derived originally from the iron sand already noticed, and is sent in the state of large amorphous masses of a reddish grey color, and of an extremely porous texture. The internal fracture is often iridescent. The *Kondapur* iron is procured from an ore found amongst the iron clay, at a place about 20 miles distant. It is said to be of a dirty brown colour, and very frangible. The iron however, is moderately compact and of a brilliant white fracture. Occasionally it contains some ingredient which spoils the steel, rendering it excessively brittle: the natives assert that the adulteration is copper, but it is more probably arsenic. The mixture being put into the crucible, the fire is excited and kept up for 24 hours. It is then allowed to subside, and the crucible is taken out and placed on the ground to cool. When quite cold it is opened, and a cake of steel of great hardness is found, weighing on an average about a pound and a half. The cake is covered with clay, and annealed in the furnace for 12 or 16 hours. It is then taken out and cooled, and again annealed, and this may be repeated a third or fourth time until the metal is rendered sufficiently soft to be worked. The steel is known by the name of *Wootz* in Telinga, and a *Kurs*, a cake of about 110 rupees weight, is sold on the spot for 8 annas. The daily produce of a furnace is about 50 seers, or in value 37 rupees. The cost of this steel is much enhanced by the exaction of the *jaghirdar*, who not unfrequently appropriates the advance to himself, and leaves the purchaser still to incur the whole expence.

The export, however, of the metal to Persia must be profitable, as it is sufficient to bring dealers from that country and to defray the cost and risk of travelling. We found at the village, in 1820, Hájí Hosyn, from Ispahán, engaged in the speculation; and it must have answered his purpose, as he was here again in 1823, having returned in the interval to Persia and disposed of the venture. He informed us that the place and the process are both familiar to the Persians, and that they have attempted to imitate the latter without success. Besides residing at the village, whilst making his purchases, he bore a personal part in the operation, weighing the proportions of the iron, and testing the toughness of the steel himself.

The following experiments may convey some notion of the degree of heat to which these furnaces can be raised, and which may be reckoned at 130° of Wedgwood. 25 rupees weight of steel, which had not been submitted to the last operation, with $\frac{1}{164}$th of a silver rupee, was fused in three hours into a button of hard steel. A piece of shelly stratum from *Jhirpa* fused into a sort of porcelain. A piece of hornblende schist was fused into a glass, with many globules of iron and manganese floating on the surface. The granite from the bed of the *Godaveri* yielded a green glass. *Belkonda* granite was partly run into a green glass with pieces of quartz little altered, floating on the mass. *Sitabaldí* basalt was melted into a yellowish green, and *Jhirpa* wacken into a very perfect opaque black glass.

V.—*Proceedings of Societies.*

1.—ASIATIC SOCIETY—Physical Class.

Wednesday, 13*th June*, 1831.

James Calder, Esq. in the chair.

The chairman communicated the offer of Dr. H. H. Spry of Sagár, to correspond with the Physical Class, on Geological subjects, which was accepted with thanks.

Correspondence.

1. The following letter was read from Mr. J. D. C. Sowerby, acknowledging the receipt of the Himalayan Fossil Shells sent to him for examination, at the suggestion of the Rev. R. Everest, in 1831.

To James Prinsep, Esq. Sec. Ph. Cl. As. Soc.

SIR,

I feel highly honoured by the resolution of the Physical Class of the Asiatic Society, forwarded to me in your letter, dated the 26th of January, and request you to present my thanks to the Society for the series of specimens which I have lately received.

I had before seen some specimens from the same mountains, in the possession of Mr. Stokes and Dr. Buckland, among which were several ammonites that are as yet unnamed. The Rev. Mr. Everest's deductions are correct, as far as they relate to the formations the fossils belong to, as you will see by the accompanying list of names, to each of which I have added the formation in which that species occurs, in England.

In the genus *Terebratula*, there are many species that cannot be depended upon as indicating particular formations, because very similar ones are found in several beds, and the species are difficult to determine, especially if not quite perfect. You speak of a *Pecten*, which Mr. Everest thinks does not differ from the common Scallop, it is very probably *P. æquivalvis*, which is characteristic of the inferior Oolite; both of its valves bear a strong resemblance to the convex valve of *Pecten maximus*. The *Helix* you speak of may possibly be *Ampullaria nobilis*, which accompanies the *Cirrus* in the lower beds of the mountain limestone of England and Ireland.

Allow me to repeat, that I am sensible of the honour conferred upon me by the Asiatic Society, and shall always take a pleasure in replying to similar communications, or in being in any way serviceable to science.

I remain,
Dear Sir,
Your faithful servant,
J. D. C. SOWERBY.

5, Camden Terrace,
West Camden Town,
London, Oct. 14, 1831.

List of Fossil Shells, from the Himalaya.

Fig. 1. (See GLEANINGS III. Plate XVII.) *Avicula* (rather than *Pecten*), species new.

2. *Spirifer striatus*, [Min. Con. tab. cclxx.] Mountain Limestone.

? Cast of the interior of *Spirifer siriatus*, Mountain Lime.

3. *Producta scabricula*, [Min. Con. t. lxix. fig. 1.]

————, new species.

These two and the *Spirifer striatus* are in a stone strongly resembling some of the Transition Slate of England, which contains similar shells.

4. *Astarte planata,* var. [Min. Con. tab. cclvii.] Inferior Oolite. A variety of this shell is found at Bayeux in Normandy, and is called *Crassina modiolaris.* Also an unnamed large bivalve.

5. *Nucula,* an unnamed species ; similar fossils occur in the Mountain Lime and Lias.

7. Strongly resembles a portion of some large *Inoceramus,* but it is not perfect enough to determine.

12, 13. *Ammonites annulatus Anguinus,* of Schlotheim, Zeiten, Versteinerungen Württembergs, t. ix. f. 2. Min. Con. tab. ccxxii. fig. 5, is the same shell. Lias formation. The large specimen is filled with sulphate of barytes, not carbonate of lime.

No. 24. *Belemnites sulcatus,* Sillot, Miller, Trans. Geol. Soc. 2nd series, vol. II. pt. 1, pl. 8, fig. 3, 4, and 5. *Bel. apiciconus,* Blainville's Memoire. Lias, inferior Oolite.

23. *Alveolus* of a Belemnite, perhaps of *B. sulcatus. Orthocera conica* of Min. Con. tab. lx. although called an *orthocera,* is only an *alveolus* similar to this.

2. The following letter from Dr. Falconer, Superintendent of the Hon. Company's Botanic Garden at Seharanpúr, was read.

Dehra Dún Fossil Remains.

To the Editor of the Journal of the Asiatic Society.

Sir,

In No. 3 of the Journal of the Asiatic Society, p. 97, Mr. Royle has announced the discovery by me of the fossil bones in the range of hills which skirts the Valley of Dehra on the south-west. I regret that Mr. Royle did not confine himself to a simple announcement of the fact, without giving an extract from the letter in which it is mentioned. The communication was made immediately after I had met with the fossils, and was an unguarded expression to an intimate friend, of what I imagined them to be, and not an opinion intended for a public Journal in the *ipsissima verba* of the letter. Beyond, therefore, the fact of fossil bones occurring in these hills, I do not wish to stand responsible for any opinion regarding their specific determination, in the present imperfect state of the inquiry. As yet they have been found in a small quantity only, and consist of a few fragmented portions of bones. The Lignite occurs in great abundance. The "fragments of the shells" (not the *skull* as stated in the Journal) of Tortoises resemble those found by Mr. Crawford and Dr. Wallich on the banks of the Irawadi, and others contained in the museum of the Asiatic Society. The "fragment of a bivalve shell" is very imperfect, and therefore very questionable.

I conceive it necessary to state that Lieut. Cautley, Superintendent of the Doab Canal, is the original discoverer of fossils in these hills. The most perfect portion I have yet seen of these fossil bones, has been in his possession several years, without however, his being aware of its nature.

H. FALCONER.

Seharanpúr, May 28.

Museum.

3. Specimens of the coal strata lately discovered at Sanárím, and near the Sanatarium in the Kasya Hills, were presented by the President in the name of Mr. W. Cracroft, with explanatory extracts from his letters.

The quality of the best specimens or middle stratum of this coal differs considerably from that of the Burdwan coal ; it contains very little earthy matter ; it burns with much flame, but does not form coke ; spec. grav. 1.330, colour brown black : composition,

Volatile matter (of which aqueous, 7.5).........	45
Carbon, ...	53
Earthy residue, ...	3
	100

4. Specimens of iron ore (red clay iron), from Sambhalpúr, presented by Capt. Jenkins, on the part of Mr. Babington : also a box of Himalayan minerals, found at the Adjt. Gen.'s office, by Capt. Jenkins.

5. The following specimens of the iron ores of the Salem Hills, Southern India, and of the iron and steel in the various stages of its manufacture, according to the native processes, by Mr. Heath, M. C. S.

I. Magnetic Iron ore from Salem, in its natural state, mixed with quartz.

II. The same ore cleaned by stamping and separating the quartz.

III. The same ore crystallized in octohedrons. This state of the mineral is rather rare.

IV. Some specimens of cast steel made from this ore by the native process, together with the crucibles in which the steel is melted. Some of these are left open to shew the manner of charging them ; others are stopped up ready to be put into the furnace.

V. Some specimens of chromate of iron from a mine lately discovered, and of Bichromate of Potash made from it.

Papers communicated.

6. Observations on the quantity of earthy matter brought down in the river Ganges, by the Rev. R. Everest.

[Printed in the present number, page 238.]

7. Report on the progress of the boring experiment, by Dr. Strong.

Since the last report considerable delays have taken place by the sickness of the superintendent. The boring No. 1, near the church in the fort was found so much injured by the searching after and extraction of the 100 feet of broken rods, that further operation in that quarter was abandoned after tubing the hole to the depth of 100 feet, and building over it a pump. There the depth obtained was 175 feet, and the water, which is sweet tasted, but muddy and ferruginous from the tubes, continues to stand at a level of 7 feet from the surface of the ground.

A second operation was commenced not long ago on the south end of the glass plot behind the Government house in the fort. Here the conductors of the experiment have adopted the use of a borer double the former size, and have in consequence easily forced down a strong sheet iron tube seven inches in diameter to the depth of 70 feet. Thence with a 6-inch auger the perforation has been carried down to the depth of 130 feet, without much difficulty, and a 6-inch tube has been already sunk into it to a depth of 117 feet. Thus far the progress has been very satisfactory, and with the assurance of an iron shaft through the two strata of sand connected with the river at 30 and 70 feet beneath the surface, the experiment promises fair to make us acquainted with the nature and quality of the water at greater depths, whether it may be entitled to the name of an artesian spring or not.

8. Note on the Japanese Mirror, by the Secretary.

[Printed in the present number, page 242.]

9. Mr. B. H. Hodgson's paper on the *Buceros Homrâi* of Nipal, and Dr. Bramley's remarks on the skeleton of the same bird, were then read.

The *B. Homrâi* is the largest species yet discovered of the singular genus, measuring 4½ feet from the bill to the tail, and 6 feet in expanse of wings.

It tenants the lower range of hills from Haridwár to Assam, and is not truly migratory, though it retires to the neighbouring mountains during the breeding season. It has been a prevalent opinion that the Buceros is carnivorous, but Mr. H. has on shooting two species out of four, found their stomachs filled exclusively with fruit, and the other two in domestic confinement shewed always a great aversion to frogs and lizards, and refused to touch rats, mice, and birds; they were fed entirely on fruits and boiled rice: both would however eat fresh meat, when vegetable diet was out of their reach.

The *Homrâi* reaches its full size in four and five years; it is gregarious and sedate; seldom alights on the ground; its ordinary voice resembles the croaking of a bull-frog, but when excited, it vociferates vehemently like the braying of an ass. The bill is nearly a foot long, very large, cleft to the eye, and strongly arched: the cutting edges brittle and broken in the centre: the casque, about 8 inches long, broad, flat at top; front in young birds pointed and continuous, becoming crescented and separated from bill in maturity and colour of casque; upper mandible, deep waxen yellow, passing into orange red; lower mandible, white; base of both, anterior of casque, inner surface of bill, &c. black; iris, crimson; legs, green grey; skin round the eye, black; body and wings, chin and junction of the head and neck, black; neck yellowish white; tail pure white with a broad black bar; all but the two first quill feathers of the wings broadly whitened at either extremity. Tips of the long coverts also white. The female and young are marked like the male.

The anatomy of the skeleton is minutely described by Dr. Bramley, particularly the connection of the horny and bony substance of the mandibles.

The tongue is fixed to the lower mandible, small, and triangular, without papillæ.

The cervical vertebræ are only 12 in number; the dorsal, seven, and capable of motion, whence he infers a limited power on the wing.

The *os hyoides* consists of five bony portions; the superior *larynx* is formed anteriorly and laterally of bone, and the *annuli* of the *trachæa* are all more or less ossified.

The thanks of the Society were voted for the several communications of the evening.

Kasya Coal.

Mr. W. Cracroft's information respecting two new localities of the Kasya Coal is contained in his letters addressed to the Honorable Sir Edward Ryan, dated May, 1832, from which the following are extracts.

"I hasten to give you a piece of information, which will interest you. I have just returned from Sanárím, where Mr. Furnell discovered a stratum of Coal cropping out on the side of a hill. I went down to examine it instantly, and found it with its cieling of new sandstone of an ochry color; below that a stratum of six inches light bituminous coal, a little tinged with ochre: next a stratum of 18 inches fine bituminous coal; under this, slate very bituminous, about six inches, and a floor of bituminous sandstone, to what depth I know not; it extended right and left as far as the *jangal* would permit us to see, and had little or no dip in any direction. The accompanying sketch (Plate VI. fig. 4) will give you a better idea of it than my verbal description. I send you specimens of all but the sandstone, which was lost on the road.

23*rd.*—" In consequence of our desire for coal becoming known at Chirra Púnjí, two specimens were brought me yesterday, one of which resembled the Sanárim bituminous coal, the other the slate. I therefore inquired for some one to shew me whence they came. To-day we mounted our horses, Col. Watson, Mr. Rhodes, Mr. Furnell, and myself, accompanied by nine coolies with pickaxes, &c. and were conducted to the foot of the limestone hill, west of the Sanatarium. After passing the stratum of limestone, we came to sandstone, and were shown a stratum of coal, (specimen No. 1,) two feet eight inches thick, with a roof (No. 2); below the coal, was No. 3, but we could see no further. This was satisfactory enough, so we left our coolies to load themselves with coal, and Mr. F. and myself mounted still higher to see if there might not be another stratum. We passed various sorts of sandstone, climbing nearly perpendicularly about sixty feet, where we found lumps of fine coal bedded in clay; and proceeding at an angle of about 35 degrees, perceived evidently another stratum cropping out, but buried in the clay. Leaving this we reached the top of the hill, whence we enjoyed a beautiful view of the Sanatarium. Our guide brought us back by an easier road; but imagine our delight, at finding in our descent the continuation of the lower stratum of coal perfectly bared, perpendicular from top to bottom; here I of course took new measurements and specimens, of which

A is the roof.
B bituminous coal, 2 feet.
C slaty coal of various consistence, 2 feet 4 in.
D coal tinged with other joints nearly perpendicular, 2 feet 1½ inch.
Depth of the coal stratum 6 feet 5½ in.
E is a specimen of the floor.
F found at top.

The rock being nearly perpendicular enabled me to come to pretty accurate measurement, and I found the shell limestone between 40 and 50 feet below the coal. I measured more than 39 feet of the stratum of limestone, and estimated about twice as much more below that, but the quality and texture are not quite the same, (but of this hereafter.) I consider the highest point we reached, to be about 400 feet above the place where we left our horses. The accompanying sketch, Plate VI. fig. 5. exhibits a section of the hill.

The stratum sinks about half an inch in a foot toward the south, but the roof, where we found it projecting, bassets nearly horizontally, and the face of the rock bears about N. E. This stratum of coal will be invaluable to the station. I shall forward a bag, by the first opportunity, for your inspection; it can be supplied at Chattak at 6 annas per maund, with good profit to the supplier, and the quantity is, I imagine, inexhaustible. I have no doubt it will be followed up, and found nearer the head of the pass, i. e. at Músmye. A box of specimens will reach you by Dák bangy: they will I hope enable you to judge fully of the value of the discovery. I am certain that these mountains, the aptitude of which to support colonists will inevitably lead to their colonization, contain resources far beyond our present estimation of them. Mr. Furnell discovered a large cavern, from whence he brought away a specimen of sulphate of lime in silky crystals. We also found an extraordinary natural well: a stone thrown into which fell into water at the end of about three seconds from dropping it."

Salem Iron Works.

The following memoranda on the subject of the Salem works, calculated soon to become important from their magnitude and from the well known zeal of their founder, are gleaned from private documents, with the perusal of which we were favored by the Agents of Mr. Heath, in Calcutta, who also presented his specimens to the Society:

The mine from which Mr. Heath draws his supply of ore is situated in the Salem district, close to a place noted on Arrowsmith's large map of India as *Shendamangalam*, in lat. 11° 21′ 30″ and long. 78° 17′ 30″.

There is abundance of fuel in the neighbourhood: it is within 20 miles of the river *Kavari*, which is navigable to the coast in the country boats.

The iron ore, a magnetic oxide of great purity, is stated by Mr. Heath to form hills of considerable size; it is in small grains, interstratified with quartz, and occasionally in regular octohedrons. This crystallized oxide is one of the richest ores of iron known; it consists according to Berzelius of 72 parts of peroxide and 28 of protoxide of iron. Some of the crystals sent are covered with a white micaceous coat, which is esteemed a sign of superiority by the natives: the specific gravity of the octohedral crystals was found to be on an average 5.136 at 60°, which is rather more than is allowed in mineralogical works. Mohs, the most accurate physiographist, calls it 5.096—Phillips, only 4.4.

On reference to the manuscript journals of the late Doctor Voysey, (from which an extract is given in the foregoing pages,) it appears that in the Godaveri iron works, ores of iron sand, and iron clay are used, which are more easy to reduce than the pure magnetic oxide, although far less rich in metal.

Mr. Heath has hitherto confined his attention to the manufacturing of bar iron, for which purpose he has set up blast and puddling furnaces, with blowing engines, fineries, and machinery for working the iron into bars commissioned from England, capable of giving a monthly return of from thirty to forty tons. We know not precisely whether Mr. Heath has as yet matured his substitution of the methods of our own country in the place of those which have from time immemorial prevailed among the natives of the place: the specimens at present under examination, are evidently intended to illustrate the native operations. We should imagine the greatest drawbacks to the success of the new method must be in the want of coal fuel, and of ready access to a market of sufficient consumption.

Mr. Heath's specimens of the native process of making steel are interesting, on account of the ignorance which still prevails in Europe on this subject.

According to the author of the Treatise on Manufacturing Iron and Steel in Lardner's 'Cabinet Encyclopedia,' our latest authority on such subjects, the right nature of Indian steel seems to be still as much an enigma as ever: nothing having been added to our knowledge since Dr. Pearson's paper on the Wootz steel, in the Philosophical Transactions, Vol. XVII. There it is asserted that the steel is made directly from the ore by fusion, and that it has never been in the state of wrought iron. "The mass has evidently been fused," says Dr. Pearson, "but the grain of the fracture is such as I have never seen in cement-steel before it has been hammered or melted;" and he suggests, that the variegated appearance of articles manufactured from it, is owing to portions of the oxide of iron having escaped metallization when melted up with the rest of the matter.

Dr. Voysey however expressly describes the compact texture and brilliant white colour of the iron used for conversion into steel; and in confirmation we have now from Mr. Heath, "the actual crucibles with broken fragments of iron bars, (about one lb. in weight each) charged ready for fusion, along with uncharred wood and green leaves;" the wood used for the purpose is that of the *cassia auriculata*, and the green leaves are those of the *asclepias gigantea.*" The cementation takes 24 hours, and the fire is then urged so as to fuse the steel. On breaking the crucible it is found in a hemispherical button, radiated on the surface as from crystallization. It has gained somewhat in weight; it is very hard, and requires to be *annealed* three or four times, covered with clay, and exposed to a red heat for 12 or 16 hours. This would be an argument that too great an absorption of carbon had taken place, and that the metal was in fact cast iron. 100 grs. of Mr. Heath's wootz, however, when dissolved in sulphuric acid, left but $\frac{1}{10}$ grain of carbonaceous matter, which is less than the usual proportion.

The brittleness of the wootz steel has been notorious ever since Damascus blades have been known in Europe and Asia. Tavernier describes the difficulty of working up the metal in his day as precisely what is experienced in the specimens before us. "The steel susceptible of being damasked comes from the kingdom of Golconda; it is met with in commerce in lumps about the size of a half-penny cake: they are cut in two, in order to see whether they are of good quality, and each makes half the blade of a sabre." He adds, that if the European methods of hardening this steel were followed, it would break like glass. Reaumur and others have always alluded to the same difficulty of forging it.

The cause of the brittleness may be in the over-carbonization, alluded to above; otherwise it must be sought in the wood used for the purpose; this point has not yet received elucidation, &c. nor from the unsatisfactory nature of all chemical analyses of iron is it likely to be soon explained.

Mr. Heath's *chromate of iron* ore seems to be of a very good quality, containing little or no foreign matter. It is of a dark greenish-grey or nearly black color, granular texture, in massive lumps, inclining to a octohedral form: not magnetic, infusible, insoluble in acids: specific gravity 4.545 at 90°.

Nitrate of potash requires more than a red heat to effect its decomposition: by caustic potash it is more readily acted on, and discharges copious fumes of a greenish, yellow colour, found to consist of sublimed chromate of potash soluble in water. The fused mass in the crucible, also, on solution yields a copious yellow precipitate with acetate of lead ; but the operation requires to be repeated several times before complete decomposition of the ore takes place.

The crystallized *bichromate of potash*, made by Mr. Heath, appears to be perfectly pure, and would be sure of a market in Europe. It is this substance which is used for dyeing. A short description of the process is given in Ure's translation of "*Berthollet's Arts of Dyeing*." All shades of orange and yellow may be produced by adding to the solution of the salt, acids or alkalies ; the acids rendering the color deeper, and the alkalies, lighter. The mordant generally used is sugar of lead. The salts of mercury may also be employed, but they are more expensive." Mr. Heath recommends the bichromate as suitable for the dyeing of Choppahs, Bandannoes, &c. Cotton twist however would be dyed much cheaper at the place where the dye was extracted from the chromate of iron, as in this way the process of crystallization would be rendered unnecessary. Mr. Heath has, in anticipation of a demand for this new product, established an extensive apparatus for its manufacture, and another for the manufacture of acetic acid, so as to enable him to supply the sugar of lead at the cheapest rate.

Chrome yellow, or chromate of lead, is much used as a pigment, but it has hitherto borne a very high price. America and Russia have furnished the greater part of the European supply : the Americans prepare it with saltpetre taken from this country, and chromate of iron from Baltimore and New Jersey, an ore by no means so pure as that discovered in Salem. It is natural to expect therefore that all the preparations of chrome will soon be advantageously exported from India.

The chrome yellow might find a market in China and the Burmese empire, as a substitute for the yellow sulphuret of arsenic, now extensively employed in the ornamental work of the lacquered-ware.

2.—Medical and Physical Society.

2nd June, 1832.

Messrs. D. McLeod, J. Stokes, S. Ludlow and O. Wray, proposed at the last Meeting, were elected Members of the Society ; and Drs. Blest and Passaman, of Chili, were elected Corresponding Members.

Cloquet's Quarto Work on Anatomy, and Manec's Plate of the Cerebro-Spinal Nerves recently received, were placed on the table ; also Specimens of *Chulchulera*, (lichen,) forwarded by Dr. Falconer.

The following communications were then laid before the Society :

1. A letter from Mr. Cope, stating, that in proceeding up the Ganges to Dinapore, he had met with a species of Argemone ; the *A. Mexicana*, the seeds of which contain a large proportion of fixed oil ; and he observes, that prior to his leaving England, a quantity of oil of the *A. Mexicana*, the produce of the West Indies, had been used in London as a mild purgative. Mr. Cope wishes to bring this subject before the notice of the Society, in hopes that the plant may afford an useful addition to the Materia Medica of India.

2. A letter from Superintending Surgeon G. Playfair, to the Medical Board, containing a brief notice of an Epidemic Influenza that had appeared at Merut, on the 7th April ; and in the course of 10 days, affected above 200 men of H. M. 26th Foot. The disease was marked by violent catarrhal symptoms, and pains in the back and limbs. The Epidemic appeared at Bareilly early in April, but no instance of a fatal termination was known.

3. A letter from Mons. Desjardins, containing the procès-verbal of the Meetings of the Society of Natural History of the Mauritius, from the 20th December, 1831, to the 17th January, 1832.

4. Dr. Casanova's account of the Medical properties of the Mineral Waters of San Pedro, in the Havanna; being the result of an examination of those waters, and a topographical account of the district, undertaken by order of the Colonial Government. The springs alluded to are thermal sulphureous; and their medical properties were found to be diuretic, aperient, and tonic. The treatise embraces an account of the diseases in which these waters have been found useful, as well as instructions for their employment.

5. Dr. Woodburn's account of Cholera, in the district of Sherghatí, presented by the Medical Board.

6. Mr. A. K. Lindesay's case of complicated Visceral disease, in which urinary calculi were found on dissection, presented by the Medical Board.

7. Observations on Hepatic Abscess, by W. Geddes, Esq. Surgeon of the Madras European Regiment.

8. Mr. Hutchinson's letter proposing the publication of a Quarterly Medical Journal;—to consist of a selection from the best medical publications; with an appendix to contain any papers of minor importance, or ephemeral interest, that might have been laid before the Society in the interval; and a precis of the latest medical intelligence, as well as an account of the proceedings of the various scientific bodies at the Presidency. The work to be supplied to the members of the Society at prime cost, or even gratuitously; and a small profit realized by the sale of extra copies at a higher price.

The expediency of making some of the Society's publications convey early intelligence of important discoveries in medicine, and of the progress of medical science in general, without any expence to the members, has been already twice brought to the notice of the Society, and some steps taken with a view of altering the form, and very much increasing the size of the Monthly Circular; for the purpose of comprehending an account of the progress of medical science in other parts of the world, so arranged as to admit of being bound up in a volume at the end of each year. The Society's annual publications would thus comprise one volume, principally composed of the discoveries in every branch of the profession in other parts of the world:—besides the volume of Transactions, as heretofore published.

9. Mr. Raleigh's remarks on an instrument for depressing the Cataract, by which he hopes to secure all advantages belonging to the native mode of operating, when performed in the best and most successful manner; at the same time, that many of the dangerous consequences frequently attendant on their mode of operating, may be avoided. A specimen of the instrument devised by the author, was sent for the inspection of the Society; its shape somewhat resembles one blade of a midwifery forceps on a very minute scale. It is fixed in a handle like the common couching-needle: the blade is about an inch in length; the two-thirds next to the handle being round, the remaining third spreads, so as to form an oblong oval shallow spoon, the centre of which being cut out leaves an oval ring; and its extremity is bent slightly forward; the widest part of the oval measures about the tenth of an inch, but the thickness does not exceed that of a couching-needle. The mode of operating is as follows:—with a lancet-shaped knife, a vertical puncture is made the eighth of an inch in length through the

coats of the eye, three lines behind the junction of the cornea and sclerotic ; and the new instrument is introduced with its concavity forwards and edges vertical ; it is carried behind the lens, over the upper edge of which the concavity of the instrument is placed, and depression effected in such a way as to separate all the attachments of the capsule, and to lodge the lens and its capsule at once below and behind the pupil ; the handle of the instrument may then be rolled between the finger and thumb, so as to disengage its blade from the lens ; and the instrument is to be withdrawn. The author considers Mr. Breton's estimate of the failure of couching in the hands of the natives, (taken probably from their own operators' representations,) to be erroneous ; and that instead of 10 per cent. of failures, 40 or 50 per cent. might be a more correct average. He says, from having seen the native oculist mentioned by Mr. Breton, put out four eyes in succession on the same morning, in two of which cases the lens was pushed into the anterior chamber, and in one the iris torn in half; and from having constantly patients brought to him whose eyes were destroyed in consequence of the native operation : he is inclined to consider couching as performed by the native oculists, barbarous and unscientific. He altogether discredits the account of the native operation having been performed seven times on one eye, with ultimate success. The author states, that in a fair proportion of cases in which the new instrument has been used, the operation has been successful; but he cannot yet decide whether the subsequent inflammation, generally speaking, is greater than after the European mode of couching. In several cases, however, it has been severe; and he thinks constitutes the principal, and, perhaps, the only solid objection to the operation performed in the manner he has now advised.

Mr. Mercer's paper relative to vaccination and varioloid diseases was then read and discussed by the Meeting.

3.—AGRICULTURAL AND HORTICULTURAL SOCIETY,

The 14*th June*, 1832.

Sir Edward Ryan, President, in the Chair.

The following Gentlemen were admitted Members of the Society, viz.

1.—Lieut. Colonel Thomas C. Watson, European Regiment.

2.—Mr. Richard Hunter, C. S., now of Cuttack.

3.—Captain W. Badenach, 57th N. I.

4.—Mr. George T. Lushington, C. S.

The following letters were read :

1. From the Secretary of the South Carolina Agricultural Society, to Mr. Piddington, Foreign Secretary, dated 31st October last, acknowledging receipt of this Society's circular letter of the 1st of the preceding March : offering to supply any indigenous plants and seeds that may be required ; and presenting some publications of the South Carolina Agricultural Society.

2.—Mr. Piddington was requested to acknowledge the receipt of these publications, and to procure a parcel of seeds for the South Carolina Society.

3.—From Captain Cowles, two letters, dated Diamond Harbour, 8th and 24th ultimo, presenting two samples of Sugar, of his manufacture, and furnishing some particulars of the proofs, &c.—The thanks of the Meeting were voted to Captain Cowles.

4.—From Mr. Kyd, dated 9th ult. presenting some China Potatoes for seed. The Secretary stated that he had forwarded the Potatoes to the Allipore Garden.

5.—From Mr. Willis, dated 9th ultimo, recommending that Government should be requested to require from Major Burney, the Resident at Ava, as large a quantity as possible of the long staple Pernambuco and other good descriptions of Cotton Seed, grown in that country, and that he be furnished with American Cotton and Tobacco Seeds for introduction there.

The Secretary informed the Meeting, that he had forwarded a copy of Mr. Willis' letter to Government, and had offered, with reference to the suggestion in the latter part of it, to supply any quantity of Seeds that might be required.

6.—From Messrs. T. A. Pitkin and T. C. Robson, dated 22nd ultimo, presenting specimens of American Flax and Tobacco, grown on their lands in the Soonderbunds, from seeds furnished by the Society, and requesting instructions as to the manner of curing the latter.

The Secretary was requested to furnish these gentlemen with copies of the methods followed by Mr. Deverine, the Society's Superintendent at Akra.

7.—From Mr. Pattle, with a Mangoe of uncommon size, grown in his own garden, and which Mr. Pattle considers the result of care and cultivation. It was found to weigh 145 Sa. wt. and to be 20. 4 by 17. 4 inches in circumference.

8.—Mr. Richard Hunter presented a specimen of Pernambuco Cotton, found by him in Cuttack, which appeared to be of good quality, and to thrive well, but he had not been able to obtain any information as to how it had been introduced there: the specimen was approved of.

9.—Mr. Robison presented a specimen of Seychelles Cotton, grown in his garden, from seed furnished by Mr. Palmer, to the Society, in 1830.

10.—Dr. Carey presented some Nankeen Cotton and Cotton Seed, grown in his garden at Serampore.

11.—Mr. Dobbs presented some Havannah Tobacco Seed, also some Chirimoya Seeds, in the name of Colonel Hezeta.—The thanks of the Meeting were offered to Col. Hezeta.

12.—Mr. Strong presented some Sea Island Cotton grown in Intally.

13.—Mr. McKean forwarded a quantity of Pernambuco Cotton grown at Duckinsore, near Calcutta, by Mr. Hastie, from seed furnished to the latter Gentleman by the Society.

The Secretary reported, that he received seven parcels of Silk, and twelve of Tobacco, from competitors; and an early day was therefore fixed, for a Meeting of the Committee of Prizes, and awarding the premium offered by Government.

4.—NATURAL HISTORY SOCIETY OF THE MAURITIUS.

Tuesday, 25th October, 1831.

Mr. L. Bouton read a letter from M. J. Desjardins, addressed to the President, proposing that a request should be made to M. Lyall for the portrait of his father, their late colleague, Dr. R. Lyall: whereupon Mr. Charles Telfair, President, who was in possession of this picture, immediately tendering it as a boon, the Society accepted it with the liveliest acknowledgments.

The same party read also the Secretary's reply to the Baron G. Cuvier, expressive of the honor felt by the Society on the possession of his bust.

M. J. P. Goudot, cor. mem. Mus. Roy. of Paris, and travelling naturalist, was introduced by M. Faraguat, on the occasion of his arrival on a projected excursion to the isle of Madagascar. He offered to the Society a collection of the land shells of France, and of the environs of Palermo, in Sicily.

M. Leinard, sen. read the description of a new species of fish of the genus *apphreus* cuv. which he names *A. capuchonné.* This is the third of the species existing in our seas. Commerson was the first to make it known in 1770. Upon the mention of this indefatigable naturalist several members again agitated the proposition of erecting a monument to his memory, and a subscription was instantly set on foot among the members present.

M. Lislet Geoffroy presented two Nos. of the *Journal des îles de France et de Bourbon*, 1786, containing remarks on *Nauscopie.*

The Society noted the publication of some of the papers read at its meetings, in the *Revue des annales des sciences naturelles* of December 1830. Also the abstract of their zoological researches in the *Jour. Zool. Soc.* of London.

Wednesday, 23*d November*, 1831.

M. Dalmas, of Bordeaux, Mr. James Calder, and Mr. James Irving, of Calcutta, were elected corresponding members.

The Secretary announced the death of three individuals in a way connected with the Society; Will. Roscoe, Esq. the Botanist: the Chevalier Aubert Du Petit Thouars, author of *Flore des îles australes de l'afrique*: and M. Auguste Céré, native of the Mauritius, formerly Director of the Botanic Garden of Pamplemousses.

The Secretary read letters from Professor Quoy and the Baron de Ferussac, thanking the Society for the diplomas awarded them.

Also from M. Marcelin Sauzier, describing the eruptions of lava in Bourbon last July, and forwarding specimens.

Dr. Casanova announces that he is forwarding the Society's interests at Calcutta. Mr. Jules Verreau, member of the Cape of Good Hope Institution, offers his services as taxidermist.

Mr. V. J. Sganzin, Capt. Art. St. Marie, Madagascar, was elected a corresponding member at Lorient. A collection of butterflies was presented in his name, containing particularly fine specimens of the *Uranie Riphée.*

M. Dalmas presented for the museum several *lusus naturæ*; weapons of the savages; and the skin of a lioness which died on the island.

M. Rob. de Chazal presented the model of an ancient monument at Rome, supposed to be the Sybil's temple.

The President presented two American serpents preserved in spirits, and Mr. B. Telfair a thick bamboo, the joints of which which were covered with *anatiffes*, from the Savannah.

The following acquisitions to the library were announced.

Hortus Indicus Malabaricus of Von Rheed, 12 vols. fol.

Herbarium Amboinense of Rumphius, 6 vols. fol.

Hooker's Botanical Miscellany, one chapter.

A member read the description of two fish of the *Filous* genus, one of a reddish green, the other clear yellow, in other respects agreeing.

Another member read also the description of a fish which he believed to be a new species.

Mr. J. Desjardins read two short notices on the *libellule bordée* and the *libellule demi-transparente*, which are not found in the *Encyclopedie Methodique*, and are thought to be new.

VI.—*European Intelligence.*

Results obtained from the Seed of the Mango.

The mango tree, *Mangifera Indica*, L. has been transported from the East Indies to St. Domingo, and the other neighbouring islands, where it is now exceedingly abundant. In consequence of which, its products may now find useful applications; to forward which purpose, M. Arequin has devoted his attention to the analysis of the seed. The fruit is a fine mass of pulp, very agreeable in the estimation of some, and the seed or grain lies in the middle, having the form of a kidney, and inclosed in a parchment-like integument.

The mango pulp contains much crystallizable sugar, and also citric acid and gum.

The mango seed is remarkable for the large quantity of gallic acid present, and for the presence also of stearic acid, and for the useful state of its starch. When a seed is cut with a knife, it gives a deep blue color to the latter ; when touched with persulphate of iron, it acquires a fine blue color, both effects due to gallic acid present.

Five pounds and a half of the seeds being worked upon, by various digestions in water, alcohol, &c. and subsequent evaporations, gave about eight ounces and a half of crystallized gallic acid.

When the pulp of the seeds had been exhausted by water, it was acted upon by alcohol, and a substance obtained by evaporation from the alcoholic solutions which crystallized, and had the following properties ; it was perfectly white ; was insipid and inodorous : if fused at 70° C. (158° Farht.), on cooling, it crystallized in mingling long acicular forms ; it is insoluble in water ; it reddens moistened litmus paper ; its solution in weak alcohol reddens infusion of litmus ; it is quite soluble in oils and fatty bodies ; it unites to salifiable bases, forming well characterized salts (soaps) ; when made into a taper, it burns like wax, with a fine white flame. This substance has all the physical and chemical characters of stearic acid, which therefore exists, ready formed, in the vegetable kingdom. Its quantity was rather more than two ounces.

When the pulp, thus far exhausted, was treated with æther, a fatty matter was obtained from it ; fusing at 30° C. (86° Farht.) ; soluble in hot æther to any extent ; insoluble in rectified alcohol ; liquifying in the mouth like cocoa butter ; when formed into a candle, burning like tallow ; having the consistence of tallow, and being of the same nature as the butter of cocoa. The powdered grain treated with water yields a small portion of this butter in a very pure and fresh state. The quantity obtained from the original quantity of seed was one ounce and a half.

After all these operations, the starch was separated by washing in water ; its quantity amounted to 32½ oz. or rather more than half the weight of the dried seeds. When the recent seeds were worked with for starch, 1 lb. always yielded about 6 oz. of starch, and by drying lost about 6 oz. of water.

Besides these substances the following were also obtained ; lignine, about 5 oz. gum, 2½ oz. ; tannin, 200 grs. nearly ; brown resin, 200 grs. ; green resin, 144 grs. and a little vegetable albumen.

M. Arequin then describes processes for obtaining gallic acid from the mango seed, either with or without the use of alcohol, and for the preparation of ink with this substance instead of galls. If obtained in abundance, the seeds may be very useful for these and analogous purposes.—*Journal de Pharmacie*, 1831, p. 421.

Catalogue of Indian Birds.

The following catalogue comprises, first, the collection taken home by Major James Franklin, F. R. S. &c. made during his tour up the Ganges between Calcutta and Benares, and in the Vindhyan range of hills between the latter place and Garra Mandela on the Nerbada: these are all numbered in the order of their systematical arrangement by the Secretary of the Zoological Society, as published in the proceedings of that body:—and, secondly, the collection of rare birds from the Himalayan mountains, presented to the Zool. Soc. by Mr. John Gould, A. L. S. most of them before undescribed. In characterizing the latter, Mr. Vigors points out the identity of a large proportion of their forms with those of northern Europe, observing that the elevation of their native mountains places them on an equality in point of climate with the birds of more northern latitudes. At the same time, he adds that many of the forms peculiar to southern Asia and the Indian Archipelago are found intermingled with those of the northern regions. Mr. Gould's birds will be recognized in the catalogue by their being unnumbered. A few Chinese birds will also be found classified with the rest, and indicated by the letter *C.* They were presented to the Zool. Soc. by H. H. Lindsay, Esq. of Canton, who procured them during the summer of 1830, in the neighbourhood of Manilla; Mr. Vigors points out fifty new species, of which he has as yet only characterized a few. It must be a subject of regret that the native names were not inserted where it was possible to ascertain them, as that would have much enhanced the value of the catalogue to Indian naturalists. We are indebted to Dr. Warlow's kindness and industry for arranging the valuable materials in their present state, gleaned from the Journal of the Zoological Society's proceedings.

ORDO I. RAPTORES.

Fam. FALCONIDÆ.

Sub-Fam. *Aquilina.*—Genus *Aquila.*

1. AQUILA VINDHIANA. *Aq. pallidè brunneo variegata; capite, pectore, remigibus secundariis, caudâque saturatioribus, hujus apice albido graciliter marginato; remigibus primariis nigris; capitis collique plumis pallido-rufo lanceolatis.*

Longitudo 26 unc.

Cawnpoor Eagle, Lath.?

Sub-Fam. *Falconina.*—Genus *Hierax.*

HIERAX ERYTHROGENYS. *Hier. capite et corpore suprà, caudâ femoribusque intensè atris; gulâ, collo in fronte, corporeque subtùs albis; strigâ a rictu ad aures extendente rufâ; rostro albo, pedibus nigris.*

Statura *Hier. cærulescentis.*

Genus *Falco.*

2. *Falco Subbuteo,* Linn. *Hobby,* Penn. *Le Hobereau,* Buff.
3. *Falco Chicquera,* Daud. *Chicquera Falcon,* Lath. *Le Chicquera,* Le Vaill.
4. *Falco Tinnunculus,* Linn. *Kestril,* Penn. *La Cresserelle,* Buff.

Sub-Fam. *Buteonina.*—Genus *Buteo.*

5. *Buteo Bacha. Falco Bacha,* Daud. *Bacha Falcon,* Lath. *Le Bacha,* Le Vaill.

BUTEO HOLOSPILUS. *But. supernè brunneus, subtùs brunnescentirufus; capite, fasciisque duabus remigum rectricumque fuscoatris; nuchâ et dorso, collo in fronte, pectore abdomineque toto, tectricibusque alarum maculis albis ocellatis, harum maculis diminutioribus.*

Staturâ tertiâ parte minor quàm *Buteo Bacha;* ei speciei simillima, differt tamen capite lævi, corporeque toto maculato.

Genus *Circus.*

6. CIRCUS TEESA. *Circ. capite corporeque rufo-brunneis, plumarum rhachibus fuscis; dorso imo, rectricibusque ferrugineis, his fasciis subobsoletis fuscis septem circiter notatis; remigum tectricibus abdomineque albescenti notatis; femorum tectricibus crissoque rufescenti-albis fronte, gulâ, nuchæque fasciâ gracili albis; rostro pedibusque flavis, illius apice nigro.*

   Longitudo 17½.

   Zuggun Falcon, Lath.?

7. *Circus cyaneus. Falco cyaneus,* Linn. *Hen Harrier,* Penn.
8. *Circus melanoleucus. Falco melanoleucus,* Gmel. *Black and white Indian Falcon,* Penn. *Le Tchoug,* Le Vaill.
9. *Circus rufus,* Briss. *Moor Buzzard,* Penn. *Le Busard,* Buff.

Sub-Fam. *Milvina.*—Genus *Elanus,* Savigny.

10. *Elanus Melanopterus,* Leach. *Le Blac,* Le Vaill.

Fam. *Strigidæ.*—Genus *Otus.*

11. OTUS BENGALENSIS. *Ot. pallidè rufescens, fusco alboque undulatim variegatus; nuchæ pectorisque plumis in medio strigâ latâ brunneo-nigrâ notatis; abdomine fusco graciliter fasciato; remigibus rectricibusque lateralibus prope apicem brunneo fasciatis, his mediis per totum longitudinem similiter notatis.*

    Longitudo 20.

    Dr. Latham alludes to this as a variety of the *great-eared Owl.*

Genus *Noctua.*

12. NOCTUA INDICA. *Noct. cinereo-brunnea; capite guttis parvis albis, alis grandioribus notatis; abdomine albo, maculis brunneis lunulaties notato; remigibus rectricibusque albo fasciatis; regione circumoculari, gulâ, fasciâque subgulari, ad aures extendente albis.*

    Fœm. *magis rufescens, abdomine magis fasciatim maculato.*

    Longitudo 9.

    Indian Spotted Owl, Lath.?

NOCTUA CUCULOIDES. *Noct. brunneo-fusca; capite, dorso, tectricibus alarum, corporeque subtus albo graciliter fasciatis; remigibus externè albo maculatis; rectricibus utrinque fasciis albis quique notatis; gulâ albâ.*

ORDO II. INSESSORES.

Tribus FISSIROSTRES.

Fam. *Meropidæ.*—Genus *Merops.*

13. *Merops Philippinus*, Linn. *Philippine Bee-eater*, Lath. *Grand Guêpier des Philippines*, Buff.

14. *Merops viridis*, Linn. *Indian Bee-eater*, Lath. *Guêpier à collier de Madagascar*, Buff.

Fam. *Hirundinidæ.*—Genus *Hirundo.*

15. *Hirundo Klecho*, Horsf. *Klecho Swallow*, Lath. *Hirondelle longipenne*, Temm.

16. HIRUNDO FILICAUDATA. *Hir. supra purpurascenti-atra, remigibus fuscis; corpore subtùs maculisque rectricum omnium lateralium albis; capitis vertice rufo; rectrice utrinque laterali elongato, ad apicem gracillimo.*

Statura *Hir. ripariæ.*

Wire-tailed Swallow, Lath.

17. *Hirundo riparia*, Linn. *Sand Martin*, Penn. *L'Hirondelle de rivage*, Buff.

Genus *Cypselus.*

18. *Cypselus affinis*, Hardw. *Allied Swift*, Hardw.

19. *Cypselus Palmarum*, Hardw. *Balassian Swift*, Lath.

Fam. *Caprimulgidæ.*—Genus *Caprimulgus.*

20. CAPRIMULGUS MONTICOLUS. *Cap. pallidè cinereo-brunneo, rufo, fuscoque sparsim variegatus; abdomine rufescenti-fusco fasciato; remigibus secundariis rufo nigroque fasciatis, primariis brunnescenti-nigris, quatuor externis fasciâ latâ albâ in medio notatis; rectricibus sex mediis faciis gracilibus nigris undulatis, duabus utrinque lateralibus albis apicibus brunneis.*

Fœm. *fasciâ alarum rufâ; caudâ concolori (sine albo).*

Longitudo 10.

Great Bombay Goatsucker, Lath.?

21. *Caprimulgus Asiaticus*, Lath., Ind. Orn. *Bombay Goatsucker*, Lath.

C. CAPRIMULGUS MACROTIS. *Cap. intensè brunneus, rufo undulatus, corpore subtùs caudâque rufo fasciatis; capite aurito scapularibusque rufo-brunneis, fusco undulatim punctulatis nigroque notatis; torque jugulari albo ad nucham extendente rufo.*

Longitudo *corporis*, 15; *rostri* ad frontem ⅜, ad rictum, 1¼; *alæ* a carpo ad apicem remigis 2dæ, 10¼; *caudæ*, 7; *tarsi*, ½.

Fam. *Halcyonidæ.*—Genus *Alcedo.*

22. *Alcedo Bengalensis*, Gmel. *Little Indian Kingsfisher*, Edw.

23. *Alcedo rudis*, Linn. *Black and white Kingsfisher*, Edw.

ALCEDO GUTTATUS. *Alc. cristatus, supra ater, maculis rotundis albis guttatim notatus; subtus albus; colli lateribus pectoreque atro maculatis.*

Statura *Alc. maximi.*

Genus *Dacelo.*

C. DACELO LINDSAYI. *Dac. corpore suprà brunneo, olivaceo et viridi nitente, guttis rufo-albidis notato, pectore abdomine crissoque albis, illorum plumis, medii abdominis exceptis, olivascenti-viridi marginatis; capitis pileo saturatè olivascenti-viridi, vittâ-superciliari lazulinâ circumdato, deinde vittâ per oculos nigrâ, alterâque suboculari ferrugineâ marginato; gulâ juguloque ferrugineis; strigâ utrinque maxillari lazulinâ; remigibus fuscis; rectricibus omnibus ad apicem, duabus utrinque externis ad latera, ferrugineo notatis; rostro subbrevi.*

Longitudo *corporis,* 10½ *; rostri,* 1⅜*; alæ* a carpo ad apicem remigis 3tiæ, 4⅛ ; *caudæ,* 4½ ; *tarsi,* ½.

C. Dacelo Lessonii. *Dac. corpore suprà brunneo, olivaceo et viridi nitente, albido guttato; capitis pileo saturatè olivaceo-viridi, vittâ superciliari cæruleo-viridi circumdato, deinde vittâ alterâ nigrâ marginato; collo in fronte corporeque subtùs albo, pectoris abdominisque plumis viridi-brunneo marginatis; strigâ utrinque maxillari viridi; remigibus fuscis; rectricibus omnibus ad apicem, tribus utrinque externis ad latera, ferrugineo notatis; rostro sublongo.*

Longitudo *corporis,* 11¾ ; *rostri,* 1⅞ ; *alæ* a carpo ad apicem remigis 3tiæ, 4¼; *caudæ,* 4¾ ; *tarsi,* ⅝.

Genus *Halcyon.*

24. *Halcyon Smyrnensis. Alcedo Smyrnensis,* Linn. *Smyrna Kingsfisher,* Lath. *Martin pêcheur de la côte de Malabar,* Buff.

Tribus Dentirostres.

Fam. *Muscicapidæ.*—Genus *Muscicapa.*

25. *Muscicapa Banyumas,* Horsf. *Banyumas Flycatcher,* Lath. *Gobemouche Chantuer,* Temm.

26. *Muscicapa nitida,* Lath., Ind. Orn. *Nitid Flycatcher,* Lath.

C. Muscicapa occipitalis. *Musc. corpore supra pallidè lazulino, capite colloque splendidioribus; abdomine lazulino-albido; maculâ occipitali grandi, torqueque gracili jugulari, sericeo-atris.*

Longitudo *corporis,* 6½.

Genus *Muscipeta.*

27. *Muscipeta Paradisi. Muscicapa Paradisi,* Linn. *Paradise Flycatcher,* Lath. *Gobe-mouche Tchitrec-be, roux et blanc,* Le Vaill.

28. *Muscipeta peregrina. Parus peregrinus,* Gmel. *Crimson-rumped Flycatcher,* Lath. *Gobe-mouche Oranor,* Le Vaill.

Muscipeta brevirostris. Mas. *Musc. capite, collo, nuchâ, dorso superiori, alis, rectricibusque mediis splendenti-nigris; corpore infra, dorso imo, pteromatum apicibus, fasciâ remigum, rectricibusque lateralibus splendidè coccineis; rostro brevi, subdebili.*

Muscipeta princeps. *Musc. capite, collo, dorso summo, alis, rectricibusque duabus mediis nigris; corpore inferiori, dorso imo, fasciâ latâ alarum, maculis paucis remigum secundariarum, rectricibusque lateralibus aurantio-coccineis; rostro fortiori.*

Longitudo circiter 9 uncias.

Genus *Rhipidura.*

29. Rhipidura albofrontata. *Rhip. capite colloque nigris; dorso cinereo-nigro; alis caudâque fusco-nigris; fasciâ subgracili frontali super oculos ad nucham extendente, pectore, abdomine, maculis tectricum alarum, apicibusque rectricum, duabus mediis exceptis, albis.*

Longitudo 6.

White-browed Flycatcher, Lath.?

30. Rhipidura fuscoventris. *Rhip. capite nigro; dorso abdomineque cinereo-nigris; alis caudâque fusco-nigris; strigâ brevi superciliari colloque in fronte albis; rectricum trium lateralium apicibus albescentibus.*

Longitudo 7½.

Broad-tailed Flycatcher, Lath.?

RHIPIDURA NIGRITORQUIS. *Rhip. cinereo-grisea; corpore subtùs, rectricumque, duabus mediis exceptis, apicibus albis; fronte, torqueque jugulari nigris; remigibus rectricibusque fuscis.*

Longitudo *corporis*, 7.

Fam. *Laniadæ.*—Genus *Ocypterus.*

31. *Ocypterus leucorhynchus. Lanius leucorhynchus*, Linn. *White-billed Shrike*, Lath. *Pie-grièche de Manille*, Buff.

Genus *Edolius.*

32. *Edolius cærulescens. Lanius cærulescens*, Linn. *Fork-tailed Indian Butcher-bird*, Edw.

Genus *Irena.*

C. IRENA CYANOGASTRA. *Ir. nigrescenti-cyanea; capite suprà, fasciâ tectricum alarum, uropygio, crissoque splendenti-cyaneis; collo in fronte, genis remigibusque atris.*

Staturâ *Irenæ Puellæ*, et simillima; differt abdomine caudâque cyaneis, haud nigris, dorso cyaneo haud lazulino, et rostri culmine plus elevato.

Genus *Hypsipetes.*

HYPSIPETES PSAROÏDES. *Hyps. capite supra subcristato, remigum apicibus, rectricibusque nigris; corpore alisque cineraceo-griseis; abdomine imo crissoque pallidioribus.*

*Rostrum pedes*que flavi. *Tectricum* alarum *remigum*que pogonia interna fusca. *Tectrices* alarum inferiores cineraceo griseæ. Longitudo *corporis*, 11½; *alæ* a carpo ad apicem remigis 3tiæ, 5; *rostri* 1; *tarsi*, ⅝; *caudæ*, 4¼.

Genus *Lanius.*

33. LANIUS MUSCICAPOÏDES. *Lan. brunnescenti-cinereus subtus albescens; strigâ superciliari rufescenti-albâ; alis rectricibusque fusco-brunneis, his duabus lateralibus albis basi notâque ad apicem fusco-brunneis.*

Fœm. aut Mas. jun. *capite corporeque suprà albido maculatis.* Longitudo 6½. *Keroula Shrike*, Lath.?

LANIUS ERYTHROPTERUS. Mas. *Lan. nuchâ dorsoque griseis; capite supra, alis, caudâque atris; corpore subtus, strigâ superciliari, remigumque apicibus albis; alis maculâ latâ rubrânotatis.* Fœm. *Capite griseo; dorso, alis, rectricibusque virescenti-olivaceo notatis; harum apicibus flavis.*

Statura *Lan. Collurionis.*

Genus *Collurio.*

34. *Collurio Excubitor. Lanius Excubitor*, var. Linn. *Cinereous Shrike*, var. C. Lath.

35. *Collurio erythronotus*, Proceed. Zool. Soc. p. 42. *Grey-backed Shrike*, Lath.?

36. CULLURIO NIGRICEPS. *Col. capite suprà, nuchâ, alis, caudâque nigris; gulâ, pectore, abdomine medio, maculâque in medio alarum, albis; dorso cinereo scapularibus, uropygio, abdominis lateribus, crissoque rufis.* Longitudo 8½. *Indian Shrike*, Lath.?

37. *Collurio Hardwickii*, Proceed. Zool. Soc. p. 42. *Bay-backed Shrike*, Lath.?

COLLURIO HARDWICKII. *Coll. capitis parte anteriore, strigâ per oculos ad collum extendente, alis, caudâque nigris; capitis vertice, corpore infra, maculâ mediâ alarum, caudæ tectricibus, rectricibus duabus lateralibus, cæterarumque, quatuor mediis exceptis, basi apiceque albis; occipite, nuchâ, dorsoque imo albescenti-griseis; dorso medio lateribusque abdominis ferrugineis.*

*Rostrum pedes*que nigri. *Caput* supernè albo nigroque colore in duas ferè partes transversim divisum. Longitudo *corporis*, 8 ; *alæ* a carpo ad remigem 3tiam, 3½ ; *rostri*, ¾ ; *tarsi*, ⅞ ; *caudæ*, 3¾.

Bay-backed Shrike, *Lath. ? Gen. Hist. vol.* 11. *p.* 13. *sp.* 6.

This bird appears to be the same as that referred to in Dr. Latham's work, the description of which is taken from one of the drawings of General Hardwicke, to whom the species is inscribed.

Collurio erythronotus. *Coll. strigâ frontali per oculos ad medium colli extendente, alis, rectricibusque quatuor mediis nigris ; capite supra, nuchâ, dorso superiori, rectricibusque lateralibus pallidè cinereis ; corpore infra, alarum maculâ mediâ, remigum interiorum apicibus, rectricum lateralium marginibus omniumque apicibus, albis ; scapularibus, dorso imo, abdominisque lateribus ferrugineis.*

*Rostrum pedes*que nigri, illius mandibulâ inferiori ad basin flavescenti *Striga* per oculos nigra, supra graciliter albo marginata. *Tectrices* alarum inferiores albæ. Longitudo *corporis*, 10½ ; *alæ* a carpo ad apicem remigis 3tiæ, 3¾ ; *rostri* ⅞ ; *tarsi*, 1⅛ ; *caudæ*, 4½.

This bird was observed to bear a great resemblance to the description of the *grey-backed Shrike* of Dr. Latham, (*Gen. Hist.* vol. ii. p. 9. sp. 3.) but to differ from it in the colours of the lesser wing-coverts and tail ; the former being all black in the Himalayan species, and blue grey, ending in pale rufous in Dr. Latham's ; while the tail in the former species had four black middle feathers and the rest cinereous, but in the latter had the two middle ones only black, the rest being white. In a group exhibiting so much similarity in the disposition of the colours as the present, such differences are material as distinguishing species.

Collurio tephronotus. *Col. fasciâ frontali pergracili ad medium colli per oculos latiùs extendente nigrâ ; capite, nuchâ, scapularibus, dorsoque saturatiùs cinereis ; collo anteriori pectoreque albescentibus, hoc fusco graciliter fasciato ; abdomine crissoque ferrugineis ; alis caudâque brunneo-fuscis, apicibus pallidioribus ; dorso imo tectricibusque caudæ superioribus subrufescentibus.*

Tectrices alarum inferiores ferrugineo fuscoque notatæ. Statura paullo minor quàm in specie præcedenti.

This bird also was observed to be closely allied to the last, and to differ from it probably only in sex or age. Until such points however could be ascertained, it was considered advisable to regard it as specifically distinct.

Genus *Graucalus*.

38. *Graucalus Papuensis*, Cuv. *Corvus Papuensis*, Gmel. *Papuan Crow*, Lath.

Genus *Ceblepyris*.

39. *Ceblepyris cana*, Temm. *Muscicapa cana*, Gmel. *Ash-coloured Flycatcher*, Lath.

40. *Ceblepyris fimbriatus*, Temm. *Echenilleur frangé*, Temm.

Fam. *Merulidæ*.—Genus *Pitta*.

41. *Pitta brachyura*. *Corvus brachyurus*, Linn. *Short-tailed Crow*, var. B. Lath. *Short-tailed Pie*, Edw.

Lamprotornis spilopterus. Mas. *Lamp. supra plumbeo-canus, plumis ad apicem fusco marginatis ; subtus albus, rufo tinctus ; uropygio rufescenti ; remigibus atris viridi splendentibus, maculâ alba ; caudâ brunneâ ; gulâ intensè rufâ.*

Fœm. *Supra pallidè brunnea, subtus albescens, brunneo tincta.*

Statura *Lamp. cantoris.*

MYOPHONUS HORSFIELDII. *Myoph. cærulescenti-ater, fronte, humeris, marginibusque plumarum pectoris splendidè cæruleis.*

Statura *Myoph. cyanei*, Horsf.

CINCLUS PALLASII, Temm. *Cincl. unicolor, intensè brunneus, rostro pedibusque fuscis.*

Statura *Cincli aquatici*, Bechst.

Genus *Oriolus.*

42. *Oriolus Galbula*, Linn. *Golden Oriole*, Lath. *Le Loriot*, Buff.

43. *Oriolus melanocephalus*, Linn. *Black-headed Oriole*, Lath. *Loriot de la Chine*, Buff.

44. ORIOLUS MADERASPATANUS. *Or. fronte, corpore suprà, tectricibus alarum abdomineque luteis; capite suprà, genis, remigibus, notâque medianâ rectricum fusco-atris ; gulâ albâ striis fusco-atris.* Longitudo 9.

Oriolus Galbula, var. γ. Lath. *Yellow Indian Starling*, Edw. *Yellow Starling from Bengal*, Albin.

C. ORIOLUS ACRORHYNCHUS. *Or. aureo-flavus ; vittâ a tictu per oculos extendente sinciputque obtegente latâ, remigibus totis, rectricumque basibus nigris ; rostro flavo, bulmine elevato.*

Longitudo *corporis*, 12 ; *alæ* a carpo ad apicem remigis 4tæ, 6 ; *caudæ*, 4½ ; *tarsi*, 1 ; *rostri*, 1$\frac{2}{5}$.

Genus *Turdus.*

45. *Turdus macrourus*, Gmel. *Long-tailed Thrush*, Lath.

46. *Turdus Saularis. Gracula Saularis*, Linn. *Pastor Saularis*, Temm. *Little Indian Pie*, Edw.

TURDUS PŒCILOPTERUS. Mas. *Turd. corpore nigro, abdomine imo subcinerascenti-fusco ; remigum mediarum pogoniis externis pteromatibusque cineraceo-griseis, his apice albis ; rostro pedibusque flavis.*

Fœm. ? *Corpore suprà brunnescenti-griseo, subtùs pallidiori ; pteromatibus remigumque mediarum pogoniis externis ut in mari notatis, sed colore subrufescenti tinctis.*

Statura ferè *Turdi Merulæ*, Linn.

A new species closely allied to the common European *Blackbird*, exhibiting the yellow bill and general black plumage of that bird, but differing from it in the varied markings of the wing.

CINCLOSOMA OCELLATUM. *Cinclos. capitis fronte et lateribus, corporeque suprà rufo-brunneis ; vertice, colloque in fronte nigro-brunneis ; pectore albescenti-rufo nigro fasciato ; abdomine pallidè rufo, nuchâ, dorso, alis, caudæque tectricibus ocellis anticè atris posticè albis, notatis ; remigibus et rectricibus lateralibus griseo-fuscis, apicibus albis.*

Rostrum pedis que flavescentes, illius culmine fusco. *Remigum* mediarum pogonia externa grisea, strigam griseam alarem exhibentes. *Tectrices* alarum inferiores rufo nigro albescentique variegatæ. Longitudo *corporis*, 14 ; *alæ* a carpo ad remigis 6tæ apicem, 5 ; *rostri*, $\frac{3}{10}$; *tarsi*, 1 $\frac{7}{10}$; *caudæ*, 7.

[*To be Continued.*]

Meteorological Register kept at the Surveyor General's Office, Calcutta, for the Month of June, 1832.

Days of the Month.	Minimum Temperature observed at sunrise.					Maximum Pressure observed at 9h. 50m.					Max. Temp. and Dryness observed at 2h. 40m.					Minimum Pressure observed at 4h. 0m.					Observations made at sunset.					Observations in Calcutta, at 10½ P. M.					Rain Gauge, No. 1.	Rain Gauge, No, 2.
	Barometer reduced to 32°.	Temper. of the air.	Depres. of M.B.Ther.	Wind.	Aspect of the sky.	Barom. red. to 32°.	Temper. of the air.	Depres. of M.B.Ther.	Wind.	Aspect of the sky.	Barom. red. to 32°.	Temper. of the air.	Depres. of M.B.Ther.	Wind.	Aspect of the sky.	Barom. red. to 32°.	Temper. of the air.	Depres. of M.B.Ther	Wind.	Aspect of the sky.	Barom. red. to 32°.	Temper. of the air.	Depres. of M.B.Ther.	Wind.	Aspect of the sky.	Barom. red. to 32°.	Temper. of the air.	Depres. of M.B.Ther.	Wind.	Aspect of the sky.		
1	29,542	83,	2,8	s.	cl.	,593	95,3	12,3	s.	cl.	,522	103,	16,1	s.	cu.	,478	100,5	13,	s.	cu.	,505	91,5	8,3	s.	cu.	,573	84,8	3,2	s.	cu.		
2	,533	81,5	1,8	do.	do.	,577	98,3	13,4	s. w.	do.	,511	102,5	17,8	do.	do.	,466	98,3	13,1	do.	do.	,492	95,5	11,3	do.	ci.	,586	86,	3,6	do.	cl.		
3	,545	83,5	2,8	do.	do.	,580	95,	11,5	s.	cu.	,475	99,5	14,8	s. e.	do.	,441	95,5	11,3	s. e.	cus.	,499	82,5	6,3	n. e.	n.	,593	83,2	4,2	e.	rn.		
4	,532	83,	2,3	do.	do.	,585	93,	9,8	do.	do.	,492	100,	16,1	do.	do.	,486	98,3	14,8	do.	cu.	,516	91,	8,8	s.	cu.	,616	85,	3,	s.	cl.		
5	,601	83,	2,5	do.	cu.	,648	94,	10,3	do.	do.	,547	103,	18,5	do	do.	,507	99,5	15,	s.	do.	,538	92,	9,8	do.	cis.	,587	82,9	4,8	e.	cus		
6	,590	79,5	3,	do.	cis.	,624	90,5	7,5	do.	do.	,510	98,5	16,8	do.	do.	,482	95,5	13,3	do.	do.	,501	92,	11,8	do.	cu.	,588	86,9	3,6	do.	do.		
7	,548	84,	3,8	do.	cl.	,593	92,	9,3	do.	do.	,503	98,3	16,1	s.	do.	,494	94,3	13,8	s. e.	cus.	,515	90,	8,5	s. e.	do.	,586	85,2	5,2	s. e.	cu.		
8	,543	81,	3,8	s. e.	cu.	,614	94,	15,	s. w.	ci.	,529	103,	22,	s. e.	do.	,501	97,3	16,4	do.	do.	,529	81,5	4,8	do.	do.	,581	83,8	5,	e.	cl.		
9	,547	83,5	3,3	do.	cl.	,592	92,5	9,5	s. e.	cu.	,492	98,	13,	do.	do.	,448	96,3	11,1	do.	ci.	,433	89,5	6,3	do.	do.	,604	83,8	1,1	s. e.	cu.	0,45	0,25
10	,502	81,	3,3	s.	cu.	,516	93,	9,1	s.	do.	,422	96,3	10,6	do.	ci.	,366	95,	9,8	s.	cis.	,408	90,	7,8	s.	do.	,475	88,	1,2	do.	cic.		
11	,433	76,5	2,3	s. e.	n.	,473	86,	4,1	s. e.	cis.	,407	96,8	13,8	s.	do.	,386	96,	11,3	s. e.	do.	,385	89,	6,3	s. e.	do.	,471	80,8	7,8	n. w.	rn.		
12	,437	81,5	4,	do.	cy.	,531	88,	6,8	do.	cu.	,453	91,3	7,4	s. e.	cu.	,439	90,	6,8	do.	cu.	,439	86,5	4,6	do.	cis.	,505	84,5	2,5	s.	cic.	0,50	0,36
13	,365	83,3	3,6	do.	cis.	,548	85,	4,8	n. e.	cis.	,488	94,5	12,3	do.	do.	,462	92,3	10,1	do.	cis.	,436	76,5	1,8	n. e.	n.	,523	78,2	3,2	n.	rn.	1,32	1,24
14	,399	76,	1,8	s.	n.	,537	86,	5,3	s.	cu.	,449	95,5	11,6	do.	do.	,434	94,5	11,	do.	cu.	,407	88,	6,1	s. e.	cu.	,487	85,	4,	s. e.	cu.		
15	,442	81,7	3,2	s. w.	cu.	,511	86,5	6,3	w.	cis.	,439	91,5	8,8	n. e.	cis.	,453	80,	6,1	n. w.	n.	,413	77,	2,5	cm.	n	,491	80,8	5,	do.	rn.	0,87	0,77
16	,467	78,3	3,1	s.	cus.	,522	92,5	4,8	s. w.	do.	,461	90,	9,5	s.	do.	,442	88,5	5,8	s.	cis.	,431	85,	4,8	do.	cis.	,510	84,5	4,5	do.	cu.	0,42	0,37
17	,504	81,7	1,5	s. e.	cis.	,556	82,5	4,3	e.	do.	,479	89,	5,5	s. e.	do.	,459	88,	5,3	do.	do.	,475	84,5	4,	s. e.	cus.	,540	84,2	4,2	s. w.	cus.		
18	,583	81,	2,8	n. e.	do.	,623	89,	7,5	n. e.	cu.	,601	79,	2,5	cm.	rn.	,560	79,7	3,	e.	n.	,573	79,7	2,5	n. e.	cis.	,545	81,	3,6	cm.	cis.		
19	,621	79,	1,8	do.	n.	,761	86,5	6,5	do.	do.	,596	79,	1,5	n. e.	do.	,567	81,	2,6	n. e.	cus.	,571	81,	2,3	cm.	do.	,626	81,2	2,7	do.	cl.		
20	,610	79,5	1,8	s. e.	rn.	,631	87,5	6,6	s. e.	do.	,548	86,7	6,	s.	cus.	,539	87,8	6,8	s. e.	cis.	,545	84,	4,1	s. e.	ci.	,616	82,3	3,9	s. e.	do.	0,20	0,17
21	,593	79,7	2,2	do.	cus.	,637	81,5	4,5	s.	do.	,578	90,8	11,3	s. e.	do.	,551	90,5	9,8	do.	cu.	,553	85,	5,8	do.	cu.	,629	82,2	3,2	e.	do.		
22	,517	78,	1,8	do.	n.	,656	82,8	3,8	s. e.	cis.	,593	85,3	4,3	s.	n.	,558	88,5	8,6	do.	do.	,549	85,3	5,6	do.	do.	,633	82,8	3,6	do.	do.		
23	,611	80,	1,3	do.	cus.	,643	89,3	7,6	do	cu.	,545	89,5	8,5	s. e.	cis.	,513	90,3	8,6	do.	do.	,510	87,	6,8	do.	ci.	,612	84,1	4,5	s. e.	cu.	0,22	0,14
24	,572	81,	1,8	do.	cu.	,602	90,5	7,3	do.	do.	,529	81,5	3,3	s	n	,525	80,5	2,8	n.	n.	,535	81,	2,8	s.	cus.	,551	82,8	4,	s.	cl.		
25	,538	81,	2,3	do.	cus.	,574	86,5	5,8	do.	do.	,480	85,5	6,	w. e.	do.	,461	84,8	5,1	cm.	cis.	,465	85,5	4,8	cm.	do.	,544	83,2	3,4	s. e.	do.	0,18	0,10
26	,495	80,	1,8	do.	cu.	,501	90,	8,	do.	do.	,425	97,3	13,8	s. e.	cu.	,422	96,	13,5	s. e.	cu.	,440	88,	7,5	s. e.	cu.	,498	84,	4,5	s.	do		
27	,459	81,	2,3	n. e.	cus.	,522	89,5	7,8	n. e.	do.	,424	86,7	6,	n. e.	n.	,422	82,8	3,6	n. e.	n.	,426	81,3	1,6	n. e.	cis.	,502	85,3	6,	e.	do.		
28	,457	82,	3,3	do.	cu.	,506	85,5	6,3	do.	do.	,416	88,3	7,8	do.	cu.	,377	87,	6,3	do.	cis.	,425	85,	5,3	do.	ca.	,445	84,	5,	do.	do		
29	,416	80,3	1,4	do.	cus.	,467	85,3	4,3	do.	cis.	,409	88,	7,	do.	cis.	,395	87,	5,5	do.	do.	,411	81,7	3,	do.	cis	,457	82,	2,9	n. e.	cu.		
30	,442	79,5	1,8	cm.	rn.	,458	87,5	6,	do.	cu.	,387	83,3	3,8	do.	n.	,358	81,5	1,3	e.	cus.	,364	82,3	2,1	cm.	do.	,420	81,5	2,6	s.	cl.	0,10	0,08
Mean,	29,515	80,8	2,5			,573	89,0	7,5			,460	92,4	10,4			,467	90,6	8,9			,476	85,5	5,6			,526	83,4	3,9			4,26	3,48

Abbreviations. In the column "wind," small letters have been used instead of capitals; *cm.* means *càlm.* In the column "aspect of the sky," *cy.* is *cloudy; cl. clear;* *cumulo stratus; cc. cirro-cumulus; n. nimbus;*

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I.—*Translation of a Tibetan Fragment, by Mr.* Csoma de Körös, *with remarks by* H. H. Wilson, *Secy.*

(Read, July 4th.)

In the 9th volume of the Gyut class of the Kahgyur occurs the original of a Tibetan fragment, which created in the beginning of the last century a lively sensation amongst the learned men of Europe, and the history of which furnishes an amusing instance of the vanity of literary pretensions, and of the patience and pain with which men of talent and erudition have imposed upon themselves and upon the world.

In the end of the 17th and beginning of the 18th century, the Russians in their incursions into Siberia came upon various deserted temples and monasteries, in some of which considerable collections of books were deposited. These were in general destroyed or mutilated by the ignorant rapacity of the soldiery, but fragments of them were preserved, and found their way as curiosities to Europe.

Amongst these, some loose leaves, supposed to have been obtained at the ruins of Ablaikit, a monastery near the source of the Irtish, were presented to the emperor Peter the Great. Literature being then at a low ebb in Russia, no attempt was made to decypher these fragments, and they were sent by the Czar to the French Academy, whose sittings he had attended when at Paris, and who deservedly enjoyed the reputation of being the most learned body in Europe. In 1723, the Abbé de Bignon, on the part of the Academy, communicated to the Czar the result of their labour, apprising him, that the fragments sent were portions of a work in the Tibetan language, and sending a translation of one page made by the Abbé Fourmont with the help of a Latin and Tibetan Dictionary in the Royal Library. The letter was published in the Transactions of the Academy of St. Petersburgh, and the text and translation reprinted by Bayer in his Museum Sinicum. Müller in his Commentatio de Scriptis Tanguticis in Siberiâ repertis—Petropoli, 1747, criticised Fourmont's translation, and gave a new one of the first lines, prepared with the double aid of a Tangutan priest, or Gelong, who rendered it into Mongol, and a Mongol student of the Imperial College, who interpreted that version to Müller. The original was also engraved in the Transactions of the Leipsic Academy. It was reprinted with corrections and additions and a new translation by Giorgi in his Alphabetum Tibetanum, and has recently been made the subject of animadversion by Mons. Remusat, in his Recherches sur les Langues Tartares. Of the previous performances, M. Remusat thus speaks: "On avoit d'abord admiré la profonde erudition qui avoit permis à Fourmont de reconnoitre seulement la langue dans laquelle le volume etoit ecrit: on a vanté depuis celle de Giorgi, qui avoit rectifié et le texte et la traduction. Je ne sais comment on peut traduire ou corriger un texte qu'on n'est pas même capable de lire. Il n'y avoit rien d'admirer dans tout cela: interprétes et commentateurs, panegyristes et critiques tous etoient presqué egalement hors d'etat, je ne dis pas d'entendre une ligne, mais d'epéler une syllabe du passage sur lequel ils disertoient.

The consequence was what might have been expected, and the attempts at translation and correction were most ludicrously erroneous. The greatest liberties possible were taken with the words, and letters were inserted or omitted at pleasure, in order to make them approximate to those terms which appeared most like them in the imperfect dictionaries possessed by the translators. After all, the translation was not only unlike the original, but unlike common sense; and as was remarked of Fourmont's version by the President de Brosses, the Latin was quite as unintelligible as the Tangutan. The following specimens of the first lines of the different versions will show that the remark was applicable to all as well as to the first.

Fourmont's Translation.

"Attritâ fortitudine quisnam brevis equus frigoris vita destruatur (pro) spiritu inest putredo. Contritus oratne? hoc est irrisio omnes vident: orat avis contrita? morbida? non scit (non potest amplius) os aperire legis (ratiocinationis)."

This must have puzzled the Czar and his academy quite as much as the original; and as Remusat observes, the Latin was of marvellous use to the translator. Fourmont would not have dared to write a syllable of such nonsense in French.

The manner in which Fourmont was led to such a strange misrepresentation of the original is explained by Mons. Remusat, from whom we may take one instance as a specimen—Thus of the word brevis equus. The MS., M. Remusat says, was read by Fourmont *Tsru pá té*, (Mr. Csoma has *ch'hud-pá-des.)* He found in the Dictionary *chung-pá* signifying 'short' and *r-ta* meaning 'a horse', and these being the nearest approach to the syllables before him, he adopted as essentially the same, and rendered them accordingly.

Müller's Translation.

"Firma conscientiâ mediante omnia parvi pendendo in principio vivente cuicumque auxilium oritur inde. Quibus consummatis futurum quid nemini notum est. Religio tota namque religionis explicatio. Magnates autem intellectu (suo) ea non comprehendunt."

The matter has not been made much more distinct by the aid of the Tangutan monk and Mongolian student.

Giorgi's Translation.

"Misericordia recreat et a cruciatibus absolvit Summus protector viventes omnes qui eam adoratoribus suis revelat. Benefici largitoris virtutem sciunt omnes, sed orationis invocationisque vim et efficaciam exponere et aperire nesciunt: nomen ea exprimit arcanum illius legis quæ lex est spirituum, &c."

How far either of these expresses the sense of the opening of this fragment, may now be duly appreciated by the perusal of the following.

Mr. Csoma's Translation.

[*Chom dan dás*] "addressed his mind to meditation upon the affairs of animate existences. The ignorant do not perceive the moral signification of moral things."

Not a word of this appears in the preceding versions. Its accuracy speaks for itself; but in confirmation of its correctness, the original Tibetan, both in Tibetan and Roman characters, is here reprinted, as well as the translation of the entire passage. Those to whom the prosecution of the subject is of interest may readily estimate for themselves the superiority of Mr. Csoma's labours, by comparing them at length with the text and translations of Fourmont and Giorgi in the Alphabetum Tibetanum.

Before proceeding to the new translation, however, a few further remarks upon the subject of the old are necessary.

The Society is apprised of the general character of the contents of the Gyut portion of the Kahgyur, to which our original belongs, and will not be surprised, therefore, to learn that a great part of the extract consists of Mantras, or mystical formulæ, or invocations, and these not in Tibetan but in Sanscrit. Now, neither of the former translators had any knowledge of Sanscrit, nor was aware that these passages were in that language. Fourmont considered them to be Tibetan, as well as the rest, and very deliberately translated the Sanscrit words with the help of his Tibetan Dictionary. As he could not find the exact words, however, he was content to take those most like them; and at the expence of a few letters omitted or inserted, he contrived equivalents for the *mantras* equally satisfactory with those he had devised for the other sentences of his text. Thus he converts the Mantra *Nama Sámanta Buddhánam,Sámantanugate,varaja, Dhermannirgata, Mahá Mahá Swáhá*, into *Na-ma Sam-tam Pou-tra Nan-hi-tsí cha-ya r-pa sa-n-ha*, which he translates, "Ægrotavit (restitit morbo) Samtam poutra. per annum dum hujus mundi evanesceret, &c." The same importing, as far as such things admit of being translated, "Salutation to the chief *Buddhas.* Obtainer of pre-eminence; best born; who proceeded from virtue. Great great adoration."

Giorgi is more upon his guard, and discovers that the mantras are not in ordinary Tibetan. He has no suspicion however of their real character, and calls them magical expressions. He prints them therefore without any translation, but nevertheless pretends to explain their purpose in his notes on the text, in which he assembles a crude mass of extravagancies from Hebrew, Chaldaic, Coptic, and Syriac, and compares these Tibetan characters to the mystic numbers and letters of the ancient Scythians and Egyptians, and of some of the early Sectarians and Heretics of the Christian Church. This display of unprofitable erudition is in fact only a shelter for his ignorance, and he knows no more about the matter than did Fourmont, without having the merit of his blundering simplicity.

We shall now proceed to the translation.

Translation of an Extract from the T. or 9th volume r,Gyut class of the Káh-gyur, the 337—339 leaves.

Ignorant men do not know that all these (doctrines) have been thus explained by *Chom dan dás* (the Supreme), the knower of all and possessor of all, who in remote ages, through compassion for all living beings, addressed his mind to meditation upon the affairs of animate existences. (a Stanza) The ignorant do not perceive the moral signification of moral things. It has been distinctly taught (by *Buddha)*, that the essential principle of morality is the non-entity of matter.

The performer of mystic rites must always dwell upon that idea, and discharge his duty accordingly.

This was a gradual and comprehensive explanation of the means by which noxious things (or evil spirits) may be appeased.

Then CHAKNA DORJE (S. VAJRAPÁNI) and other *Dor,je* bearers, (*Vajradharas*, bearers of thunderbolts), KUNTU-ZANGPO (SÁMANTA BHADRA), and other *Chang chub sempás* (Bodhisatwas) having adored *Chom dán das*, NAM PAR-SNANG-DSAT (the Bhagaván or Lord VAIROCHANA), being desirous to express each in his own *mantra* or invocation, his mystic praise, and how they judged in this great circle the source of infinite mercy, of the pure way of access to the root of all things, requested permission from CHOM DAN DAS.

Then CHOM DAN DAS having granted them permission, and bestowed his benediction upon them, thus spake, "Illustrious children, accordingly as you judge of the root of things (the first moral being), utter your mystic sentences for the purification of all animate existence."

Then the Bodhisatwa KUNTU ZANGPO, being immersed in that profound meditation, which is called the region of the ornamental (characteristic) of a Buddha, uttered this mystical sentence (mantra) of irresistible efficacy.

Nama Sámanta Buddhánam, &c. Glory to the exalted Buddhas! obtainer of eminence; best born; who proceedest from virtue—great, great adoration. This is the mantra of KUNTU ZANGPO.

[For the rest of this, and for the Sanscrit of the other Mantras, see the passages in Italics in the Tibetan extract in Roman character.]

Then the Bodhisatwa CHAMPA (MAITREYA) after being immersed in the profound meditation called "the universally manifested beneficence," thus uttered his own radical prayer *(vija mantra)*, *Nama Sámánta Buddhánám, &c.* Glory to the exalted Buddhas; conqueror of the invincible; possessor of the fame of all purity—adoration. This is the prayer of CHAMPA.

Then the Bodhisatwa NAM-KHE NYING PO (ÁKÁSA GERBHA) being immersed in the profound meditation called "the purest region," uttered through mystery, Glory to all the Buddhas; wonderful holder of blessings; who art possessed of equal elevation with the heavens—sulutation. This is the prayer of NAM-KHE NYING PO.

Then the Bodhisatwa GRIPPA THAM CHET NAM-PAR SELVA (S. Sarva Anavarana Vishkambhi) being immersed in the meditation, called "the power of great mercy," uttered his mystery, Glory to the exalted Buddhas; thou who art not separated; connected with the Aswattha tree. *Trám Trám*, *Rám Ram*—salutation.

[This is one of the Mantras, of which there is no making any sense; some allusion is implied probably, a knowledge of which is necessary to explain the words. The concluding syllables are merely ejaculatory monosyllables.]

Then the Bodhisatwa Kuntu Chenresik Vangchuk (S. Avalokiteswara) being immersed in the meditation called (after him) Kuntu Chenresik, or " looking every where with clear vision," thus together with his followers uttered his own radical mystery, Glory to the exalted Buddhas: universal *Tatháagata*, Avalokitá; abounding with clemency —Ra-ra-ra-hum-jah—salutation. This is the mantra of Chenresik.

Glory to the exalted Buddhas, Jang-jang sa,—salutation. This is the mantra of Thu-chhen t'hop (S. Maha Sthana Prápta).

Glory to the exalted Buddhas ; offspring of clemency, Tárá, by whom existence is traversed—salutation. This is the Mantra of the Lhamo Grol ma, (the goddess Tárá.)

Glory to the exalted Buddhas : frightener of every fear. Hum, Sphotaya—salutation. This is the mantra of Kronyer Chen Má (S. Bhrikuti.)

Glory to the exalted Buddhas : born from all the *Tathágatas ;* decorated with a chaplet of Lotus flowers—salutation. This is the Mantra of *Kos Kar Chen* (S. Pándura vásiní), the goddess clothed in white garments.

Glory to the exalted Buddhas: Hum-Eat-bind-*Sphotaya.* This is the Mantra of a *Ta-grin.* (S. *Kinnara*).

Then the Bodhisatwa Sahi nying po (S. Kshiti gerbha) being immersed in the meditation called " the region of reasoning," uttered this mystery, Glory to the exalted Buddhas, Ha ha-ha Putanu—salutation. This is the mantra of Sahi nying po.

Then the Bodhisatwa Jam-pal Zhon nur gyurzh pa (S. Manju Sri Kumara bhatta bhuta) being immersed in the deep meditation called " the miraculous transformation by the blessings of Buddha," thus uttered his own radical mystery, Glory to the exalted Buddhas. He-he-he, the young prince, Liberation. Communion.—Remember, remember, resist. Swaha. This is the Mantra of Jam-pal.

Then Chakna Dorje (S. Vajrapáni), the lord of those who deal with mysteries, being immersed in the deep meditation called " the invincible," thus uttered together with his followers his own radical mystery, Glory to the exalted *Vajras*, fierce and greatly wrathful. *Hum.* This is the mantra of Chakna Dorje.

(Similar mantras by the goddess Mámakí and five others follow, occupying three lines).

Then the Lord Sakya Thup-pa (Muni) being immersed in the deep meditation called " the mine of precious things," thus with his attendants uttered his own mystery, Glory to the exalted Buddhas ; reliever of all distress; master of all virtue. Equal, equal to the heavens—salutation. This is the Mantra of Sakya Thup-pa).

(Similar mantras are continued through the following page of the same leaf.)

The Tibetan Text in Roman Character.

Note.—The letters in italics at the commencement of any syllable, are omitted in the pronounciation. The Sanskrit passages or *mantras* are printed in italics.

Mi *b*lun po dé dag gis *h*di ltar *b*chom-*l*dan-*h*das thams chad *m*khyen pa chhos thams chad la *m*ñ ah *br*n yes pa Sems chan gyi don thogs “[*]par thugs su chhud pa dès *s*ñon sems chan *r*nams la phan par *B*zhed nas *h*di dag thams chad *b*shad do zhes bya var ni mishes so.

Chhos *r*nams kyi ni chhos kyi *m*ts'han *b*Lun po dès ni dé mi shes; Chhos *r*nams kun gyi *m*ts'han nyid ni, stong pa nyid du yang dag *g*sungs sñags pa *r*tag tu der *g*nas nas, rab tu ñes par las byaho. *B*gegs zhi var bya va rim par phyé vá sté *r*gyas paho.

Dé-nas phyag na *r*do *r*jé la sogs pa *r*do *r*jé *h*dsin pa dé dag dang Kun tu *b*zang po la sogs pa byang chhub sems *D*pah dì *r*nams kyis *b*chom-*l*dàn-*h*das *r*nam-par-snang-*m*dsad la phyag *h*ts'hal nas snying *r*jè chhen po *h*byung vahi *d*kyil *h*khor chhen po *h*dir chhos kyi *d*vyings *r*nam par dag pahi *S*go ji *l*tar *r*togs pa rang rang gi ts'hig tu *br*jod pahi ts'hig gis *g*sang *s*ñags *r*nams *s*mra var *h*dod nas *b*chom-*l*dan-*h*das la *g*sol va *b*tab po dé nas *b*chom-*l*dan-*h*das *r*nam par snang *m*dsad kyis byang chhub sems *d*pah dé dag dang *r*do *r*jé *h*dsin dé dag la mi nyams pahi chhos nyid du byin gyís *br*labs nas *b*kah *s*tsal pa: Rigs kyi bu dag chhos kyi vyings ji *l*tar *r*togs pa *b*zhin sems chan gyi khams *r*nam par *s*byang vahi *g*sang sñags kyi ts'hig *r*nams *s*mros-shig.

Dé-nas dé-hí ts'hé byang chhub sems *D*pah Kun tu *b*zang pos sangs *r*gyas kyi yul zhes bya vahi ting gé *h*ds'in la *s*nyoms par zhugs nas *St*obs thogs pa med pahi *g*sang sñags *s*mras pa: *Namah Sámanta Baddhánám; Samantánugati Varaja, Dhermanirgata, Mahá Mahá. Swáhá.* Kun tu *b*zang po hiho.

Dé-nas byang chhub sems *d*pah byams *p*as byamspa chhen po kun tu *m*ñon par *h*byung va zhes bya vahi ting gé *h*dsin la *s*nyoms par zhugs nas rang gi *s*nying po *s*mras pa: *Namah Samanta Buddhánám, Ajitanajaya, Sarvva Satwayashayánugata, Swáhá.* Byams pahi ho.

Dé-nas byang chhub sems *d*pah nam *m*khahi *s*nying po *r*nam par dag pahi yul zhes-bya vahi ting gé *h*dsin la *s*nyoms par zhugs nas *g*sang sñags *s*mras pa: *Namah Samanta Buddhánám, A'kásha somatánugata Vichittram Varadhara, Swáhá.* Nam *m*khahi *s*nying pohi ho.

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[*] The Tibetan fragment of Giorgi commences here.

Dé-nas byang-chhub sems *d*pah *s*grib pa thams chad *r*nam par sel va *S*nying *r*jé chhen pohi *St*obs zhes bya vahi ting gé *h*dsin la *s*nyoms par zhugs- nas *g*,sang sñags *s*mras pa : *Nama Samanta Buddhánám, A'swaáta hrita, Avyudgata, Trám Trám, Ram, Ram, Swáhá.* *S*grib ba thams chad *r*nampar sel vahi ho.

Dé nas byang chhub sems *d*pah kun tu spyan ras *g*zigs *d*vang phyug spyan ras *g*zigs zhes bya vahi ting gi *h*dsin-la *s*nyoms par zhugs nas rang gi *s*nying po *h*khor dang *b*chas par smras pa: *Namah Samanta Buddhánán, Sarvva Tathágata, Avalokita, Karaná, Máyá, Ra Ra Ra, Hum jah, Swáha.* Spyan ras *g*zigs *d*vang phyug gi ho.

Namah Samanta Buddhánám, jang jangsa,Swáhá. *M*thu-chhen-thob pahi ho.

Namah Samanta Buddhánám, Karnnodbhavé Tárí Taráni, Swáhá. Lhá mo *s*grol ma hi ho.

Namah Samanta Buddhánám,Sarvva Bhaya Trásaái Hum spho'taya, swáhá. Khro G,nyer chan mahi ho.

Namah Samanta Buddhánám, Tathágata Vishwayá, Sambavé, Padma málini, Swáhá.

Gos *d*kar-chan gyi-ho. *Namah Samanta Buddhánám, Hum khada bandha spho'taya, Swáhá.* *R*Ta *N*grin gyi ho.

Dé-nas byang chhub sems *d*pah-sahi *s*nying po *r*do rje mi shigs pa r,tog pahi yul zhes bya vahi ting gé *h*dsin las *s*nyoms par shugs nas *g*sang sñags *s*mras pa : *Namah Samanta Buddhánám Ha Ha Ha, Putánu, Swáhá.* Sahi *s*nying pahi ho.

Dé-nas byang chhub sems *D*pah *h*jam *d*pal *g*zhon nur gyur pas sangs *r*gyas kyi byin gyis *br*labs *r*nam par *h*phrul pa zhes bya vahi ting gé *h*dsin la *s*nyoms par zhugs nas rang gi *s*nying po *s*mras-pa : *Namah Samanta Budhánám, Hé Hé Hé, Kumaraka, Vimukti, Sathírthati,S mara smara, Prathihana, Swáhá.* *H*jam *d*pal gyi ho.

Dé nas *g*sang va pahi *b*dag po Phyag na *r*do *r*jé mi *h*pham pazhes bya vahi ting gé *h*dsin la *s*nyoms par zhugs nas rang gi *s*nying po *h*khor dang *b*chas pa *s*mras pa: *Namah Samanta Vaj'ránán, Chánda Máhá*[*]" *Ros'hana Hum.* Phyakna *r*do *r*jéhi ho.

* * * *

Dé-nas déhi ts'hé. Chom-*l*dan-*h*das Shákya Thub pas rin po chhehi *h*byung gnas zhes bya vahi ting gé *h*dsin la *s*nyoms par zhugs nas nyid kyi *s*nying po *h*khor dang *b*chas pa *g*sungs pa : *Namah Samanta Buddhánám,Sarvva klésha nishuddhána, Sarvva Dherma vahi prapta, Gagana sama sama, swáhá.* Shákya Thub pahi ho.

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[*] Giorgi's fragment ends here in the middle of the word *mahá,* the remaining passage is added to complete the sense.

Text of the Kah-Gyur. *Gyut 9th. Vol. leaf 337-339. vide Alphabet Tib. p.663-752.*

མི་ཟླུན་པོ་དེ་དག་གིས་འདི། ལྷར་བཅོམ་ལྡན་འདས་ཐམས་ཅད
མཁྱེན་པ། ཆོས་ཐམས་ཅད་ལ་མངའ་བརྙེས་པ། སེམས་ཅན་གྱི་དོན།
རྟོགས་〃པར་ཐུགས་སུ་ཆུད་པ་དེས་སྔོན་སེམས་ཅན་རྣམས་ལ
ཕན་པར་བཞེད་ནས་འདི་དག་ཐམས་ཅད་བཤད་ཏོ་ཞེས་བྱ
བར་ནི་མི་ཤེས་སོ།། ཆོས་རྣམས་ཀྱི་ནི་ཆོས་ཀྱི་མཚན།། ཟླུན་པོ
དེས་ནི་དེ་མི་ཤེས།། ཆོས་རྣམས་ཀུན་གྱི་མཚན་ཉིད་ནི།། སྟོང
པ་ཉིད་དུ་ཡང་དག་གསུངས།། རྟོགས་པ་རྟག་ཏུ་དེར་གནས
ནས།། རབ་ཏུ་ངེས་པར་ལས་བྱའོ།། བགེགས་ཞི་བར་བྱ་བ
རིམ་པར་སྤྱེ་བ་སྙེ་རྒྱས་པའོ།། དེ་ནས་ཕྱག་ན་རྡོ་རྗེ་ལ་སོགས
པ་རྡོ་རྗེ་འཛིན་པ་དེ་དག་དང་ཀུན་ཏུ་བཟང་པོ་ལ་སོགས་པ་བྱང
ཆུབ་སེམས་དཔའ་དེ་རྣམས་ཀྱིས་བཅོམ་ལྡན་འདས་རྣམ
པར་སྣང་མཛད་ལ་ཕྱག་འཚལ་ནས། སྙིང་རྗེ་ཆེན་པོ་འབྱུང
བའི་དཀྱིལ་འཁོར་ཆེན་པོ་འདིར་ཆོས་ཀྱི་དབྱིངས་རྣམ་པར
དག་པའི་སྒོ་ཇི་ལྟར་རྟོགས་པ་དང་རང་གི་ཚིག་ཏུ་བརྗོད་པའི་ཚིག
གིས་གསང་སྔགས་རྣམས་སྨྲ་བར་འདོད་ནས་བཅོམ་ལྡན་འདས
ལ་གསོལ་བ་བཏབ་པོ།། དེ་ནས་བཅོམ་ལྡན་འདས་རྣམ
པར་སྣང་མཛད་ཀྱིས་བྱང་ཆུབ་སེམས་དཔའ་དེ་དག་དང་།
རྡོ་རྗེ་འཛིན་དེ་དག་ལ་མི་ཉམས་པའི་ཆོས་ཉིད་དུ་བྱིན་གྱིས
བརླབས་ནས་བཀའ་སྩལ་པ། །རིགས་ཀྱི་བུ་དག་ཆོས་ཀྱི

J. B. Tassin lith.

དབྱིངས་ཇི་ལྟར་རྟོགས་པ་བཞིན་སེམས་ཅན་གྱི་ཁམས་རྣམ་པར་སྦྱོང་བའི་གསང་སྔགས་ཀྱི་ཚིག་རྣམས་སྨྲོས་ཤིག །དེ་ནས་དེའི་ཚེ་བྱང་ཆུབ་སེམས་དཔའ་ཀུན་ཏུ་བཟང་པོས་སངས་རྒྱས་ཀྱི་རྒྱན་གྱི་ཡུལ་ཞེས་བྱ་བའི་ཏིང་ངེ་འཛིན་ལ་སྙོམས་པར་ཞུགས་ནས་སྟོབས་ཐོགས་པ་མེད་པའི་གསང་སྔགས་སྨྲས་པ། ན་མཿས་མནྟ་བུད་དྷཱ་ནཱན། ས་མནྟཱ་ནུ་ག་ཏེ་བ་ར་ཛེ་དྷརྨ་ནི་ར་ཛ་ཏཱ་མ་ཧཱ་མ་ཧཱ་སྭཱ་ཧཱ།། །།ཀུན་ཏུ་བཟང་པོའི་འོ།། དེ་ནས་བྱང་ཆུབ་སེམས་དཔའ་བྱམས་པས་བྱམས་པ་ཆེན་པོ་ཀུན་ཏུ་མདོན་པར་འབྱུང་བ་ཞེས་བྱ་བའི་ཏིང་ངེ་འཛིན་ལ་སྙོམས་པར་ཞུགས་ནས་རང་གི་སྙིང་པོ་སྨྲས་པ། ན་མཿས་མནྟ་བུད་དྷཱ་ནཱན། ཨ་ཛི་ཏ་ཉ་ཛེ་ཡ། སརྦ་ས་ཏྭ་ཨ་ཤ་ཡཱ་ནུ་ག་ཏ་སྭཱ་ཧཱ། བྱམས་པའི་འོ། དེ་ནས་བྱང་ཆུབ་སེམས་དཔའ་ནམ་མཁའི་སྙིང་པོ་རྣམ་པར་དག་པའི་ཡུལ་ཞེས་བྱ་བའི་ཏིང་ངེ་འཛིན་ལ་སྙོམས་པར་ཞུགས་ནས་གསང་སྔགས་སྨྲས་པ། ན་མཿས་མནྟ་བུད་དྷཱ་ནཱན། ཨཱ་ཀཱ་ཤ་ས་མ་ཏཱ་ནུ་ག་ཏ་བི་ཙི་ཏྲཾ་བ་ར་དྷ་ར་སྭཱ་ཧཱ། ནམ་མཁའི་སྙིང་པོའི་འོ།། དེ་ནས་བྱང་ཆུབ་སེམས་དཔའ་སྒྲིབ་པ་ཐམས་ཅད་རྣམ་པར་སེལ་བ། སྙིང་རྗེ་ཆེན་པོའི་སྟོབས་ཞེས་བྱ་བའི་ཏིང་ངེ་འཛིན་ལ་སྙོམས་པར་ཞུགས་ནས་གསང་སྔགས

སྨྲས་པ། ན་མཿ ས་མནྟ་བུད་དྷཱ་ནཱན། ཨཿསཏྭ་ཏ་ཧི་ཏ། ཨབྷྱུད་ག་ཏ། ཏྲཾ་ཏྲཾ་རཾ་རཾ་སྭཱ་ཧཱ། སྒྲིབ་པ་ཐམས་ཅད་རྣམ་པར་སེལ་བའི་འོ།། དེ་ནས་བྱང་ཆུབ་སེམས་དཔའ་ཀུན་ཏུ་སྤྱན་རས་གཟིགས་དབང་ཕྱུག་ཀུན་ཏུ་སྤྱན་རས་གཟིགས་ཞེས་བྱ་བ་ཏིང་ངེ་འཛིན་ལ་སྙོམས་པར་ཞུགས་ནས་རང་གི་སྙིང་པོ་འཁོར་དང་བཅས་པར་སྨྲས་པ། ན་མཿ ས་མནྟ་བུད་དྷཱ་ནཱན། སརྦ་ཏ་ཐཱ་ག་ཏ་ཨ་བ་ལོ་ཀི་ཏ། ཀ་རུ་ཎ་མ་ཡ་ར་ར་ར་ཧཱུཾ་ཛཿ སྭཱ་ཧཱ། སྤྱན་རས་གཟིགས་དབང་ཕྱུག་གི་འོ།། ན་མཿས་མནྟ་བུད་དྷཱ་ནཱན། ཛེད་ཛེདས་སྭཱ་ཧཱ། མཐུ་ཆེན་ཐོབ་པའི་འོ།། ན་མཿས་མནྟ་བུད་དྷཱ་ནཱན། ཀ་རུ་ཎོད་བྷ་ཝེ་ཏཱ་རེ་ཏཱ་ར་ཎི་སྭཱ་ཧཱ། ལྷ་མོ་སྒྲོལ་ཡམའི་འོ།། ན་མཿས་མནྟ་བུད་དྷཱ་ནཱན། སརྦ་བྷ་ཡ། ཏྲཱ་ས་ནི་ཧཱུཾ་སྥོ་ཊ་ཡ་སྭཱ་ཧཱ། ཁྲོ་གཉེར་ཅན་མའི་འོ།། ན་མཿས་མནྟ་བུད་དྷཱ་ནཱཾ། ཏ་ཐཱ་ག་ཏ་བི་ཥ་ཡ། སཾ་བྷ་བེ། པདྨ་མཱ་ལི་ནི་སྭཱ་ཧཱ། གོས་དཀར་ཅན་གྱི་འོ།། ན་མཿ ས་མནྟ་བུད་དྷཱ་ནཱན། ཧཱུཾ་ཁ་ད་བན་ཛ་སྥོ་ཊ་ཡ་སྭཱ་ཧཱ། རྟ་མགྲིན་གྱི་འོ།། དེ་ནས་བྱང་ཆུབ་སེམས་དཔའ་སའི་སྙིང་པོ་རྡོ་རྗེ་མི་ཤིགས་པ། རྟོག་པའི་ཡུལ་ཞེས་བྱ་བའི་ཏིང་ངེ་འཛིན་ལ་སྙོམས་པར་ཞུགས་ནས། གསང་སྔགས་སྨྲས་པ། ན་མཿས་མནྟ་བུད་དྷཱ་ནཱན། ཧ་ཧ་ཧ། སུ་ཏ་ནུ་སྭཱ་ཧཱ། སའི་སྙིང་པོའི་འོ།། དེ

ནས་བྱང་ཆུབ་སེམས་དཔའ་འཇམ་དཔལ་གཞོན་ནུར་གྱུར་
པས།སངས་རྒྱས་ཀྱི་བྱིན་གྱིས་བརླབས་རྣམ་པར་འཕྲུལ་
པ་ཞེས་བྱ་བའི་ཏིང་ངེ་འཛིན་ལ་སྙོམས་པར་ཞུགས་ནས་
རང་གི་སྙིང་པོ་སྨྲས་པ། ན་མཿས་མནྟ་བུད་དྷཱ་ནཱཾ། ཧེ་ཧེ
ཧེ། ཀུ་མཱ་ར་ཀ། བི་མུཀྟི།པ་ཐྠི་ཏ། སྨ་ར་སྨ་ར། པྲ་ཏི་ཏ་ཉ
སྭཱ་ཧཱ། འཇམ་དཔལ་གྱི་འོ།། དེ་ནས་གསང་བ་པའི་བདག
པོ་ཕྱག་ན་རྡོ་རྗེ་མི་འཕམ་པ་ཞེས་བྱ་བའི་ཏིང་ངེ་འཛིན་
ལ་སྙོམས་པར་ཞུགས་ནས། རང་གི་སྙིང་པོ་འཁོར་དང་
བཅས་པ་སྨྲས་པ། ན་མཿ ས་མནྟ་བཛྲ་ཎཱཾ། ཙཎྜ་མ་ཧཱ་རོ་ཥ
ཎ་ཧཱུྃ། ཕྱག་ན་རྡོ་རྗེའི་འོ།།

དེ་ནས་དེའི་ཚེ་བཅོམ་ལྡན་འདས་ཤཱཀྱ་ཐུབ་པས་རིན་པོ
ཆེའི་འབྱུང་གནས་ཞེས་བྱ་བའི་ཏིང་ངེ་འཛིན་ལ་སྙོམས་
པར་ཞུགས་ནས་ཉིད་ཀྱི་སྙིང་པོ་འཁོར་དང་བཅས་པ་
གསུངས་པ། ན་མཿ ས་མནྟ་བུད་དྷཱ་ནཱཾ། ས་རྦ་ཀླེ་ཤ་ནི་ཥུ་ད
ན། ས་རྦ་དྷརྨ་བ་ཤི་ཏཱ་པྲཱཔྟ་ག་ག་ན་ས་མ་ས་མ་སྭཱ་ཧཱ། ཤཱཀྱ
ཐུབ་པའི་འོ།།

II.—*Estimate of the Risk of Life to Civil Servants of the Bengal Presidency in each year of their Residence in India. By* H. T. Prinsep, Esq. *Secretary to Government, &c. &c.*

The Number of the Gleanings in Science for September, 1831, contained an article " On the Duration of Life in the Bengal Civil Service" with several tables, exhibiting the results at which the author had arrived by various processes of calculation. The subject is of first-rate interest to all residents in India, and the manner in which these tables have been given forth is likely to lead to their being taken upon trust as of full authority. The results however are too startling to be admitted without a strict examination of the data, which are the basis of calculation; and as the registers and statements from which these profess to be taken were compiled principally in my office, and have recently been brought to more accuracy than they possessed when first prepared and furnished to the Finance Committee, and to other departments and public officers, I have thought it my duty to recast them myself into a tabular form, so as to allow the results afforded by them to be compared with those asssumed in the article in question. I am sorry to say, that they differ too widely to be adjusted by any compendious explanation of discrepancies; and, as I have found reason moreover to doubt whether any accurate conclusions can be drawn from the specific results which are there exhibited as the basis of calculation, I am compelled to adopt somewhat different forms. For these reasons, no less than for assurance, that the data have not been lightly assumed, my first table has extended to a size and contains a quantity of detail which may prove inconvenient.

It is necessary to premise that the materials we possess are: first, the appointments made in each year by the Honorable Court of Directors. Secondly, the arrivals in India under these appointments; which are necessarily irregular in date, and not equal in number with the nominations. Thirdly, the retirements; which is rather a wide class, including as well those who absolutely resign, as those who leave the country upon temporary leave, and overstay the period of five years fixed by Act of Parliament as the limit for absence from India without loss of the service. Civil Servants on Furlough, or in Europe, under temporary leave, being still borne on the registers, and their deaths being reported, are considered as still in the service, and though dying perhaps in Europe or on shipboard would be entered amongst the deaths. The dismissals from service are included in the head of Retirements. Fourthly, Deaths; the reports of which, with the dates, are ordinarily on record;

or, if not so, the time can be ascertained with sufficient accuracy by a reference to the books of the General Treasury, which show up to what date salary has been drawn and arrears adjusted with executors. Deaths on shipboard, when not reported, are considered as of the year in which the ship left India.

From the above materials, the Court's annual list of appointments being taken as a ground-work, every individual name has been traced, and the fate of the person who bore it, ascertained to the time of his death, or of his quitting the service. The following statement exhibits the result in one view with the date by the calendar year of each death or retirement. If any one should desire to know the names of the individuals represented by the figures of this table, that information also is at his service in the registers that have been compiled, together with the specific ground of placing in each instance. Our present business however is with the results in abstract.

This table corresponds with that of page 273 in the article of the GLEANINGS referred to, only so far as that the number of appointments between 1790 and 1828 will be found to be the same. The number here is 842, to which add 11 for those who never came to India under their appointments, as noted at the foot of the table. The writer of the article assumes 852*, showing that he has followed the same registers without rejecting the non-arrivals, which, for the correct ascertainment of the proportion of deaths, should evidently have been done. The table requires to be well studied and examined, before we proceed to make deductions from the data it contains. The test or verification of its accuracy will be found in the last column, which gives the remaining servants of each year, that is, those still in the service, after deducting the deaths and retirements, up to the date of compilation, from the number of original appointments. See Table No. I.

Now, the first thing to be remarked in this table is, that the appointments being taken from the date of the dispatch of the Court of Directors, which date is not invariably the 31st December or 1st January, the period comprised in the year of appointment is not a complete year. Of the 19 men appointed in 1790, 15 only arrived in India in that year; the remainder came in 1791. But whether they arrived or not would not very much signify, if we had their life to reckon for a complete year. The material circumstance is, that the appointments were made at different dates, mostly, indeed, in the first half of the year before May; but one gentleman (Mr. Leycester) was appointed in December, 1790, and yet reckons high on the list of the year. For this last reason, added to the difficulty created by the non-arrivals, it has been deemed

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* This number is one short of the true, because there were two Robert Grahams appointed in the same year, and they were supposed to be the same person.

TABLE I.

Shewing the Appointments, Deaths, and Retirements for each year, from 1790 *to* 1832.

The figures towards the right hand of each column denote Deaths: *those on the left hand,* Retirements.

Years.	Nominations.	1790	1791	1792	1793	1794	1795	1796	1797	1798	1799	1800	1801	1802	1803	1804	1805	1806	1807	1808	1809	1810	1811	1812	1813	1814	1815	1816	1817	1818	1819	1820	1821	1822	1823	1824	1825	1826	1827	1828	1829	1830	1831	1832	Remain.	
																																													in India.	on furlough.
1790	19	..	..	..	3	..	1	1	11	..	1	..	..	1	..	..	..	..	..	..	..	1	1	1	..	..	..	..	1	..	..	..	..	1	1	..	..	..	1	..	..	..	11	..	1	
791	18	..	..	..	..	..	..	1	..	1	1	..	..	..	1	..	3	1	..	..	..	..	1	1	..	..	1	1	..	..	1	..	1	1	..	..	..	..	..	1	..	..	..	..	2	
792	18	..	..	..	..	1	..	..	..	..	1	1	..	1	..	1	1	..	..	..	..	1	2	..	1	1	1	1	..	1	11	..	..	..	..	..	..	..	..	..	..	1	..	..	1	
793	12	..	..	..	..	..	..	..	..	..	..	2	..	..	..	1	1	..	..	1	..	..	1	1	..	1	..	1	..	1	..	..	..	..	..	..	..	..	..	..	..	..	..	..	2	
794	26	..	..	..	..	1	..	..	1	..	1	..	..	1	2	..	..	1	3	1	1	..	1	12	..	1	1	..	..	1	..	1	..	..	1	1	..	..	1	11	..	..	1	..	0	
795	30	..	..	..	..	..	..	..	..	..	..	1	1	..	..	..	1	..	..	1	11	..	..	..	1	..	11	1	21	12	1	11	1	..	..	..	1	..	1	1	1	..	1	1	4	1
796	24	..	..	..	..	..	..	..	..	1	..	..	1	1	1	..	..	1	1	2	1	..	1	..	1	..	..	..	1	..	1	..	..	..	3	..	..	..	2	1	..	..	..	..	5	
797	20	..	..	..	..	..	..	..	..	2	1	1	2	1	..	1	..	..	..	..	1	..	..	..	11	..	1	..	..	..	..	..	1	..	..	..	..	..	1	..	1	..	..	..	3	1
798	32	..	..	..	..	..	..	..	..	1	1	1	11	..	..	..	1	1	..	..	..	..	1	1	1	..	21	1	1	1	2	1	12	1	1	..	1	2	..	..	1	..	11	..	4	1
799	17	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	11	..	1	1	..	..	1	..	..	..	1	..	..	..	21	..	2	1	..	2	..	..	..	..	..	..	..	..	3	
800	18	..	..	..	..	..	..	..	..	..	..	..	11	1	..	..	..	..	1	..	1	..	..	..	..	1	..	..	..	11	..	..	..	1	1	..	..	1	1	1	..	..	1	..	4	
801	20	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	2	..	..	1	..	..	..	..	2	..	1	..	1	..	..	..	..	11	..	1	1	1	..	1	..	..	..	1	6	
802	24	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1	1	2	..	..	..	1	1	..	..	..	..	..	..	1	1	1	..	..	2	1	1	..	..	1	1	..	3	1	5	
803	26	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1	..	..	..	..	..	..	..	..	..	..	..	1	1	..	1	1	1	1	1	2	1	..	..	..	1	1	1	..	12	2
804	17	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1	..	..	1	..	..	1	..	..	..	..	1	1	..	..	1	..	1	2	1	11	..	..	1	1	3	1
805	32	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1	1	..	12	..	1	11	..	2	1	1	..	..	1	..	..	..	1	..	..	..	..	..	..	1	11	1	14	2
806	16	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1	..	1	..	..	..	1	..	..	..	1	..	..	..	..	..	..	2	..	..	..	..	..	1	..	9	2
807	17	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1	..	..	1	..	..	..	..	1	1	1	..	..	..	..	..	..	1	1	1	..	..	..	..	..	8	1
808	20	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1	..	1	..	..	..	..	..	1	1	..	..	..	1	..	..	..	..	..	1	1	1	1	..	..	11	3
809	12	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1	1	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1	..	8	
810	17	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1	..	..	..	12	..	1	2	..	..	..	..	..	..	..	..	..	..	..	..	1	..	9	
811	24	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1	1	..	..	11	1	2	..	..	..	..	1	..	..	..	..	..	16	
812	21	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1	1	..	..	1	2	..	1	3	1	..	1	..	..	..	1	..	..	..	..	..	9	2
813	21	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1	..	1	1	..	..	1	..	1	..	..	..	..	..	3	..	..	13	1
814	28	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1	..	..	1	..	21	..	..	1	1	..	..	1	..	..	11	..	1	17	
815	9	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1	..	1	1	..	..	..	..	..	..	..	..	..	..	1	..	5	
816	26	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1	1	1	..	..	1	1	1	..	1	..	..	..	..	..	19	3
817	18	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1	11	..	..	..	..	1	..	..	..	..	..	..	..	13	3
818	17	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	2	2	1	..	..	1	..	..	..	..	..	..	..	11	1
819	19	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1	..	1	1	..	1	..	..	..	15	3
820	17	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	2	11	..	..	..	1	..	..	..	1	..	..	11	3
821	17	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1	..	..	..	..	..	2	..	..	14	2
822	13	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1	1	..	..	..	..	..	..	1	..	10	1
823	13	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1	..	..	1	..	..	..	..	10	1
824	20	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	2	..	1	..	..	..	17	
825	20	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1	..	..	..	..	..	..	19	
826	33	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1	..	2	1	1	1	1	26	1
827	50	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1	2	1	..	5	..	41	
828	41	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1	1	..	39	1
829	44	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..			41	
830	25	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	25	4
831	29	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1	..	28	
Total,	940																																											Total remaining in the Service on the 1st July, 1832,	513	

* We have been compelled to omit the surviving residents of each calendar year from this Table, from the impossibility of compressing so much into the space allowed. The omission is immaterial, as the same numbers are given in Table II. For the same reason we have been obliged to put the deaths and retirements in juxtaposition in the same column, but as the numbers are in every case units, there can be no difficulty in distinguishing them.

TABLE II.

Survivors of each year of service, commencing with the 1st Jan. following the date of nomination.

Years.	Nominations.						Y	e	a	r	s					o	f					S	e	r	v	i	c	e.														
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41
1831	29																																									
1830	25	25																																								
1829	44	44	44																																							
1828	41	41	41	40																																						
1827	50	49	47	46	46																																					
1826	33	32	32	30	29	28																																				
1825	20	20	19	19	19	19	19																																			
1824	20	20	20	20	18	18	17	17																																		
1823	13	13	12	11	11	11	10	10	10																																	
1822	13	13	12	11	11	11	11	11	11	11																																
1821	17	17	17	17	16	16	16	16	16	16	14																															
1820	17	17	15	15	13	13	13	12	12	12	12	11																														
1819	19	19	19	19	19	19	18	18	17	16	16	15	15																													
1818	17	17	17	15	13	12	12	12	11	11	11	11	11	11																												
1817	18	18	18	17	15	15	15	14	14	13	13	13	13	13	13																											
1816	26	26	26	25	24	23	23	23	22	21	23	20	19	19	19	19																										
1815	9	9	9	8	8	7	6	6	6	6	6	6	6	6	6	6	6																									
1814	28	28	27	27	27	26	26	23	23	23	22	21	21	21	20	20	20	18																								
1813	21	21	21	21	20	20	19	18	18	18	17	17	17	16	16	16	16	16	13																							
1812	21	20	19	19	19	18	16	16	15	12	11	11	10	10	10	10	9	9	9	9																						
1811	24	24	24	24	24	24	23	22	22	22	20	19	17	17	17	17	16	16	16	16	16																					
1810	17	17	16	16	16	16	13	13	12	10	10	10	10	10	10	10	10	10	10	10	10	10																				
1809	12	12	12	11	10	10	10	10	10	10	10	10	10	10	10	10	9	9	9	9	9	9	9																			
1808	20	19	19	18	18	18	18	18	18	17	16	16	16	16	15	15	15	15	15	15	14	13	12	11																		
1807	17	17	16	16	16	15	15	15	15	15	14	13	12	11	11	11	11	11	11	10	9	8	8	8	8																	
1806	16	16	16	15	15	14	14	14	14	13	13	13	13	12	12	12	12	12	12	12	10	10	10	10	10	10																
1805	32	32	31	30	30	27	27	26	21	24	22	21	20	20	20	19	19	19	19	18	18	18	18	18	18	18	17															
1804	17	17	17	17	17	16	16	16	15	15	15	14	14	14	14	14	13	12	12	12	11	11	10	8	7	5	5	5														
1803	26	26	25	25	25	25	25	25	25	25	25	25	25	25	24	23	23	22	21	20	19	18	16	15	15	15	15	14	13													
1802	24	24	24	23	22	22	20	20	20	19	18	18	18	18	18	18	18	17	16	15	15	15	13	12	11	11	11	10	9	9												
1801	20	20	20	20	20	18	18	18	17	17	17	17	17	15	15	14	14	13	13	13	13	13	11	11	10	9	8	8	7	7	7											
1800	18	18	16	15	15	15	15	15	14	14	13	13	13	13	13	12	12	12	12	10	10	10	10	9	8	8	8	7	6	5	5	5										
1799	17	17	17	17	17	17	17	15	15	14	13	13	13	12	12	12	12	11	11	11	11	8	8	6	5	5	3	3	3	3	3	3	3									
1798	32	31	30	29	27	27	27	27	26	25	25	25	25	25	24	23	22	22	21	20	19	18	16	15	12	11	10	10	9	7	7	7	6	6								
1797	20	20	18	17	16	14	13	13	12	12	12	12	12	11	11	11	11	9	9	6	6	6	6	6	6	5	5	5	5	5	5	4	4	3	3							
1796	24	24	24	23	23	23	22	21	20	20	20	19	18	16	15	15	14	14	13	13	13	13	12	12	11	11	11	11	8	8	8	8	6	5	5	5						
1795	30	30	30	30	30	30	29	28	28	29	28	27	27	27	26	24	24	24	24	23	23	21	20	17	14	13	13	10	10	10	10	9	9	8	7	6	6					
1794	26	25	25	25	24	24	23	23	23	22	20	20	20	19	16	15	14	14	13	10	9	9	8	8	8	7	7	6	6	6	5	4	4	4	3	1	1	1				
1793	12	12	12	12	12	12	12	12	10	10	10	10	9	8	8	8	7	7	7	6	5	5	4	4	3	3	2	2	2	2	2	2	2	2	2	2	2	2	2			
1792	18	18	18	17	17	17	17	17	16	15	15	14	14	13	12	12	12	12	12	11	9	9	8	7	6	5	5	4	2	2	2	2	2	2	2	2	2	2	2	1		
1791	18	18	18	18	18	18	17	17	16	15	15	15	15	14	14	11	10	10	10	10	10	9	8	8	8	7	6	6	6	5	5	4	3	3	3	3	3	3	2	2	2	
1790	19	19	19	19	16	16	15	14	12	12	11	11	11	10	10	10	10	10	10	10	10	9	8	7	7	7	7	7	6	6	6	6	6	5	4	4	4	4	3	3	3	3
Totals,	910*	905	862	795	736	674	687	595	559	533	504	480	461	432	411	387	359	344	318	289	269	242	215	192	167	150	131	108	92	75	65	54	45	38	29	23	18	12	9	6	5	3
Deduct half the retirements,		1	2	3	1	5	3	2	2	1	1	1	1	1	3	1	3	1	3	2	3	4	3	3	2	3	2	3	2	0	2	3	2	1	1	0	0	1	1	0	0	0
Survivors corrected		904	860	792	735	669	684	593	557	532	503	479	460	431	408	486	356	343	317	287	266	238	212	189	165	147	129	105	90	75	63	51	43	37	28	23	18	11	8	6	5	3

* N.B.—From the nominations are excluded 11 cases, in which the persons nominated never came to India.

necessary to reject the year of appointment entirely from the calculations, and to assume the first year for the men appointed in 1790, as commencing from the 1st January, 1791, and so with all following years. The compiler of the tables, in the article of the Gleanings before referred to, has included this year in the computation of 852 as the number of appointments up to 1828, for he would otherwise have rejected the nominations of the last year of the series. His first year being, as is evident from this circumstance, that of nomination, he sets down the deaths upon the complete number of persons nominated as being, in the year of their appointment, only 2. The above table, however, shows six deaths in the year of appointment, or five, if the years subsequent to 1828 be thrown out; and this, without making any allowance for the eleven cases of appointed servants who never came to India, several of whom may have been prevented by death from availing themselves of their appointments. Whence the author of that article took his numbers, it is beyond me to guess; but it will stand to reason, that two deaths upon 850 appointments made in the course of 40 years, mostly a period of war, can be no near approximation to the risks of the voyage out, and the numberless accidents to which headstrong youth is liable. Six deaths, in the year of actual appointment, have been traced; but, as there is reason to doubt, whether this even can be the whole number, while, as above remarked, the period is never a complete year, it has been deemed better to take, as the first year for calculation of the value of life, that dating from the 1st January after appointment. The deaths of our next year are 17, which I confess my inability to reconcile in any way with the number of the Gleanings, which is 9 only for the two years' risk of life upon 809 appointments. It is not my business, however, to point out these discrepancies. The essential thing is to make out a statement that shall be free from error, or as nearly so as the case will admit; and that given above is offered as the best which our present materials afford the means of framing. In the table which follows, No. III, the ratio of deaths to survivors, in each year of residence, is attempted to be exhibited, the deaths being taken from the table above, and the number of persons whose life was at risk being thus computed: the total appointments between 1790 and 1831, were 951, of whom 11 died in England, or changed their mind, or from other cause never came to India. There remain 940, from which number must be deducted the ascertained deaths (5)*, and retirements

* The deaths upon 940 in the year of appointment were 6 by our table, but one of these belonged to the 29 nominations of 1831, all which being rejected from the calculation for the first year after appointment, and being deducted separately, this death must not be subtracted again. The deaths upon 940—29 or 911 were only 5.

(1), in the first year, being together 6; also the appointments of the year 1831 (29), which could not be included in the computation, unless the year 1832 were brought in. The number, therefore, of Civil Servants appointed between 1790 and 1831, who were in the condition to abide the chance of life for a first year, commencing from the 1st January after their appointment, was 905. Our table assumes 904, because there was one retirement in the year we are reviewing; and, as those who retire give the risk of their lives only for the broken period before their departure, the number of persons on the register on the 1st January requires correction on their account. It is assumed, that retiring servants give, on the average, the risk of their lives for half the year in which they retire; accordingly deduction is made, from the registered numbers on the 1st January, of half the number of the retirements between that date and the 31st December following. Where the number is uneven, as in this case being *one*, the deduction is made alternately to include or reject the unit. We thus begin with 904 lives, of which the proportion of deaths in the first year was 17, being in the ratio of 188 out of 10,000. For the computation of the ratio in the second year, we have the 905 men of the first year, minus the whole number of retirements (1), and deaths (17), in the course of that year, and minus also the appointments of 1830, which were 25, that is, 905—43 or 862. Of this number of registered servants on the 1st January of the second year, four retired in the course of the year: deducting two, therefore, for the diminished risk upon their lives, the number 862 stands corrected to 860, of which number 21 died in the year, being in the ratio of 244 out of 10,000. A separate value has thus been computed for each year of life in India, from the first to the thirtieth inclusive; after which the number of registered servants becomes too small to afford results at all trust-worthy. Before we proceed to the tables exhibiting the estimate of the value of life for each year, formed on this principle, it will be proper to exhibit separately the precise number of survivors in India, on the first of January of each year of their service; it being my purpose, as above explained, to compare these numbers, not with the original appointments as in the table of the GLEANINGS, but with the deaths of the year then commencing. I shall presently explain why no correct result could be extracted, from a comparison of the survivors with the number of original appointments, or even with that of arrivals in India. See Table, No. II.

Taking the table of survivors as the material for calculation, the ratio of deaths is exhibited for each year in the table which follows, No. III. The same ratio is reduced to a decimal proportion upon 10,000, for more ready deduction of the average of each five years, and for comparison with the tables of Europe. The number of deaths assumed, and the moiety of retirements deducted in Table II, may be tested by comparison with Table I, in which all the appointments, deaths, and resignations are separately entered, according to the calendar year in which they occurred.

TABLE III.

Showing the Ratio of Annual Deaths.

Years of Residence.	Age.	Lives at risk on 1 Jan.	Deaths during the year.	Ratio of Deaths upon 10,000.	Average of 5 years.	Average of 5 years, according to Table in Gleanings.	Average of Dr. Young's mean for England.	Ratios of column 5 adjusted by averages of five years.
1	20	904	17	188	203	128	96½	188
2	21	860	21	244				207
3	22	792	15	189				203
4	23	735	18	245				489
5	24	669	10	150				191
6	25	684	8	117	209	162	133	199
7	26	593	15	253				211
8	27	557	13	233				209
9	28	532	16	301				210
10	29	503	7	139				216
11	30	479	6	125	179	165	155	207
12	31	460	13	283				171
13	32	431	8	186				179
14	33	408	5	122				177
15	34	386	7	181				175
16	35	356	4	112	214½	205	170	181½
17	36	343	6	175				206
18	37	315	10	317				214½
19	38	287	7	244				268
20	39	266	6	225				317½
21	40	238	9	378	370½	411	203	349½
22	41	212	9	424				391
23	42	189	9	476				370½
24	43	165	5	303				372½
25	44	147	4	272				421
26	45	129	5	388	403	811	247	348
27	46	105	7	666				394
28	47	90	1	111				403
29	48	75	4	533				407
30	49	63	2	317				407
31	50	51	0	0	582		326	
32	51	42	0	0				
33	52	36	3	833				
34	53	27	2	741				
35	54	22	0	0				
36	55	17	1	588				
37	56	11	1	909				
38	57	8	0	0				
39	58	6	0	0				
40	59	5	0	0				
41	60	3	1	3,333				

TABLE IV.

Showing the Annual Decrement of life, according to the adjusted annual value of Life in India, as compared with the latest Tables for England, and with the rate of Decrement in the Gleanings for September, 1881.

Dr. Young's general mean of decrement for England, calculated upon 100,000 Births, and commencing with survivors at 20 years of age.			Decrement in India upon the same number, calculated for each year at the adjusted annual ratio of Deaths of Table III. last column.		Decrement upon the number of survivors at the age of 20 out of 10,000 births, according to the Northampton Tables as given for India in the Gleanings.	
Age.	*Survivors.*	*Deaths*	*Survivors.*	*Deaths.*	*Survivors.*	*Deaths.*
20	52221	452	52221	981	5132	63
21	51748	473	51240	1061	5069	64
22	51259	409	50179	1019	5005	65
23	50737	557	49160	929	4940	66
24	50180	610	48231	921	4874	67
25	49570	652	47310	941	4807	68
26	48918	655	46369	978	4739	69
27	48263	664	45391	949	4670	69
28	47599	682	44442	933	4601	70
29	46917	704	43509	940	4531	71
30	46213	709	42559	981	4460	72
31	45504	711	41578	711	4388	73
32	44793	710	40867	732	4315	75
33	44083	708	40135	710	4240	77
34	43375	710	39425	690	4163	79
35	42665	712	38735	703	4084	81
36	41953	718	38032	783	4003	83
37	41235	723	37249	799	3920	85
33	40512	728	36450	977	3835	87
39	39784	740	35473	1126	3748	89
40	39044	762	33147	1158	3659	96
41	38282	780	31989	1155	3563	110
42	37502	796	30834	1142	3453	130
43	36706	803	29692	1105	3323	150
44	35903	808	28587	1203	3173	175
45	35095	830	27384	953	2998	198
46	34265	850	26431	1041	2800	198
47	33415	867	25390	1023	2602	198
48	32548	880	24367	992	2404	198
49	31668	900	23375	951	2206	198
50	30768		22424		2080	

The results of the first of these tables by no means correspond with those given in the GLEANINGS, and will not admit of very ready comparison. The ratio of deaths, however, to the number of survivors set down for each year in that article, has been calculated in order that the extent of discrepance may be seen. But it strikes me, that there is a fallacy in the GLEANINGS' Table, which, besides that there are errors in the numbers assumed as above pointed out, must make it valueless for any computation of the risk of life in India. The basis of calculation for each period there taken is the following. The number of appointments made between 1790 and 1819, (I take this year at random,) is stated at 603. By the end of 1828, the last year's servants will have been 10 years in India, or at least on the register; and computing the results of all these appointments for 10 years, it is found that there were 39 retirements and 77 deaths amongst them in that period. It is hence assumed, that in 10 years 77 deaths take place in 603, minus 39, or 564 cases of persons resident in India between the ages of 20 and 30, leaving 487 survivors. But how can this be a true ratio, when the risk of life upon the 39 cases of retirement, *while they remained in India*, is lost to the calculation. This number should not have been deducted from the 603 appointments as consisting of cases taken out of the life risk altogether; but if any correction were attempted, it should have been made by deducting only half the number, on the principle that the country had the risk of their life while they staid in it, which may be computed on the average at a half risk. The number of deaths would then perhaps have borne a pretty correct proportion to the appointments, but the number of surviving residents would have needed a like correction. The omission to note this makes but little difference, perhaps in the earlier years, wherein there are comparatively few retirements, but it has wonderful effect on the ratios of the later. Take for instance the 25th year, of which the data are as follows: appointments from 1790 to 1804, 341; resignations out of these in 25 years, 93; deaths, 105. Now, it makes a very material difference whether these 105 deaths are to be taken as 105 out of 341, minus 93, i. e. out of 248, giving 143 survivors, as in table the second, page 274, or 105 out of 341 minus $\frac{93}{2}$ or 46 being 295, leaving 190 survivors. The number of survivors in India is however the actual number found in the registers that cannot be changed, and the calculations of the GLEANINGS' article are made on this number. The question therefore is presented in a different shape, and if this number be made the basis of any estimate or calculation, there must be corrections applied to settle out of how many these are the remnant from the effect of *mortality only*. For the fact, that many servants, after abiding the risk of life for 20 years, have at last withdrawn themselves while still living from both the survivors' list and from the original number, must leave the deaths upon the remaining appointments to bear a much higher ratio than they ought to do. Suppose, for instance, out of 100 arriving in a given year, 40 die in the course of 25 years, and 40 more having given the risks of their lives for 20 years, retire living between the 20th and 25th, then, by the table at page 274 in the Gleanings, these 40 being deducted from the 100, the deaths would be stated at 40, out of 60, and the survivors only 20 of *that* number. This circumstance, viz. the fact that the retirements come mostly in the later years of service, will of itself explain the wide difference apparent in the value of life in the later years, compared with the earlier as exhibited in the article in question, and remarked upon there as if fully established. The table at page 274 shows a decrement of very nearly 1-12th of the number living, for each year, from the age of 45 to 50, which is out of all reason: one in 41 to 1 in 37 is the ratio of the Northampton tables quoted for the same age, and the difference of climate cannot surely triple and quadruple this mortality at that period of life*.

Looking upon all computation from the *number* of *survivors* after a given period as impossible, in consequence of the large proportion of retirements in the advanced years of service, I am compelled to reject the tables of the Gleanings altogether, and offer instead those given above, which are based, as already explained, upon a comparison of the number of deaths in each year of service, with the number living, and in India on the first day of the year. This reduced to a decimal proportion will allow a comparison to be made of the value of life in each year, with the value assumed in the best approved tables of Europe. The retirements will not much affect a calculation made on this principle, and unless error can be detected in the numbers assumed for the deaths on one hand, or for the total of risks on the other, I am not aware of any ground on which the comparison can be impugned. Proceed we therefore to this part of the subject, and first for the age of appointment. In the article of the Gleanings this is taken at 20 years. Now, considering that 15 years was heretofore the age of earliest appointment, and 22 years the latest permitted by Act of Parliament; considering too that until 1806-7, there was no detention at the Hertford or Hayleybury College, but those appointed were at once shipped to their destination; so that many actually reached India before they were 16: this assumed age appears too high, 17 years for the age of arrival before the establish-

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* Per Table in the Gleanings. Per Northampton ditto.

Age.	Deaths.	
45	1 in 15	1 in 41
46	1 in 14	1 in 40
47	1 in 13	1 in 39
48	1 in 12	1 in 38
49	1 in 11	1 in 37

ment of the College in England, and 19 for the average subsequently, or for the general average 18 years would seem to be a fairer estimate; but we will allow 19, for the convenience of assuming the same period of life for our results, as the article in the GLEANINGS; for as in the above tables the first year is reckoned from the 1st January following the appointment, we have then 20 years for the age of those whose risk of life is computed for that year. In Tables III. and IV. I have attempted a comparison of the value of life in India, from the age of 20 to 50, as afforded by the above tables for the Civil Service on one hand, and as given in the most approved tables for the same age in Europe on the other.

It will be seen, that for the value of life in Europe, I have taken the general mean prepared by Dr. Young, by compounding the Northampton and Carlisle tables with the London Bills of Mortality, and with the rates of the Equitable Life Insurance. This I believe to be the latest estimate of the kind that has been published. It will be found in the volume of the Philosophical Transactions for 1826, and Dr. Young's celebrity as a calculator entitles it to be received as of first rate authority.

In Table III. in which the annual deaths are given as they occurred, with the ratio calculated to a decimal proportion for each year, there will be found an average of the same decimal ratio for each five years of the period embraced in the calculation. In order to afford the means of ready comparison, I have also computed the ratio of deaths to the annual survivors, as given in the table in the GLEANINGS, and in Dr. Young's table of the decrement of life, and have reduced both to a decimal proportion to 10,000. It will be seen, that my result is for the first five years of residence in India, commencing at the age of 20, a risk for each year of 203 in 10,000. The tables of Europe make the risk at the same period of life only 96½ in 10,000, while the table in the GLEANINGS, professing to be based on the same materials with my own, but calculating from the number of survivors upon a total of appointments, from which retirements have been deducted, gives 128. There are errors in the number of deaths, which account for much of this latter difference; for if a due number of deaths had been taken for the first two years, there is no reason why in this part of the table there should be much variation. The result of the comparison with England is, that the chance of death between the ages of 20 and 25 is to Europeans residing in India under the most favorable circumstances, more than double what it is in England; and this may well be imagined to be the case under the risks from Fever and exposure to the climate, independently of other causes.

In the second five years our proportion is 209 out of 10,000 for each year's deaths, whereas in England it is only 133; but this difference is no longer double, it is only a little more than 3 to 2. The GLEANINGS' table gives 162.

The third lustrum of residence is the most healthy period, according to our table, and experience is in favor of the same conclusion. The constitution is now adapted to the climate, and the seeds of premature decay, though they may have been sown, have not had time to produce their effect. For this period of life India is nearly as safe a place of residence as England, and it is the only period during which there is any proximity at all in the ratios. From this time forward the yearly value of life progressively and regularly decreases as age advances, and it will be observed to do so much more rapidly in India than in England. The error of principle in the calculations of the GLEANINGS begins to be particularly observable in the ratios for the two periods following the fourth. From 205 in 10,000, the rate of the third period, the deaths according to that table advance to 411 for each year, after a residence of 20 years, and to 811 for the years between 25 and 30 of residence. Our result, though as compared with the general mean for England, worse for Indian residents of this standing, in the proportion of 5 to 3, is nevertheless much less unfavorable than the rate above quoted; indeed, for the last period our rate is less than half that of the GLEANINGS.

The results for the years after the 30th of residence, are founded on too low numbers to be built upon, and yet the average on the totals to the 41st year comes pretty nearly to the rate one might have expected. The further deterioration of value corresponds with that afforded by the mean tables of Dr. Young for the same period of life, and may be noted as a curious result, though the ratio cannot be looked upon as established.

In Table IV. I have thrown the results of Table III. into a form to shew the *decrement* of life according to my computation of its value for each separate year. This has been done merely to satisfy the curiosity of those who delight in seeing the same results in different shapes; and because the published tables being ordinarily in this form, it is convenient to present the means of ready comparison by giving one to correspond. For any purposes of calculation, the separate value ascertained for each year of Indian life, from the age of 20 to 50, seems the more useful result to depend upon.

III.—*On the Gypsum of the Himalaya. By Capt.* P. T. Cautley, *Ben. Arty.*

While there appears to be a general unwillingness on the part of geologists to admit the gypsum of the Alps as a recent formation, the leading authorities in that science are divided whether to consider it as *primitive*, or to class it among the indefinite *transition* formations.

M. Brochant has reviewed the gypsum formations of the Alps, and given his opinion on their relative antiquity : we have also accounts of other countries, betraying the same uncertainty with reference to the point at question : and perhaps we may not be far wrong in attributing many of the doubts in the classification of gypsum and other similar minerals, to the very interpolation of the order *Transition*, an arrangement convenient enough as offering a resting place for every variety not stamped with the decided mark of primary or secondary, but to the scientific inquirer a most deplorable bar to *precision*, a term not inapplicable altogether to the science, as we may hope to find it under a revised, well arranged, and *permanent* nomneclature.

The gypsum of the Paris basin, that accompanying the red marle of England, and that of other similar localities, have been acceded to as secondary formations by all geologists; while those found in the higher mountain ranges of the globe have from their singular and generally ill-defined position, placed authors in doubts as to their classification. M. Brochant argues, that from the similarity of appearance in Gypsum rocks, he should be led to ascribe them all to the same æra ; and from his own observation decides, that they all belong to the *transition* series, with this difference, which he deems important, that the ancient secondary gypsum of Bavaria, Saltzburg, &c. &c. reposes on strata essentially posterior to the transition class ; an objection, as De la Beche observes, nugatory from the frequent conjunction of the primary and secondary strata, exemplified by the oolite of the Jura resting on gneiss in the Rhine, &c. But although we find the superior classes of the secondary rocks in *conjunction* with the higher classes of the primary, the latter order is never found reposing on the newer formations; indeed the only example given of an occurrence of this sort is by McCulloch, of gneiss on a secondary rock, which is noticed in the preface to Conybeare's work, and exemplified by a drawing, most satisfactorily explaining the deception.

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* The term *secondary*, as here used, includes what is generally called *tertiary*. —Ed.

Saussure, Daubuisson, and others, have conceived some of the Alpine gypsum to be primary; that of Cogne, mentioned by Brochant, as discovered and considered primitive by Daubuisson, obtaining the distinction from a superincumbent stratum of lime-stone "a little crystalline, blueish grey, and very schistose from a mixture of talc;" the gypsum having no outcrop whatever, and consequently being imbedded in the above rock; and, as M. Brochant says there is every reason to suppose that the schistose limestone of the roof contains quartzose veins, as also happens in transition limestone, he, rather gratuitously, concludes that the formation is contemporaneous.

The presence of these quartzose veins, which is the *type* of *transition*, and the absence of outcrop, rest on the mere ipse dixit of the villagers, and can hardly be received as proofs in a matter where direct geological accuracy is concerned. The deposit also of Val Canaria is a very doubtful proof of the existence of gypsum primarily. The fact of its underlying mica slate is contradicted by Brochant, who thinks the same of his transition variety. The proof of its being primitive is therefore still far from being ascertained, and I propose in a future part of this paper to suggest causes that might place in doubt, even the superincumbence of mica slate as a proof of its antiquity. The general description given by writers on the subject of Alpine gypsum, so closely applies itself to the mineral lately found in the line of mountains north of the *Dehra Dún*, both in regard to its position and its attendant rocks, that a comparison becomes exceedingly interesting, as illustrative of the difference, if there be any, of the gypsum decidedly secondary, and that which is accompanied by rocks of evidently a more ancient formation.

The localities which have come under my immediate observation are two of those adverted to by Captain Herbert, in his communication to the Society. The first near *Sansardhárá*, immediately on the skirts of the mountains bounding the valley of *Dehra*, on the north: the second about four miles further north, near the village of *Salkot'h*, differing in position most essentially from the former, though resembling it in character; to enter into a detail of each, with its respective peculiarities will be necessary in furtherance of the history of the rock in question.

Gypsum opposite Sansardhára.

Immediately opposite the stalactitic caves, and beyond the rapid stream that runs towards the village of *Nagul*, a passage into the mountains is effected up the course of one of its tributaries, which branching off to the left, leads you at once to the gypsum, the proximity of which becomes apparent from the masses and broken pieces in the bed of the stream. A considerable slip in the mountain, of a very recent date, displays the position of the rock, which would doubtless otherwise have remained concealed, as no vestige whatever can be found on the unbroken surface of the mountain. To give therefore an explicit account of its actual dimensions, or even to describe the locality, is perfectly impossible, further than what is exhibited to the eye: from the confusion attending on these fractures, and the precipitous and irregular structure of the mountain, covered with vegetation and an impervious wood. The gypsum is apparent here in two beds or strata, separated by a reddish argillaceous schist, and reposing upon a blueish limestone, in contact with which there are evident signs of passing one into the other. Independent of these beds or strata, unconnected and insulated masses of gypsum appear throughout the schist, the whole lying horizontal without any apparent dip or inclination. Beneath the blueish limestone, on which the lowest stratum rests, are varieties of a lime rock, of a darker color, reticulated with veins of calcareous spar, large rhomboidal crystals of the latter being found of considerable size, and in a much greater proportion than in the neighbouring mountains: indeed, the debris formed by the slipping of this face of mountain is altogether composed of these varieties of limestone, fragments of calcareous spar, and the pieces of broken gypsum and schist. The quality of this gypsum varies as much as its color; the former from a compact crystalline mass, to a loose, powdery, and arenaceous soil, hardly to be termed rock; the latter from a pure white, slightly translucent at the edges, to a dirty grey, particularly in its passage into the limestone. The colors however are exceedingly various: a brilliant yellow variety was discovered in great abundance. The height of this deposit from the bed of the stream is about 1000 or 1200 feet. The mountain series decidedly calcareous.

Gypsum at Salkot'h.

The former gypsum I have explained as alternating to all appearance with argillaceous schist, and forming a series with rocks, the antiquity of which may be a matter of remark hereafter. This gypsum is apparently superficial, and entering into the series more as an independent formation, than as a feature expressive of the general structure of the mountain. It shows itself opposite that village, about four miles north of *Sansadhára,* jutting from the face of the mountain in a bold and irregular outline, to the height of about 200 feet from the bed of a tributary that joins the Nagul stream, opposite the village of *Salkot'h.* The whole mass is composed of gypsum, without the intervention of any alternating rocks ; and a conclusion may naturally be drawn from the absence of the mineral in its vicinity, that this deposit is insulated, or simply an enormous nodule, resembling those of calcareous tufa so frequently met with, in detached and unconnected masses. The falling down of large masses of the upper part of the rock has caused such confusion and irregularity below, that it would be even doubtful whether the deposit actually extends to the bed of the stream, or whether its limits might not properly be curtailed to a depth of at least one-half, a circumstance moreover that precludes the possibility of discovering the rock on which it lies, or of satisfactorily describing the concomitant formations. The same difficulty generally occurs with these rocks; their decomposition is universally great, and the extreme variableness in texture so open to the attacks of weather, that externally, without the aid of slips and fractures, it is almost impossible to detect any regularity in stratification, or in fact any clue wherefrom to form an idea of their general character. The tendency that this rock has to form itself into peaks and protruding points is well preserved here, and deserves mention from a peculiarity for which it is distinguished in the Alps; resting solely however upon the decomposing character of the rock, and from no material *form* of composition. The mountain itself is formed entirely of the blueish limestone formerly mentioned, into which the gypsum decidedly passes, modifying itself into a blueish variety, effervescent, and differing only in appearance from the limestone itself, by its want of compactness, and loose and friable quality : a black fragmentary and argillaceous lime rock is also in abundant dissemination throughout the lower part of the deposit, and singularly attached to those parts where the gypsum appears to be of a purer quality than at others ; indeed it generally appears that by the presence of the rock in question, the mineral acquires a purity both in color and texture, unobtainable in those parts in contact with the blue limestone or at a distance from the black rock. It would be endless to enumerate the colors that appear throughout this formation ; from the purest white crystalline, it passes through dirty grey pink, until it arrives at the blue limestone, when it obtains a tinge of that color. The texture is also as variable, and I may say, that throughout the whole deposit a very small proportion is of that variety generally known by the name of alabaster ; and even those parts so fragmentary, and so interspersed with the coarser varieties, that any attempt at converting it into ornamental uses would, I fear, be out of the question. The specimens that I have seen in cups and small vases fully authorize this conclusion: their appearance being more of a white earth, or chalky limestone, than of a gypsum, or to speak in plain terms, of an alabaster. The varieties of Himalayan gypsum as yet discovered are certainly deficient both in beauty and value as an article of use, though interesting for comparison with other formations.

Selenite, in small tabular crystals, is disseminated throughout this gypsum, though in hardly sufficient abundance to give any peculiar character to the formation.

A question of considerable interest arises from the appearance and position of the above-mentioned deposits, which, as mentioned in a former part of this paper, from their position under rocks of the primary and secondary classes, acquire an appearance of antiquity, not borne out by the general history of the mineral; namely, that the gypsum throughout the globe is simply an infiltration analogous to the tufa and calcareous deposits, and depending on causes chemically similar; the sulphuric acid being the active generator instead of the carbonic. If in the proximity of sulphur an excess of oxygen would produce sulphuric acid, a difficulty is removed, and the contact with lime-rock or carbonate of lime would, it may be supposed, produce its sulphate, or gypsum; and I cannot perceive the improbability of such a process having been or being still in force; or that nature's laboratory might not have been as active in the dissemination of gypsum, as it is in the present day, of the calcareous tufa.

The argument obtains considerable weight from a most material circumstance, which almost makes it a matter of certainty that the origin of all gypsums is contemporaneous; this is, the exact resemblance both in texture and crystallisation that they all bear, whether Alpine, or those varieties found with the secondary rocks: a similarity that does not exist in any of the lime-stones formed at different periods, nor in other rocks: the primary and secondary varieties shewing the most decided dissimilitude both in texture, quality, and position.

The term infiltration must be received, as implying the simple power of a mineral in solution to insinuate itself into cracks and fissures, or to fill hollows and cavities, without any reference to a gradual process, as it is possible that the mineral in question might in many instances (particularly in those deposits where an appearance of stratification or alternation with other rocks is apparent) have undergone a change, more sudden, and more general, than what we understand by the term "infiltration," as applies to the formation of calcareous tufa. A question may be put, as to the absence of any impressions of vegetable remains,—as to the want of the cylindrical and radiated texture, which so peculiarly marks the tufa in formation? It must be confessed, that on comparing the minerals, and supposing the process under which they are found to be *similar;* difficulties, though not irreconcilable to the above supposition, present themselves. In the first place, the action of sulphuric acid would tend in a much more rapid degree to the formation of gypsum, than does the presence of carbonic acid and lime to produce tufa. The same rapid action would create a texture of a totally different quality, and the ingredients themselves would destroy any vegetable remains that might be enveloped in the mass: had the same gradual and slow process that forms the tufa been also exerted in forming gypsum, similar texture would have been the consequence; and the deposit of the latter would shew at least marks of stalactites, &c.; but though infiltration is granted as a solution of the problem, the action of time and other causes may have removed those outward and visible marks that might have tended at once to a direct conclusion. Age, pressure, and other causes, are well known as the means of producing most extraordinary changes in the system, and also in the texture and quality of the rocks themselves. The above causes, in a greater or less degree, may have equally exerted their effects on gypsum.

The obvious transition of the blue limestone into the gypsum at the deposit at *Salkot'h;* and the extreme purity of the gypsum when in contact with the black fragmentary rock, which scarcely effervesces with acids, leads me to the idea that all these varieties of lime-rock in the proximity of the mineral are simply modifications, caused by the action of the sulphuric acid in a greater or less degree. The springs and rivers in the vicinity of all these formations abound in carbonic acid, as is evident from innumerable deposits of tufa, and stalactitic formations;—while the rocks themselves are of limestone:—near *Sansadhárá,* sulphur and sulphuretted hydrogen impregnate the waters, and it is at least plausible to suppose from the occurrence of gypsum, that the presence of sulphuric acid is one, if not the main cause of the superabundance of carbonic acid diffused through all the springs, and leading to the tufaceous and stalactitic deposits of lime that not only appear in such magnificence at the caves of *Sansardhárá*, but actually give a coating to the bed of the streams, and are the cause, I conclude, of the enormous excess of local conglomerate that appears throughout the whole of the ranges, of which *Masúrí Tíba* and *Bhadráj* form such prominent features; the latter mountain terminating the range towards the Jumna, whilst the eastern or opposite extremity, under the name of *Skanda Déhí*, is washed by the Ganges. The yellow color of some varieties of the gypsum may depend on the contact with sulphur*, the abundance of which mineral may be concluded from the sulphuretted waters above alluded to:—that it was so in former times, is sufficiently shewn by the existence of the gypsum itself. Whether it is not daily forming may be a matter of doubt, at least in the above localities: we find independent masses of tufa apart from the proximity of springs and water, the course of the latter having changed or dried up; at least the argument would stand thus on the discovery of a mass of calcareous tufa similarly situated to the gypsum deposit of *Salkot'h*, or that of other countries, not forgetting the primary deposit of Daubuisson at Cogne!

If therefore where carbonate of lime, sulphur, and water are abundant, the chemical change above mentioned, is allowed, or is supposed from analogy to be a probable consequence, gypsum can no longer be entitled to a place in either primary transition or secondary classes; but must be considered as an adventitious formation common to all ages, and produced by causes analogous to the present rapid formation of calcareous tufa. Amongst our primary and transition rocks, none can be assimilated to the stalactitic carbonate of lime; amongst our secondary or latest class of general rocks, there is none like the gypsum, that is to say, we know of none actually forming at this day. Causes that led to the formations of such abundance of gypsum formerly, may from unassignable reasons, no longer exist; and those which produce the tufaceous carbonates, then at rest, may now be in full vigor.

The above reasoning is not affected by any account of a gypsum deposit that I have met with, and although the regular stratification or alternation of gypsum with clay slate, as above alluded to, may at first be a startling objection to the proposed theory, it will on examination be easily accounted for. The above discovered deposit of gypsum was assumed actually to consist of strata, but this is somewhat doubtful.

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* Is not the yellow color due to the presence of oxide of iron?—Ed.

To those who may differ with me on the subject, 1 must observe in conclusion, that gypsum has never been found in a country or district where the presence of the lime carbonate has been wanting; but mostly in a position surrounded by vast tracts of that mineral, rising in successive ranges in the vicinity of springs and running streams, whose courses are marked by their deposit of lime, in the presence of springs impregnated with sulphur and sulphuretted hydrogen. When the very ingredients are at active work at the present day in the manufactory of stalactite, may we not with circumstantial evidence at least, convict them of pursuing a different course, and under different times and circumstances of forming *gypsum!*

P. S. I may mention another deposit of the mineral on the *Masúrí* range, on the descent from the ridge or spur upon which Capt. Brooke has fixed his residence, to the valley of the *Aglar* river. There are also appearances of it on the ascent from *Rajpúr* via *Jaraípani* to *Masúrí*, in the black fragmentary rock interspersed with minute threads of the gypsum, although, as far as my observation has been directed, the mineral at this point does not appear in mass: at the former deposit however, on the slope to the *Aglar* river, we find it in great abundance, though in quality by no means superior to the *Salkot'h* variety; the situaton is partly to the right and left of the foot-path on the ascent, in large nodular masses, or independent rocks, whose outer surface exhibits the usual sharp angular and pointed features, and partly in irregular lumps imbedded in the debris of a huge slip of the mountain, which must have fallen within the last few years, as it bears every appearance of freshness. Unless we are to suppose that the mountain from which this slip has taken place was in itself formed of debris, and the rounded boulders of water-worn rock, which I may safely assume not to be the case, the appearance of these detached masses of gypsum is very unusual; they neither look like pieces broken off from a large mass in the fall of the mountain, nor have they the least resemblance to boulders; but from their uneven honey-combed surfaces, I could almost bring myself to imagine, that they had been formed by infiltration into holes and fissures in the rock or soil; the outer surface decidedly having the appearance of being formed in a mould which the irregular internal surface of a natural cavity would exhibit. These pieces vary in size, but do not exceed in dimensions a cubic foot or thereabouts.

IV.—*Climate of Chirra Punjí.*

(Extract from a letter to the Surveyor General of India, from Dr. W. Rhodes.)

The remark in the *Hurkaru*, "that the rains had set in with great violence at Chirra," is incorrect. By a reference to the accompanying Table it will be observed that, for the last 20 days of the month, the weather has been remarkably fine and almost free from rain.

By a self-registering thermometer set at the beginning of the month, I find that the temperature during the day has been as high as 76, and at night as low as 56. The climate now is very delightful, and surpasses the finest summer months in England.

Chirra Punjí, 3rd June, 1832. W. R.

Meteorological Register kept at Chirra Punjí, for May, 1832.

	OBSERVED AT 10 A. M.						OBSERVED AT 4 P. M.					
Date.	Barometer.	Thermometer.	M. B. Ther.	Wind.	Strength.	Aspect of the sky.	Barometer.	Thermometer.	M. B. Ther.	Wind.	Strength.	Aspect of the sky.
1	25,780	64	63½	W.	Var.	Rain.	25,740	67	67	S.W	Var.	Cy. Rain.
2	766	63	63	S.W	do.	do.	760	63	62	do.	do.	do.
3	850	64	64	W.	Stg.	do.	764	63	63	do.	do.	do.
4	800	62	61½	S.	Var.	do.	788	63	63	do.	do.	do.
5	790	62	61	W.	do.	do.	696	61	59	E.	Lt.	Cloudy.
6	786	63	62	W.	do.	do.	710	63	62	W.	Var.	Cy. Rain.
7	784	63	62	S.W.	do.	Cloudy.	690	62	62	do.	Lt.	do.
8	730	59	50	do.	do.	Rain.	700	62	61	S.W	Var.	Cloudy.
9	736	61	60	do.	Stg.	do.	795	63	62	W.	Lt.	Cy. Rain.
10	850	65	64	W.	Var.	Cum.	780	70	65	do.	Var.	Clear.
11	860	67	65	do.	do.	Cloudy.	720	69	65½	S.W	do.	Cloudy.
12	836	69	66	do.	do.	Clear.	700	68	65	do.	do.	do.
13	700	64	64	do.	do.	Cloudy.	700	68	66	do.	do.	Clear.
14	750	62	61½	S.W.	do.	do.	∼∼∼	67	65	do.	do.	Cloudy.
15	800	65	62	W.	do.	Clear.	750	69	65	W.	do.	do.
16	818	67	64	Cm.		do.	750	64	63	do.	do.	Clear.
17	820	67	63	do.		do.	760	69	65	do.	Lt.	do.
18	830	70	65	W.	Var.	do.	770	71½	70	do.	do.	do.
19	854	64½	64	do.	do.	do.	800	67	66	do.	Var.	Cloudy.
20	800	66	61	do.	do.	do.	784	68	64	S.W	do.	Clear.
21	820	67	63	Cm.		do.	750	70	66	W.	Lt.	do.
22	804	67	62	do.		do.	760	69	63	do.	do.	do.
27	732	71	69	do.		do.	700	73	64	S.W	do.	do.
28	750	72	69	do.		Cloudy.	684	73	69	Cm.		do.
29	760	70½	68	do.		Clear.	680	71½	68	S.W	Lt.	Cloudy.
30	766	71	66	S.W.	Lt.	do.	698	71	65	do.	do.	Clear.
31	750	71½	69	Cm.		Cloudy.	700	72	68	do.	do.	Cloudy.
Mns	25,790	66,2	63,5				25,736	672	64,5			

V.—*Proceedings of the Asiatic Society.*

Wednesday, the 4th July, 1832.

The Hon'ble Sir C. E. Grey, President, in the chair.

1. Mr. J. Pearson was elected a Member of the Society.

2. The Acting Secretary reported, that the amount of the late Dr. Bruce's legacy had been received and invested in Government Securities.

3. Upon the motion of Mr. F. C. Strong, seconded by Mr. D. Ross, the following resolution was passed unanimously:

" A Report upon the progress of the boring experiment having been submitted at the last meeting of the Physical Class, 13th June, from which it appears, that a second perforation has been commenced upon and carried down to the depth of 160 feet successfully, having been already tubed to the depth of 120 feet: and further, the Government having expressed great interest in the result of the experiment, and having through Colonel Casement, Military Secretary, placed at the disposal of the Physical Class the services of three European soldiers of the Sapper and Miner Corps, lately arrived from England, who have been regularly instructed in the art of boring for water,—

Resolved, that a sum of Rs. 500, in addition to the 2000 already expended, be placed at the disposal of the Committee, for the further prosecution of the boring experiment."

4. *For the Museum.*—Mr. F. P. Strong presented a flying fish.

Mr. J. F. Cathcart presented a specimen of a Cape fish, called there " Sea-horse fish ;" also a pair of Cape pheasants.

Captain Sanders, Engineers, presented an ancient coin recently procured at Kanouj, by Mr. E. V. Irwin, C. S.

5. *For the Library.*—The following rare and valuable works were presented by the Hon'ble Sir C. E. Grey, President.

Lexicon Græco-Latinum Constantini, 1592.
Platonis Opera Omnia, 3 vols. folio, 1578.
Aristotelis Opera Omnia, 11 vols. 4to. in 6, 1587.
Ciceronis Opera Omnia, 10 vols. 4to. 1783.
The works of Dugald Stewart, 5 vols. 4to. London.
Histoire de la Philosophie Moderne, par Jean Gottlieb Buhle, 6 vols. 8vo.

The following works were also laid on the table:

Lament on the capture and destruction of Edessa, an Armenian Poem, written in the middle of the twelfth century, by Nierses Shinorbali, published in Calcutta, in 1832 ; presented by the Editor Mr. John Avdall.

Dictionary of the Tamul and French Languages, presented by Lieut. A. Blin, Mem. As. Soc. Paris, who announces his intention of publishing a French translation of Shakespear's Hindustani Grammar, printed " par le procédé autographique."

Meteorological Register for April—*from the Surveyor General.*

From the Translation Committee of the Royal Asiatic Society.

Subscription copies of

No. 1. Translations from the Chinese and Armenian, by C. F. Neumann,	1
2. Life of Sheikh Mohammed Ali Hazin,	1
3. Miscellaneous translations from Oriental languages, vol. 1st,	1
4. The Algebra of Mohammed Ben Musa,	1
5. Life of Hafiz-ool-Moolk, Hafiz Rehmut Khan,	1
6. Travels of Macarius,	1
7. History of the Maritime Wars of the Turks,	1
Annual List of Donations and Bequests to the Trustees of the British Museum, 1830; *from the Trustees*,	1
Journal Asiatique, Nos. 44, 46, and 47. *From the Asiat. Soc. Paris*,	3
Considérations sur les Alphabets des Philippines. By Monsr. Jacquet, Paris,—*the author*,	1
The Christian's Magazine, No. 1 to 10, Pampt.—*unknown*,	10
List of the Geographical Society of London, January 1, 1832. Pamphlet,—*the Society*,	1
Proceedings of Do. Do. Nos. 22 and 23,—*the Society*,	2
Observations sur quelques points de la Doctrine Samaneenne, et en particulier sur les Noms de la Triade Supreme, par Monsr. M. Abel Remusat,—*the author*,	1

From the Secretary to the Societé de Caen.

Essai sur les Combustions humaines, Rapport fait par M. P. A. Lair, à la Societé Linnéenne de Normandie, &c.	7
Rapport fait à la Societé sur l'utilite de la culture des Pommes de Terre dans le Calvados,	2
Rapport fait a la Societé Royale D'Agriculture et de Commerce de Caen, sur les Troupeaux, &c.	8
Exposé Historique, &c. Monsr. Lair,	2
De la Peche, du Parcage et du Commerce des Huitres en France,	2
Catalogue de la Bibliothéque de la Societé Royale D'Agriculture et de Commerce de Caen,	2
Notices Historiques,	2
Annuaire du Calvados, 1829, 30, 31,	3
Memoires de la Societé Linnéenne du Calvados, 1824, and 25,	3
Compte rendu et Rapports des Travaux de la Societé Philharmonique du Calvados de 1827 et 28,	3
Discours sur la seconde exposition des Produits des Arts du Departement du Calvados,	6
Sur le Pommier, et sur une Nouvelle varieté de Pomme, decouverte in 1820, dans le Departement du Calvados,	9
Rapport sur les Voyages de M. d' Urville, &c. by Monsr. Lair,	2
A. M. Dumont-D'urville sur le Retour de l'Astrolabe,	3
Fête Pastorale de Blainville,	2

Papers read.

1. Answer to Dr. Milman's questions respecting the Indian Jews, by Daood, a respectable Jew residing in Calcutta. Communicated by Dr. J. Tytler.

These answers refer only to the recent establishment of Jews in Calcutta itself, not to those who have become naturalized on the Malabar Coast.

2. A descriptive Catalogue of the ancient Roman Coins in the Society's Cabinet. By Mr. J. Prinsep.

3. Translation of a fragment in the Tibetan language, by Mr. Csoma de Körös, with remarks by Mr. H. H. Wilson, Sec.

4. An Analysis of the remainder of the Kahgyur, by Mr. Wilson, was also laid on the table.

On the conclusion of the business of the evening the President rose, and addressed the meeting (which was unusually numerous), in the following words :—

" Gentlemen,—The pleasure of meeting a more numerous body of the Society than is usual, makes it impossible that I should find fault with my friend Mr. James Prinsep, for having added to the notices of the meeting an intimation that I should take my leave of you this evening. I regret only that it may have caused an expectation that I should offer a more complete tribute of gratitude than I am capable of expressing, or that I should have prepared for the Society one of those comprehensive views of the fields of literature, science, and art, which have been usual on similar occasions, and which generally are well adapted to them, but which I do not think would be suited to that of my own departure. Having never entered the vineyard as your fellow-labourer, I will not cull the fruits produced by the labour of others, that I may claim a merit for merely laying them before you, and arranging them. I feel, that there is little which it would become me to say on this occasion, but to excuse myself for what I have omitted to do. But it has always been known to you, that I neither have nor ever pretended to have any acquirements in Oriental Literature: and I should have almost thought it incumbent on me to decline even the gratification of being elected your President, if I had not regarded it as an honorary appointment, and known at the same time that as long as Mr. Wilson continued to be your principal Secretary, the Society could not suffer from any deficiencies of mine.—Gentlemen, he has really been your President: and I rejoice, that his absence from Calcutta affords me the opportunity of saying what I could not so well have said of him in his presence. Whether you consider his unrivalled attainments in Sanscrit Literature, or the many valuable works with which he has enriched your Transactions, or which he has otherwise given to the world, or his indefatigable and most meritorious devotion of his time and talents to the establishment of an extensive system of education for the native youth, or the many amiable qualities which distinguish him in private life, you must all feel that if you should lose *him*, of which there is at present some likelihood, you will indeed sustain an irreparable loss :—yet a loss not to be deplored by his friends, and least of all by me ; for it might afford me the hope of meeting him soon amid other scenes, where the happiest portion of my youth was passed, and which, now that I am turning homewards, rise upon my waking memory with the vividness and imaginary beauty of a dream. This would indeed be to me a source of infinite pleasure, if it was not qualified, and if my mind was not divided, if I may use the expression, by the reflection that the event which would take Mr. Wilson to Oxford would leave in India another distinguished member of your Society, my excellent friend Dr. Mill, whose presence alone prevents me from expressing of himself praise as fervent and sincere as that which with a willing ear he has heard of his rival in a generous contest. Gentlemen, though I have disclaimed, as I was bound to do, all acquirement or ability in the department of Oriental Literature, I will not pretend to entertain so humble an opinion of the results of a life which has at least been a studious and thoughtful one, as that there is no province of study in which I might have hoped to gather offerings which I should not have been ashamed to present to you. But here in vindication of my own consistency, and to shew at least that I dealt fairly by you in accepting the office of your President, I beg leave to recall what none of you are likely to recollect, that seven years ago, upon another public occasion, in taking leave of a Society at Madras, of which also I was President, I bade adieu at the same time to all literary employment, so long as I should fill the station to which I was called in Bengal. I foresaw that it would impose upon me a predominant duty, and one of which the most peculiar features are not perhaps the most obvious, and to which I knew my own mind too well to think I could give a divided attention. How I have performed that duty, this is not the place, neither is it for me, to say: but I will say, that to perform it aright, in its most important and essential particulars, has been the earnest and engrossing purpose of my soul. I do not look for a fair estimate in the present day. I have never weighed appearances against realities in the scale of popular applause. But time will declare it; and I am willing to abide the judgment of time. All that I desire at present is to offer the duties of my station to your consideration, as some apology for what might otherwise appear a neglect of what you had a right to have expected of me. From that station and those duties I have now retired, and I have to regret, that the leisure which I thus obtain can no longer be employed either in your service or your company. But in that studious retirement, which, I devoutly hope, awaits the latter portion of my life, I shall to the end of that life be proud that I have borne the name of your President, and I shall recollect with gratitude both the favor which conferred on me that honor, and the indulgence which has been attendant on my tenure of it."

The President sat down amidst a general demonstration of feeling on the part of the members, to which Sir Edward Ryan gave expression in the following reply:

"Sir,—I am requested by the members who are present, to express to you their feelings on this, I may truly say, sorrowful occasion. I wish they had selected some one more competent to be the organ of their thoughts and wishes, but at the risk, nay with the certainty of being unable adequately to express the feelings which your eloquent address has excited in their minds, I cannot decline the honor, for so indeed I consider it, which they have conferred upon me.

"For more than five years, Sir, you have filled that chair, and during the whole of that period, I repeat with confidence, you have evinced the deepest interest in the welfare of our Society—you have never willingly absented yourself from our meetings—and you have taken an active and diligent part in the duties which devolve on your station amongst us. During this period, we have been indebted to your munificence, for a splendid addition to our Museum, of an extensive cabinet of minerals and geological specimens; and this night you have made a valuable addition to our Library, by the Books which are now before us. You have never lost sight of us in your occasional visits to different parts of India, and from the Himalaya and Penang you have added to the valuable collection, which we had received from you, specimens collected with your own hands. By your kindness, courtesy, and hospitality to those strangers whom science or literature may have guided to the shores of India you have shewn the respect we bear to their attainments.

" Sir, half a century has nearly elapsed since this Society was founded by one who was then a Judge of the Court in which you so recently presided. I mean of course that great and good man Sir William Jones, to whose memory we cannot revert without the deepest sentiments of veneration and esteem. Many distinguished persons have since filled that chair, a proud distinction to any man: but I speak with sincerity my own feelings, and those I believe of the gentlemen around me, when I say, that, great as were the acquirements of many of your predecessors in their various paths of knowledge, the lustre which they have thrown over that chair has been brightened and enhanced by you.

" I must no longer trespass on your time, but permit me to hope, that on your return to your native country, it may be some satisfaction for you to know, that you bear with you the respect, the esteem, and the regard of this body, over whom you have so long presided."

The Acting Secretary was directed to take the usual steps for bringing before the Society, as soon as possible, the subject of the election of a President to fill the vacant chair.

2.—NATURAL HISTORY SOCIETY OF THE MAURITIUS.

Tuesday, 20th December.

M. J. V. Sganzin forwarded 17 stuffed birds from Ste. Maria Madagascar.

Letters from the following parties, acknowledged the receipt of honorary diplomas: the Rev. J. Adamson, D. D. Cape; Sir W. E. Parry, R. N. F. R. S. New Holland; Sir John Jamison, K. C. V. Sydney; Andrew Smith, Esq. M. D. M. N. S. Algoa Bay; Le fébure Marcy, Mahé, Seychelles Islands.

Other letters were submitted.

The following works were added to the Library—Annual Report of the Agr. and Hort. Soc. of Sydney; Journal des îles de France et de Bourbon, 1786-91.

M. Lislet Geoffroy presented a specimen of Bark obtained from a native chief in Madagascar, in 1815.

M. C. Telfair, Pres. offered in the name of Capt. Trotter, of the Corvette *Curlew*, a black *Ibis* of Agaléga; also some sea Cocos from the Praslin Isle, which he was desirous to introduce in the colony. Also, for the Library, a description of the Isle of St. Paul, with two views by Mr. Pollock.

The President announced that Mr. Hampton had commissioned from Madagascar two pair of crows, to attempt their multiplication on the Island.

Mr. W. Boyer presented a list of objects collected and lodged in the Museum by 15 of his pupils since the 1st August.

Mr. Lienard, sen. read a note on a new species of *zanclus*, differing from that delineated in Cuvier, having one filament less in the dorsal fin, and one thorny ray in the pectoral fin.

Mr. J. Desjardins read the description of two new species of *chétodons*, a fish vulgarly called *pavillons* in the Island, as is the *zanclus* mentioned above. He gives them the names of *chetodon queue d'or*, [*chétodon chagsuries*,—J. Desj.] and le *C. Joyeux* [*chét. festivus*, J. Desj.]

The following gentlemen were proposed as honorary members—MM. Ivoneff Dupont, (resident,) F. Eydoux, J. Baume, J. O. Westwood, W. Twining, J. Verreaux, Richard, Dir. Bot. Gard. Bourbon, and J. Goudot, nat. Madagascar.

VI.—SCIENTIFIC INTELLIGENCE.

I.—*Boring for water in France.*

In Mr. Hericart de Thury's recent work on Artesian springs, the following curious fact is noticed relative to the distance to which subterranean currents percolate. A perforation made at Tours, brought up from a depth of 363 feet a quantity of fine sand, and the remains of vegetables and shells. Branches of the thorn were recognized, some inches in length, blackened by their long exposure to the water ; also the stalks and roots, still white, of many marsh plants, and the seeds of many plants in a state of preservation, particularly of a species or variety of *Gallium ;* fresh water shells were also discovered. It was supposed that the water of this well could not have taken more than four months to traverse its subterraneous course, because the seeds from their fresh state must have fallen on the preceding autumn ; and that the supply came from some valley in Auvergne, or Vivarais, which is not so easily proved ; but the fact is not the less curious.

In many of the departments of France, funds have been publicly subscribed for the purchase of a set of boring rods : in some, associations have been formed to use them, and great attention is paid to the enumeration of the strata pierced through by the instrument. At a shaft sunk at the Saint Oven gate, near St. Denis, in January 1829, no less than six springs of water were cut through, one stationary, and the five others ascending to different heights.—*Journ. des Savans*, 1831.

2.—*Meteorological Averages at Canton and Macao.*

Thermometer at Canton, Lat. 23° 12'. *N.*

	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Annual Mean.
	°	°	°	°	°	°	°	°	°	°	°	°	°
Noon,....	64	57	72	77	78	85	85	85	83	77	67	62	74.5
Night,....	50	49	60	68	72	70	81	78	76	69	57	52	65.1
Highest,	74	78	82	86	88	90	94	80	88	85	80	70	82.9
Lowest,..	29	38	40	55	64	74	79	75	70	57	40	45	55.5

Mean temperature of Canton, 69.5

Thermometer at Macao, Lat. 22° 16′.

	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Mean.
	°	°	°	°	°	°	°	°	°	°	°	°	°
Morning,	62	59	66	73	77	82	84	82	81	75	65	62	72.3
Aftern.,	65	59	69	75	78	84	88	85	84	78	68	65	74.8
Highest,	72	71	77	83	85	89	92	90	88	86	80	70	81.9
Lowest,	53	49	55	66	71	74	81	79	76	61	57	57	64.9

Mean temperature of Macao, 73.5

Fall of Rain at Macao, from 1812 *to* 1831, *in inches.*

1812	1.0	2.6	5.4	6.1	19.8	16.0	12.2	14.1	17.6	6.0	4.3	2.2	107.3
1813	0.8	1.6	1.0	4.2	14.8	13.0	5.8	5.7	5.1		2.2	0.5	54.5
1814		3.1	2.8	5.4	18.6	29.0	11.9	7.2	4.4	4.5	8.8		95.7
1815		From 1st January to 31st December,											64.5
1816		Ditto ditto,											48.8
1819	2.5	3.8	2.7	2.0	8.0	4.2	4.3	18.5	6.0	4.6	1.8	1.1	59.0
1820	1.5	0.3	1.7	3.5	5.0	5.0	7.5	5.8	20.8	13.0	1.0	0.8	65.9
1821	1.0	3.6	2.4	5.0	9.2	10.2	8.0	11.5	2.7	10.5	2.5	2.0	68.6
1822	0.5	0.3	1.2	3.8	17.8	9.1	3.2	7.0	12.6	3.0	4.8	0.3	63.6
1823		0.1	0.6	5.6	1.0	12.8	11.6	7.0	6.0	11.0			55.7
1824			0.8	3.0	6.2	17.9	4.7	4.3	16.7	6.4	7.0	1.6	68.6
1825		0.3	4.0	3.5	8.5	13.4	7.0	13.6	8.2	3.8	1.0	1.0	73.3
1826	1.1	2.4	2.8	18.6	5.8	4.4	11.8	11.5	15.2	3.5	2.7		79.8
1827			2.		9.9	8.7	9.2	16.	3.5	.6	1.5	1.	51.8
1828	.1	1.4	3.6	11.1	22.8	17.4	10.9	10.0	16.2	5.9	0.2	4.6	104.6
1829	2.4	5.1	1.4	10.1	12.1	4.2	4.1	9.2	8.8	1.0		0.8	59.3
1830		0.5	1.0	0.4	4.4	4.6	7.1	10.3	19.4	5.3	1.0		52.9
1831		1.2	0.9	6.6	25.6	7.7	4.5	7.0	11.7	9.2	0.8		75.3
Mean	0.68	1.67	2.15	5.56	11.85	11.10	7.75	9.90	10.92	5.50	2.47	0.99	
									Mean annual rain, inches,				70.0
Rainy days,	3½	7	6	10	15½	9	10	12½	10	5	3	3½	

The averages at Canton are taken from the Meteorological Diary of the Canton Register for 1831. Those at Macao are from a private diary by Mr. Blettermen, during the same year.—*Companion to the Anglo-Chinese Kalendar of* 1832.

3.—*Polyzonal Lens.*

We are grieved to learn by a letter from Sir David Brewster to Mr. George Swinton, that there are at present little hopes of the accomplishment of the grand object, towards which the liberality of the lovers of science in India contributed so meritoriously a few years since. The failure of Messrs. Gilbert and Co. Opticians, who had already, it seems, executed one Lens on the Polyzonal principle for the Light-house Board, under the Dr.'s directions, had delayed further proceedings: and although the Firm was again established, the loss of all their tools and apparatus rendered it impossible for them to undertake the job at the price before settled, namely £80. Dollond and Co. would not attempt it under £400. Having experienced in these disastrous times the greatest difficulty in getting subscriptions from scientific men, Sir David had made a formal application to Lord Althorpe for some public aid, but this also was refused from the state of the revenue. Sir David fears therefore that he shall be obliged to re-transmit the sum subscribed towards the Lens in India. This would indeed be a mortification, and we cannot help thinking, that if the grand Polyzonal Lens can really be completed at an expence of £120, the patrons of science in India would rather make up the whole sum required than abandon, on such an unworthy consideration, an experiment of national and universal interest.

4.—*Litharge of Ava.*

In the examination of Ava minerals, printed in No. I. of this Journal, I expressed some doubt as to whether a specimen of crystallized litharge there described was a natural ore or an artificial product: the following passage in a letter from Major H. Burney sets the matter at rest. P.

" Mr. Lane, upon further inquiry, ascertained that the litharge was not a natural but an artificial production. It was brought however from the *Shan* territory, and there is always much difficulty in obtaining correct information regarding the productions or proceedings of the *Shan* race."—*Rangoon, 4th June*, 1832.

5.—*Timber Trade in Cachar.*

Timbers sold in Cachar are divided into three kinds, called Gúndah, Dúm, and Karí. Gúndahs consists of Jarul only, and are used chiefly in Sylhet for boat building. They are sold at two rates, according to their size. Those timbers which are less than ten *haths* in length and six *múts* in circumference are called Pyah, and are worth about 27½ Rupees each on an average; but those above that size are sold by the *khálí*, which is a measure derived from a rude and inaccurate mode of estimating the cubic contents of the timbers, in which they are assumed to be regular parallelopipedons, thus: 10 haths × 6 múts × 6 múts, 360 parts, of which 250 make a khalí; the value at present of which is about 3 Rs. 6 annas. Six múts make a hath, and the hath is equal to 20 inches.

The following table includes various kinds of timbers used chiefly for posts, beams, and small boats. The prices of these are in proportion to their size, but may be stated just now as here given :—

Nagísar, Cham, Awal,	25 haths by 3½ haths in cir. from 10 to 12 Rupees each.
Teylo, Súníd, Morye, Gandrú, Gamér,	25 hauts by 3½ hauts in cir. from 9 to 11 Rupees.
Sílratta, Sepai, Gandí, Jam, Chika,	25 hauts by 3½ hauts in cir. from 8 to 10 Rupees each.

Karí, consists of smaller trees running from 9 to 12 haths in length, which are sold in lots at from 1 to 1½ cawns per hath measured on the girth. The following are included in this class :

Ratta, Pumar, Karil, Kurta, Jokí, Singra, Chatní, Singtajah, Singdrine, Harís, Puarí, and many others.

Ratans, Jalí Bét, 7 Rs. pr. 100 muras (of 75 béts each). Súndí Do. one quarter higher.

Gala ditto, the large kind running from 80 to 120 feet in length, is unsaleable, and therefore only cut to order.

The prices above-mentioned are now current in Kachar; in addition to which the following duties are charged on the transit of the different articles to Sylhet.

	Rs.	a.	p.	
On Gúndahs,	0	6	6	
On Dúms and Káris, from	0	6	0	to 1 0 0 each.
Ratans, from	2 to 3 rupees per 100 murahs.			

The expence of floating the timbers from the forest to Banga is about 1 R. 4 as. per score, and about the same sum is charged for conveying them to Sylhet; but this expence is more than compensated by the sale of the bambus given gratis by the wood-cutters to form the rafts.

As Jarul is used only in Sylhet, for the construction of large chunam boats, the trade in that article has fallen off greatly of late, in consequence of the stagnation in the lime business, and the annual demand therefore does not now exceed two thousand timbers, which is about one-half the number formerly exported.

From 1500 to 2000 Dúms and Káris form the amount exported of those classes.

Jarul is seldom carried beyond the district of Sylhet in logs, in consequence of the difficulty of floating the timbers across so large a river as the Megna; it is sometimes exported in planks, but more commonly is worked up at Azmeri-ganj, Chattak, and Sanam-ganj into boats, for which, on account of its buoyancy, it is eminently fitted.

A Jarul boat well smeared with bélah will last with occasional repairs about 10 or 12 years, and one of twelve hundred maunds burthen may be built in Kachar for about 350 Rupees. Of the trees sold as Dúms and Káris, there are many which are very strong and durable woods, fit for building and furniture, but which have not yet been introduced to a fair market in consequence of the want of enterprize and capital of the traders.

It is further probable, that as the forests have never been thoroughly examined by any intelligent European, we are still ignorant of many valuable productions which they contain. Besides the Oak and Tún, Chumal, (well fitted for furniture,) Wild Nutmeg, Cinnamon, and Clove trees have, it is said, been seen in them.

T. F.

VII.—*Recommendations of the Sub-Committees of the British Association for the advancement of Science.*

An abstract of the Proceedings, and a first Report, of the grand Association convened at York in the autumn of 1831, has been published in the Philosophical Magazine of last March. As the suggestions drawn up are of general application, we lose no time in giving them circulation in

India. From an observation under the head of Hygrometry we are glad to find, that Indian labours receive their full share of consideration. There are many points among the desiderata, such as the gradation of temperature with altitude, the diurnal oscillations of the barometer, &c., which are peculiarly easy of elucidation in this climate; and we trust that they will be taken up by some of our friends at *Dehra Dún*, *Chirra Punjí, &c.* The Association proposes to supply delicate instruments for these observations, and in this respect it might certainly render us eminent service; for it may safely be stated that there is not a standard thermometer or barometer in the country, which can be trusted to reduce our results to terms of a known instrument at home.

It must be confessed, that at first sight the manner in which this new Society proposes to promote the cultivation of the sciences does not appear commensurate with the eclât and grandeur of its foundation; it exerts its persuasion on men eminent in various sciences, to perfect essays and experiments upon which in many cases they state themselves to be already engaged; it invites reports upon the recent progress of every branch of science, but these surely would have been furnished without any such recommendation, and publication would have been ensured free of expence to the authors through the numerous Societies and Periodical Journals already devoted to each division of knowledge. The reports are stated to be only preliminary to measures hereafter to be adopted for advancing and directing future investigations: but the members of such an association composed, as it must be, chiefly of scientific men, are surely aware whither to direct their researches, and unless substantial prizes and rewards are offered, who among them will readily quit the train into which he may have been drawn by taste or circumstances, to pursue a new course of study? A wide class of observers of what is called "the lower order of facts," in Meteorology, Botany, and Zoology may be created, and if well directed, their efforts may certainly prove of great utility; but for the refined examination of the first data of chemistry, of the abstruse questions of mathematical analysis, of astronomical problems, &c. the spontaneous labours of the habitual and secluded devotee will ever command more reliance than the hurried and ostentatious productions of commissioned students and experimenters. We observe that most of the general recommendations of the Society have been zealously taken up by the parties invited to prepare reports for the next meeting; we shall thus have a series of elegant essays, without perhaps much of real novelty, that would not have seen the light as soon in the ordinary way. But although we are not sanguine in our hopes of any brilliant achievement of invention by an association of such a nature, it would be unfair to suppose that it will produce no good results:—"it will cement a general co-operative union of the Philosophical Societies of the country; its publications will form a national catalogue of the scattered particulars of each science accurately detailed—and if Societies shall concur in thus meeting each other—in proposing certain common objects—in communicating from year to year the means which they are employing, and the progress which they are making, *it seems impossible* that this should be done in the presence of an assembly concentrating a great part of the scientific talent of the nation, without kindling an increased ardour of emulous activity; *it seems impossible,* that the deputies of any Society should attend such meetings without bringing back into its bosom an enlargement of views, and communicating to its members new lights of knowledge, new motives for inquiry, and new encouragement to perseverance."

The following are the recommendations of the Sub-Committees, drawn up and circulated after the first meeting.

Committee of Mathematical and Physical Science.

Mathematics.—The Committee recommend that the Vice-President of the Association residing at Cambridge be requested to use his utmost efforts to procure from some competent individual, a report to the next Meeting on the progress of Mathematical Science.

Astronomy.—That Professor Airy be requested to favour the Association with a report on the state and progress of Physical Astronomy, together with such remarks on the improvements of Practical Astronomy as he may deem it useful to add.

Theory of Tides.—That J. W. Lubbock, Esq. be requested to furnish a statement of the means which we possess, or which we want, for forming accurate tables for calculating the time and height of High-water at a given place.

Meteorology.—That James D. Forbes, Esq. be requested to draw up a report for the next meeting, on the present state of Meteorological Science.

The Committee, considering that the science of Meteorology is in more want than perhaps any other of that systematic direction which it is one great object of the Association to give, has thought it advisable to propose the following points for investigation.

I. That the Association should employ all the means in its power to procure a Register of the Thermometer during every hour of the day and night, to be kept at some military or naval station in the south of England.

Note.*—Until the phænomena and distribution of diurnal temperature are more thoroughly understood than at present, we can hardly hope that any very sure footing has been obtained in the study of Meteorology. The hourly register kept for several years at the military station of Leith Fort in lat. 56°, has shown that we want nothing but the combination of a sufficient number of trust-worthy observations, in order to obtain results of primary importance to the science, and which may one day enable us to arrive at the true form of the daily and annual curves of mean temperature, with a precision almost mathematical. In order, however, to extend the benefit of such investigations, it is

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* The notes appended to the Recommendations have been drawn up by some of the members of the Committees since the meeting.

absolutely necessary that they should be pursued in different latitudes. The mode of rendering available registers, otherwise almost without value from not being made at the proper hours, will be best illustrated by a reference to the account of the Leith observations.—*Transactions of the Royal Society of Edinburgh*, Vol. X.

II. That the establishment of such an hourly Meteorological Register be pointed out as a highly interesting object, in reference especially to the important point of intertropical climate, to the Committee of the Association in India.

III. That the Committee in India be requested to endeavour to institute such observations as may throw light on the phænomena of the horary oscillations of the barometer, near the equator. Should the concurrence of the Committee on these points be obtained, it would probably be desirable that the Association should take measures for sending out delicate and accurate instruments.

IV. That Mr. Phillips and Mr. William Gray, jun. of York, be requested to undertake a series of experiments on the comparative quantities of rain falling on the top of the great tower of York Minster, and on the ground near its base. The Committee has been induced to propose this specific question in consequence of the local fitness of the situation, and the facilities offered for its solution by the authorities; but it is to be wished that similar experiments should be made elsewhere, that, by an extended comparison of observations, light may be thrown upon the anomalies which have been observed at Paris and in other places*.

V. That the Association should express its desire to receive a satisfactory exposition of the theory of the moistened bulb hygrometer, and that observers be also invited to institute series of comparative experiments on the indications of the moistened thermometer and the temperature of the dew point.

Note.—These indications may be ascertained by Mr. Dalton's process, or by Mr. Daniell's hygrometer, or by both. Notwithstanding the ingenious and laborious researches of Hutton, De Saussure, Leslie, Anderson, and Gay Lussac upon this subject, scientific deductions drawn from more extended experiments are greatly wanted. The simplicity and certainty of the experiment by which the cold produced by the evaporation of water is measured, renders an accurate theory of the result peculiarly desirable. The experimenter would do well to consult Mr. Dalton's views on the theory of hygrometry, contained in his Meteorological Essays, and in the Manchester Transactions; and to examine the investigations of Professor Leslie, (Relations of Heat and Moisture, and Supplement to the Encyclopædia Britannica, article *Meteorology;*) of Dr. Anderson, (Edinburgh Encyclopædia, article *Hygrometer*,) and of M. Gay Lussac, (Biot, *Traité de Physique*, Tom. II.) A good series of observations at high temperatures will be found recorded in Nos. II. and III. of a Calcutta Journal, entitled Gleanings in Science†.

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* The Ochterlony monument would be a favorable position for a peculiar series of experiments in Calcutta.

† Vide also Observations in the GLEANINGS, No. VI. page 47 and 189.

VI. That experiments on the decrease of temperature at increasing heights in the atmosphere be recommended as an important subject for the contributions of observers.

Note.—Series of observations for considerable periods of time on the mean temperature of the air at fixed hours, and at stations of which the difference of height has been accurately measured, are the most valuable. The best hours for observations are those which give most accurately the mean temperature of the period of observation. The hourly observations at Leith Fort have determined the hours which give the annual mean temperature in this country to be about 9¼ A. M. and 8½ P. M. Experimental balloons have lately been employed by the Earl of Minto, to assist the solution of this problem, which is one of the most interesting in Meteorology : but the investigation of it is nearly brought to a stand for want of sufficiently numerous observations. The observer may be referred for information to Ramond's *Mémories sur la Formule Barométrique de la Mecanique Céleste;* to the researches of Humboldt; to Professor Leslie, Supplement to the *Encyclopædia Britannica,* Article *Climate;* to Pouillet, *Elemens de Physique;* to Mr. Atkinson's paper on Refractions, in the Memoirs of the Astronomical Society : and to Mr. Ivory's Memoir on the same subject in the Philosophical Transactions, and his papers in the Annals of Philosophy.

VII. That the observation of the temperature of springs at different heights and depths should be pointed out as an object of great interest, in prosecuting which insulated inquirers may render essential aid to science.

Note.—When springs are copious, a few observations in the course of the year suffice to give with great accuracy their mean temperature. The height of the springs above the mean level of the sea, and the depth of Artesian wells, should be carefully observed ; and where the corresponding mean temperature of the air can be obtained, it should be stated. In two points of view these observations are important, independently of the inference which they may furnish as to the decrease of heat in the atmosphere. The great interest attached to the phænomenon of the progressive increase of temperature of the globe, as we descend through the strata, renders of value observations on the temperature of springs at considerable heights, of springs in mines, and of those brought to the surface from some depths by the process of boring. This question has been treated with great success by M. Cordier in several memoirs, some of which have been translated into English. Again, the researches of Humboldt, Buch, Wahlenberg, and more recently Kupffer, in a Memoir on Isogeothermal Lines, read before the Academy of St. Petersburg in 1829, have shown that the temperature of the earth differs in many parts of the globe from that of the air, being generally in defect below lat. 56°, and in excess beyond it. Artesian wells, and the deviation of the mean temperature of the earth from that of the air in different latitudes, have opened new fields for discussion ; and by the zealous co-operation of observers cannot fail to present results, of which at present we can form but an imperfect idea.

Magnetism.—It appears to the Committee highly desirable, that a series of observations upon the intensity of terrestrial magnetism in various parts of England be made by some competent individual, similar to those which have recently been carried on in Scotland, by Mr. Dunlop.

Should the Committee succeed in finding some individual ready to undertake the task, they propose that an application should be made to the Royal Society of Edinburgh, for permission to make use of the standard needle belonging to them, and constructed under the direction of Professor Hansteen of Christiana.

It appears to the Committee of considerable importance that a certain number of observations should be made throughout Britain with the dipping needle, in order to reduce the horizontal to the true magnetic intensity.

Note.—The time of three hundred vibrations should be observed, and the methods of observation and reduction should be the same as have been employed and described by Humboldt, Hansteen, and others.

Electro-Magnetism.—The Committee recommend as an important subject for further prosecution, the examination of the electro-magnetic condition of metalliferous veins. The Committee would refer for the details of what has been already done upon this subject, to the paper of Mr. Fox in the Philosophical Transactions for 1830, and would propose that the experiments should be extended to veins which traverse, as in some of our mines, horizontal and dissimilar strata.

Optics.—That Dr. Brewster be requested to prepare for the next meeting a report on the progress of optical science.

Acoustics.—That the Rev. Robert Willis be requested to prepare for the next meeting a report on the state of our knowledge concerning the phanomena of sound, and the additions which have been recently made to it.

Heat.—That Professor Powell be requested to prepare for the next meeting a similar report respecting heat.

Electricity.—That Professor Cumming be requested to prepare for the next meeting a similar report on thermo-electricity, and the allied subjects, in which recent discoveries have been made.

Chemical Committee.

It appears to the Committee of supreme importance, that chemists should be enabled, by the most accurate experiments, to agree in the relative weights of the several elements, hydrogen, oxygen, and azote, or, which amounts to the same thing, that the specific gravity of the three gases should be ascertained in such a way as would insure the reasonable assent of all competent and unprejudiced judges.

They think it highly desirable, that the doubts which remain respecting the proportions of azote, oxygen, &c. in the atmosphere should be removed; that the proportions of azote and oxygen in nitrous gas and nitrous oxide should be strictly determined; and that the specific gravities of the compound gases in general should be more accurately investigated.

They recommend that the members of this Committee, and British chemists in general, be invited to make experiments on these subjects, and communicate their results to the next meeting at Oxford.

That Mr. Johnston be requested to present to the next meeting a view of the recent progress of chemical science, especially in foreign countries.

That Dr. Daubeny be requested to undertake an investigation into the sources from which organic bodies derive their fixed principles.

That Mr. Johnston be requested to undertake the inquiries which have been suggested to the Committee, into the comparative analysis of iron in the different stages of its manufacture.

That Mr. West be requested to pursue the experiments contemplated by him into the conbinations of gaseous bodies when passed through heated tubes.

That the Rev. W. Vernon Harcourt be requested to prosecute the inquiries contemplated by him into the chemical phenomena from which the materiality of what are sometimes called ethereal substances has been inferred.

Mineralogical Committee.

The Committee recommend, that the Rev. Professor Whewell be requested to present to the next meeting a report on the state and progress of Mineralogy.

Geological and Geographical Committee.

The Committee recommend, that geologists be requested to examine strictly into the truth of that part of the theory of M. Elie de Beaumont, in its application to England, Scotland, and Ireland, which asserts that the lines of disturbance of the strata assignable to the same age are parallel, and that a report to the next meeting on this subject should be procured.

That Mr. Phillips be requested to draw up, with such co-operation as he may procure, a systematic catalogue of all the organized fossils of Great Britain and Ireland, hitherto described, with such new species as he may have an opportunity of accurately examining, with notices of their localities and geological relations.

The Committee propose, that Mr. Robert Stevenson, civil engineer, be requested to prepare a report upon the waste and extension of the land on the east coast of Britain, and the question of the permanence of the relative level of the sea and land; and that individuals who can furnish observations be requested to correspond with him on the subject.

Note.—The importance which, especially of late years, has been attached to facts of this nature, in illustration of the sciences of hydrography and geology, and the mass of uncombined materials which have recently been accumulating, have induced the Committee to make the present recommendation ; and in doing so, it feels pleasure in being able to have in its view an individual whose practical acquaintance with the coast in general, and more particularly the minute survey made by him some years since, gives reason to expect from his report much important and accurate information.

Botanical Committee.

The Committee recommend, that Professor Lindley be requested to prepare for the next meeting an account of the principal questions recently settled, or at present agitated, in the philosophy of Botany, whether in this country or abroad :

That botanists in all parts of Great Britain and Ireland be invited to compose and communicate to the meetings of the Association catalogues of county or other local Floras, with indications of those species which have been recently introduced, of those which are rare or very local, and of those which thrive, or which have become or are becoming extinct, with such remarks as may be useful towards determining the connection which there may be between the habitats of particular plants, and the nature of the soil and the strata upon which they grow ; with statements of the mean winter and summer temperature of the air and water at the highest as well as the lowest elevation at which species occur, the hygrometrical condition of the air, and any other information of an historical, œconomical, and philosophical nature.

Note.—If upon this plan a complete botanical survey of the British islands could be obtained, the results would be important when the Flora in the aggregate came to be compared with its relations of soil, climate, elevation, &c.

Catalogue of Indian Birds.

[*Continued from p.* 267.]

CINCLOSOMA CAPISTRATUM. *Cinclos. capite suprà, genis, pteromatum maculâ rectricibusque ad basin intensè atris; remigum pogoniis externis, rectricum apicibus, tectricibusque alarum fusco-griseis, his fasciâ albâ notatis; dorso medio pallidè brunnescenti-griseo; collo in fronte, nuchâ, pectore, abdomineque summo pallide, dorso abdomineque imis saturatiùs, rufis.*

Rostrum nigrum, *pedes* flavescentes. *Remiges* interiores, *rectricum*que mediarum bases rufi. Longitudo *corporis*, 10; *alæ* a carpo ad apicem remigis 6tæ, 4; *rostri*, $\frac{}{10}$; *tarsi*, 1 $\frac{3}{20}$; *caudæ*, $4\frac{1}{2}$.

CINCLOSOMA VARIEGATUM. *Cinclos. strigâ a rictu per oculos extendente, mento colloque in fronte, maculâ pteromatum et mediâ alarum, rectricumque mediarum basibus atris; fronte, strigâ genarum infrà, pectoreque pallidè albescenti-rufis; notâ pteromatum, abdomine crissoque rufis; capite suprà, nuchâ, dorsoque brunnescenti-griseis; alarum pogoniis externis, rectricumque mediarum quatuor apicibus cineraceo-griseis; rectricibus quatuor utrinque lateralibus externè flavo-olivaceis, apicibus albis.*

Rostrum nigrum, *pedes* rubri. Longitudo *corporis*, 11; *alæ* a carpo ad apicem remigis 6tæ, 4; *rostri*, $\frac{9}{10}$; *tarsi*, 1 $\frac{8}{10}$; *caudæ*, $4\frac{1}{2}$.

CINCLOSOMA LINEATUM. *Cinclos. capite suprà, nuchâ, dorso imo, rectricibusque duabus mediis brunnescenti-griseis; regione post-oculari, dorso summo, corpore infrà, rectricibusque lateralibus pallescenti-rufis; his fasciâ nigrâ pone apicem album notatis; capitis nuchæque plumis in medio lineis fuscis, pectoris dorsique summi lineis pallidis, per totam rhachium longitudinem graciliter strigatis.*

*Rostrum pedes*que flavescentes. Longitudo *corporis*, $9\frac{1}{2}$; *alæ* a carpo ad apicem remigis 6tæ, $3\frac{1}{2}$; *rostri*, $\frac{7}{10}$; *tarsi*, 1; *caudæ*, $3\frac{3}{4}$.

Genus *Timalia*.

47. TIMALIA CHATARÆA. *Tim. suprà pallidè brunnescenti, subtùs rufescenti-cinerea; capite corporeque suprà lineis fuscis striatis; rectricibus fusco obsoletè fasciatis; rostro pallido.*

Longitudo $9\frac{3}{4}$.

Gogoye Thrush, Lath.?

48. *Timalia pileata*, Horsf. *Pileated Thrush*, Lath.

49. TIMALIA HYPOLEUCA. *Tim. suprà rufescenti-brunnea, subtùs alba; alis rufis; his caudâque subtùes cinereis, rectricibus fusco obsoletè fasciatis; rostro nigro.*

Longitudo $6\frac{1}{2}$.

50. TIMALIA HYPERYTHRA. *Tim. suprà olivascenti-brunnea; capite in fronte corporeque toto subtùs rufis; caudâ supernè fusco obsoletè fasciatâ; rostro pallido.*

Longitudo 5.

Genus *Ixos*.

51. *Ixos jocosus.* *Lanius jocosus*, Linn. *Jocose Shrike*, Lath.

52. *Ixos Cafer.* *Turdus Cafer*, Linn. *Cape Thrush*, Lath. *Le Courouge*, Le Va. ill.

53. *Ixos fulicata.* *Motacilla fulicata*, Linn. *Sooty Warbler*, var. Lath. *Traquet noir des Philippines*, Buff.

Fam. *Sylviadæ.*—Genus *Iora*.

54. *Iora scapularis*, Horsf. *Scapular Wagtail*, Lath.

Genus *Sylvia.*

55. *Sylvia Hippolais,* Lath. Ind. Orn. *Lesser Pettichaps,* Lath. *Reed Wren,* Lath. This is the bird alluded to under Dr. Latham's *Reed Wren,* as an Indian variety called *Tikra* and *Tiktiki.*

Genus *Prinia.*

56. **Prinia cursitans.** *Prin. corpore, suprà pallidè brunneo, fusco striato; gulâ juguloque albis; abdomine rufescente; rectricibus mediis fuscis, omnibus subtùs ad apicem fasciâ nigrâ albo terminatâ notatis.*

Longitudo 4.

57. **Prinia macroura.** *Prin. suprà grisescenti-brunnea; capite, alis, uropygioque subrufescenti tinetis: subtùs ferrugineo-albida; rectricibus quatuor mediis saturatioribus fusco obsoletè fasciatis, subtùs ad apicem fusco leviter notatis.*

Longitudo 5½.

58. **Prinia gracilis.** *Prin. cinereo-grisea; dorso, alis, caudâque olivascentibus: gulâ, pectore, abdomineque subtùs albidis; rectricibus subtùs griseis fasciâ nigrâ albo terminatâ notatis.*

Longitudo 4 $\frac{7}{10}$.

Foodkey Warbler, Lath ?

Genus *Motacilla.*

59. **Motacilla picata.** *Mot. capite, collo, corporeque supra nigris; strigâ utrinque superciliari alterâque longitudinali alarum, corpore subtùs, rectricibusque duabus lateralibus albis.*

Longitudo 9.

Pied Wagtail, Lath. pl. 104.

60. *Motacilla flava,* Linn. *Bergeronnette jaune,* Buff. & *Bergeronnette de printemps,* Buff. *Yellow Wagtail,* Lath.

This is the Indian bird alluded to by Dr. Latham under the head of *Yellow Wagtail,* called *Peeluck,* which is its Indian name.

Genus *Enicurus.*

(Hitherto considered limited to the Indian archipelago.)

Enicurus moculatus. *En. capite, collo, dorso superiori, pectore, ptilis, remigibus secundariis caudâque intensè atris; frontis notâ latâ, maculis confertis nuchæ et sparsis dorsi, pteromatibus, dorso, imo, abdomine, rectricibus lateralibus, mediarumque apicibus albis; remigibus primariis fuscis; rostro nigro pedibus albescentibus.*

Staturâ, *En. specioso* æqualis.

Genus *Saxicola.*

61. *Saxicola rubicola,* Temm. *Stone Chat Warbler,* Lath.

Genus *Phœnicura.*

62. *Phœnicura atrata,* Jard. & Selb. *Indian Redstart,* Id.

Phœnicura cœruleocephala. *Phœn. atra, abdomine strigâque alarum longitudinali albis; capite pallide cœruleo.*

Staturâ, *Phœn. communi.*

Phœnicura leucocephala. *Phœn. corpore apiceque caudæ atris; abdomine, crisso, uropygio, rufis; capite supra albo.* Statura *Phœn. rubeculæ.*

Phœnicura rubeculoïdes. *Phœn. capite, collo, corporeque supra atro-cœruleis, capitis summo splendidiore; abdomine albo; pectore rufo.*

Staturâ, *Phœn. cœruleocephalæ.*

PHŒNICURA FULIGINOSA. *Phœn. corpore fuliginoso-plumbeo ; caudâ rufâ.* Staturâ paullo major quam præcedens.

Fam. *Pipridæ.*—Genus *Parus.*

63\. *Parus atriceps*, Horsf. *Mésange cap-négre*, Temm.

PARUS XANTHOGENYS. *Par. capite cristato, gulâ, pectore, abdomine medio, strigâ utrinque colli, scapularium maculis, alis, caudâque atris, his albo notatis ; dorso scapularibusque virescenti-griseis ; genis, strigâ superciliari, maculâ nuchali, abdominisque lateribus flavis.*

Staturâ præcedentis.

PARUS MELANOLOPHUS. *Par. griseus ; capite cristato pectoreque atris ; genaram, nuchæ, tegminumque alarum maculis albis ; remigibus rectricibusque fuscis ; maculâ sub alis rufâ.*

Staturâ *Par. atro* paulo minor.

PARUS ERYTHROCEPHALUS. *Par. supra pallidè brunnescenti-canus, subtus rufescenti-albus ; gulâ, strigâ superciliari, rectricumque lateralium pogoniis externis albis ; capite supra rufo ; strigâ latâ per oculos ad nucham extendente, thoraceque atris.*

Staturâ *Par. pendulini*, Linn.

PARUS MONTICOLUS. *Par. capite, collo, pectore, abdomine medio, alis, rectricibusque atris ; genarum maculâ latâ nuchalique parvâ, tegminum remigum secundariarum rectricumque apicibus, et remigum primariarum rectricumque lateralium pogoniis externis albis ; abdominis lateribus flavis.*

Staturâ paulo minor *Par. majori.*

Tribus CONIROSTRES.

Fam. *Fringillidæ.*—Genus *Alauda.*

64\. ALAUDA CHENDOOLA. *Al. suprà pallidè grisescenti-brunnea, plumis fusco in medio notatis ; corpore subtùs strigâque superciliari albis ; rectricibus brunneis, duarum utrinque lateralium pogoniis externis albis ; pectore brunneo maculato, capite cristato.*

Staturâ *Al. arvensis*, Linn.

65\. ALAUDA GULGULA. *Al. pallidè rufescenti-brunnea, plumis in medio latè et intensè brunneo lineatis ; subtùs albescens, pectore brunneo lineato ; femoribus rufescentibus ; rectricibus brunneis, externâ utrinque ferè totâ, secundæ pogonio externo, albis.*

Staturâ ferè præcedentis.

Genus *Mirafra.*

66\. *Mirafra Javanica*, Horsf. *Alouette mirafre*, Temm.

67\. MIRAFRA PHŒNICURA. *Mir. pallidè cinereo-brunnea ; corpore subtùs, remigum pogoniis internis, rectricumque basi rufis ; rostro albo, culmine apiceque fuscis.*

Longitudo 5.

Genus *Emberiza.*

68\. *Emberiza Baghaira. Baag-geyra Lark*, Lath.

This bird is the common *Ortolon* of India, called *Baghairi.*

69\. *Emberiza Gingica*, Gmel. *Duree Finch*, Lath.

70\. *Emberiza cristata*, Gould's Century of Himalayan Birds.

71\. *Emberiza Bengalensis. Baya Berbera*, Asiat. Res. *Loxia Bengalensis*, Linn.

The Hindu name of this bird is *Baya ;* its Sanscrit name *Berbera.*

EMBERIZA CRISTATA. Mas. *Emb. capite cristato corporeque atris ; alis caudâque rufis.*

Fœm. aut Mas jun. ? *Capite subcristato corporeque fuscis, abdomine imo pallidiori ; alis caudâque rufescentibus, fusco tinctis.*

Staturâ *Carduelis communis.*

CARDUELIS SPINOÏDES. Mas. *Card. fronte, occipite, collo corporeque infra, ptilis, pteromatum apicibus, fasciâ remigum, rectricumque lateralium basibus flavis ; capite supra dorsoque olivaceis ; alis caudâque fuscescenti-nigris.*

Fœm. ? *Coloribus minùs saturatis ; abdomine dorsoque olivaceo-fusco striatis.*

Staturâ paulò major quàm *Card. Spini.*

CARDUELIS CANICEPS. *Card. brunnescenti-canus ; alis caudâque nigris ; circulo angusto frontem rictum gulamque circumcingente coccineo ; fasciâ alarum aureâ ; thorace, maculis paucis alarum, uropygio, abdomine imo, crisso, rectricum externarum pogoniis internis, mediarumque apicibus albis.*

Staturâ *Card. communis.*

Genus *Fringilla.*

72. *Fringilla Amandava,* Linn. *Le Bengali Piqueté,* Buff.

73. *Fringilla formosa,* Lath. *Lovely Finch,* Lath.

74. *Fringilla Malabaria,* ——. *Loxia Malabaria,* Linn. *Malabar Grosbeak,* Lath.

75 FRINGILLA FLAVICOLLIS. *Fring. suprà cinereo-grisea, subtus albida ; jugulo maculâ flavâ notato ; humeris ferrugineis ; alis maculis albis fascias duas exhibentibus notatis.*

Longitudo $5\frac{3}{10}$.

This bird, though placed amongst the *Finches*, differs in the form of its bill, and it may perhaps hereafter be found expedient to remove it.

FRINGILLA RODOPEPLA. *Fring. suprà brunnea ; capite, nuchâ, dorsoque lineis fucis rosaceoque nitore notatis ; strigâ utrinque superciliari, gulâ, thorace, maculis alarum, uropygio, corporeque subtus rosaceis.*

Longitudo circiter 7 uncias.

FRINGILLA RODOCHROA. *Fring. supra brunnea ; capite, nuchâ, dorsoque lineis fuscis, illo rosaceo tinctis ; fronte, strigâ utrinque superciliari, gulâ, pectore, corpore subtus, uropygioque rosaceis ; alis immaculatis.*

Longitudo circiter $5\frac{1}{2}$ uncias.

Genus *Coccothraustes.*

Coccothraustes icteroides. Mas. *Cocc. capite, jugulo, dorso medio, alis, femorum tectricibus, caudâque atris ; nuchâ uropygio, corporeque subtus luteis.*

Fœm. *Olivaceo-cana, uropygio abdomineque lutescentibus ; remigibus rectricibusque atris.*

Genus *Ploceus.*

76. *Ploceus Philippinus,* Cuv. *Philippine Grosbeak,* Lath.

Fam. *Sturnidæ.*—Genus *Pastor.*

77. *Pastor roseus,* Temm. *Rose-coloured Thrush,* Lath. *Le Roselin,* Le Vaill.

78. *Pastor tristis,* Temm. *Merle des Philippines,* Buff.

79. *Pastor griseus,* Horsf. *Le Martin gris de fer,* Le Vaill.

80. *Pastor Contra* vel *Capensis,* Temm. *Etourneau Pie,* Buff.

81. *Fastor Pagodarum,* Temm. *Le Martin Brâme,* Le Vaill.

Fam. *Corvidæ.*—Genus *Corvus*

82. *Corvus Corone,* Linn. *Carrion Crow,* Lath.

This bird appears to be the common *Carrion Crow* of India; it differs only in size from the European *Crow*, and in the greater elevation of the bill.

Genus *Coracias*.

83. *Coracias Bengalensis*, Linn. *Blue Jay from the East Indies*, Edw.

Genus *Pica*.

84. *Pica vagabunda*, Wagler. *Rufous Magpie*, Hardw.

Genus *Garrulus*.

GARRULUS LANCEOLATUS. *Garr. vinaceo-badius; capite subcristato, gulâ, jugulo, alisque atris: collo anteriori albo, lanceolati; pteromatibus remigibusque cœruleo fasciatis, illis albo terminatis; cauda cœruleâ, nigro fasciatâ, fasciâ lata apicali albo terminatâ notatâ.*

GARRULUS BISPECULARIS. *Garr. pallidè badius, uropygio crissoque albis; maculâ latâ postrictali, caudâ, pteromatibus, remigibusque atris; his duabus cœruleo fasciatis.*

GARRULUS STRIATUS. *Garr. pallidè brunneus, subtus pallidior; corporis suprà subtusque plumis in medio albo longitudinaliter striatis; cristâ verticali remigibus, rectricibusque unicoloribus.*

This latter species was observed to deviate in general colour and markings from the European species, although according in form; and in the former characters to exhibit a manifest approach to the *nut-crackers* or the genus *nucifraga* of Brisson.

Genus *Nucifraga*.

NUCIFRAGA HEMISPILA. *Nuc. castaneo-brunnea; capitè subtus, collo anteriori, dorso, pectoreque albo maculatis; capite summo, alis, rectricibusque intensè brunneis*; *his, duabus mediis exceptis, ad apicem latè albis.*

This new species, in the shape of the bill, is shorter and stouter at the base than in the European species, and approaches to the *Jays*.

Fam. *Buceridæ.*—Genus *Buceros*.

85. *Buceros Gingianus*, Lath. *Indian Hornbill*, Lath.

There is some confusion with regard to this bird in Dr. Latham's General History, under the heads of *Gingi* and *Indian Hornbill:* it is the *Dhanésa* of India.

86. *Buceros Malabaricus*, Gmel. *Unicorn Hornbill*, Lath.

There is also much confusion with regard to this bird under the heads of *Pied Hornbill* and *Unicorn Hornbill* of Latham: it is the *Dhanésa* of the latter, var. B.

Tribus SCANSORES.

Fam. *Psittacidæ.*—Genus *Palæornis*.

87. *Palæornis torquatus*, Vig. *Psittaca Borbonica torquata*, Briss. *La Perruche à double collier*, Buff.

88. *Palæornis Bengalensis*, Vig. *Psittacus Bengalensis*, Gmel. *Blossom-headed Parakeet*, Lath. sp. 74. var. A.

89. PALÆORNIS FLAVICOLLARIS. *Pal. viridis; capite lilacino-cano, flavo marginato; rectricibus mediis cœruleis apice albo.*

Longitudo 12.

According to the description, this would appear to be Dr. Latham's *yellow-collared Parrakeet;* but he refers to figures which do not correspond.

Genus Psittacula.

PSITTACULA RUBIFRONS. *Psitt. viridis, subtùs pallidior; fronte, dorso imo, rectricumque tectricibus coccineis; remigibus caudâque viridi-fuscis, rostro subelongato rufo.*

Staturâ paullò major quàm *Psitt. Galguli.*

Fam. *Picidæ.*—Genus *Bucco.*

90. BUCCO CANICEPS. *Buc. gramineo-viridis; capite, nuchâ, collo, pectoreque griseis; illius plumis in medio albido lineatis; rostro rubro; pedibus flavis; regione circumoculari nudâ flavescenti-rubrâ.*

Longitudo 10.

Fichtel's Barbet, Lath.?

This bird is the *Bara-Basanta* of India, and appears to be the same as var. A. of Dr. Latham's *Fichtel's Barbet.*

91. *Bucco Philippinensis,* Gmel. *Barbu des Philippines,* Buff.

Genus *Picus.*

92. *Picus Bengalensis,* Linn. *Bengal Woodpecker,* Lath.

93. *Picus Mahrattensis,* Lath., Ind. Orn. *Mahratta Woodpecker,* Lath.

PICUS HYPERYTHRUS. Mas. *Pic. corpore suprà nigro, albo-maculato, subtus rufescenti-badio; capite crissoque coccineis; strigâ utrinque per oculos extendente albâ; mandibulâ superiori nigrâ, inferiori albâ.*

Fœm. *Capite nigro albo-lineato.*

Staturâ *Pic. medii,* Linn.

PICUS OCCIPITALIS. Mas. *Pic. viridis, uropygio lutescenti; fronte coccineo; vertice strigâ latâ occipitali ad nucham extendente, alterâque utrinque sub oculos postrictali atris; remigibus rectricibusque fusco atris, parum duabus mediis pallido-fusco striatis, illis externè albo maculatis; gulâ genisque canis.* Fœm. *Fronte atrâ albo lineatâ.*

PICUS SQUAMATUS. *Pic. suprà viridis, uropygio sublatescent; gulâ juguloque viridi-canis; capite coccineo; strigâ superoculari, abdomineque viridi albis, hoc atro squamato; strigâ superciliari alterâque utrinque mentali atris; remigibus rectricibusque fusco atris, illis externè, his utrinque albo maculatis.*

PICUS SPILOLOPHUS. *Pic. dorso alisque sanguineo-coccineis; subtùs sordidè albus, fuscescenti undulatus; capite colloque nigris, guttis albis maculatis; hujus maculis grandioribus; remigibus caudâque fuscis, harum pogoniis internis albo maculatis.*

Longitudo *corporis,* $11\frac{3}{4}$.

PICUS MODESTUS. *Pic. suprà ater, alis ad latera apicesque subrufescentibus; capite in fronte genisque obscurè coccineis, occipite, gulâ, jugulo, colloque grisescenti-atris, plumis maculâ minutissimâ albâ ad apicem terminatis; rectricibus duabus mediis elongatis.*

Longitudo *corporis,* 15; *alæ* a carpo ad apicem remigis 4tæ, 6; *caudæ,* 6; *tarsi,* 1; *rostri,* $1\frac{1}{2}$.

PICUS AURICEPS. Mas. *Pic. capite supra aureo; occipite, abdomine imo, crissoque coccineis; colli parte posteriori et strigâ utrinque laterali, corporeque supra nigris; colli parte frontali et lateribus, corporeque infra albis, hoc nigro striato; scapularibus, pteromatibus, remigibus, rectricibusque lateralibus albomaculatis; dorso medio griseo, albo nigroque fasciato.*

Fœm. *Sine notâ coccineâ occipitali.*

Staturâ *Pic. medii.*

PICUS PYGMÆUS. Mas. *Pic. capite supra dorsoque medio griseo-canis, hoc albo nigroque fasciato; strigâ utrinque per oculos ad nucham extendente, gulâ, maculisque pteromatum remigum et rectricum lateralium albis; pectore abdomine-

que albescentibus, fusco graciliter striatis; notâ longitudinali gracili utrinque post oculos cocciueâ.

Fœm. *Sine notâ coccineâ postoculari.*

Staturâ minor quam *Pic. minoris.*

Fam. *Certhiadæ.*—Genus *Sitta.*

94. SITTA CASTANEOVENTRIS. *Sit. supernè griseo-plumbea; pectore abdomineque castaneis; strigâ a rictu per oculos ad nucham extendente, remigibus, rectricumque pogoniis internis nigris; gulâ maculâque rectricum lateralium albis.*

Longitudo 5.

Ferruginous-bellied Nuthatch, Lath.?

Genus *Certhia.*

95. CERTHIA SPILONOTA. *Certh. suprà griseo-fusca, albo maculata; capite albo graciliter striato; gulâ abdomineque albidis, hoc fusco fasciato; caudâ albo fuscoque fasciatâ.*

Longitudo 5½.

The tail of this bird is soft and flexible, in which respect it differs from the type of the genus; but it agrees in all others.

Genus *Upupa.*

96. *Upupa minor,* Shaw. *La Huppe d' Afrique,* Le Vaill.

Fam. *Cuculidæ.*—Genus *Leptosomus.*

97. *Leptosomus Afer.* *Cuculus Afer,* Gmel. *Edolian Cuckow,* Shaw.

Genus *Cuculus.*

98. *Cuculus canorus,* Linn. *Common Cuckow,* Lath.

This bird, on comparison with the *common Cuckow,* differs so little that it can scarcely be called a variety; it is the common *Cuckow* of India, and its habits and note resemble those of the European bird.

99. *Cuculus fugax,* Horsf. *Bychan Cuckow,* Lath.

The common Indian name of this bird is *Pípiha* or *Pipeeha,* from its note; in Sanscrit *Chataca.* Dr. Buchanan named it *Cuculus radiatus.*

100. *Cuculus Sonneratii,* Ind. Orn.? *Le petit Coucou des Indes,* Sonn.? *Sonnerat's Cuckow,* Lath.?

Not having either specimen or figures to refer to, I conclude, from description alone, that this bird is *Sonnerat's Cuckow.*

Genus *Centropus.*

101. *Centropus Philippensis,* Cuv. *Coucou des Philippines,* Buff. *Chestnut Coucal,* Lath.

Genus *Lampromorpha.*

LAMPROMORPHA AMETHYSTINA. *Lamp. suprà splendidè amethystina; abdomine albo, fasciis viridi-amethystinis ornato; rectricibus lateralibus albo notatis.*

Longitudo 7¼.

This description is taken from a bird in the state of change, the amethystine feathers on the back, tail and breast, appearing partially through a ferruginous ground, but sufficiently numerous and defined to indicate the adult plumage. A younger bird in the collection has nearly the whole of the upper body ferruginous, with an amethystine feather here and there breaking out. In a note appended to the description of the species, Mr. Lindsay states that the natives considered them of extremely rare occurrence.

The male exhibited of this species was observed to have the two middle tail feathers elongated beyond the rest, and the lateral feathers were shown to be altogether soft and flexible, like those of the genus *Picumnus,* Temm.

This bird is the *Mahooka* of India, so named from its note; it is called also, by the English, *Pheasant Crow.* Dr. Latham's *chestnut Coucal* very accurately describes it, but his figure is bad; having apparently been taken from a drawing of Gen. Hardwicke's, which stated it to be a young bird. Dr. Buchanan named it *Cuculus castaneus.*

Genus *Eudynamys.*

102. *Eudynamys Orientalis. Cuculus Orientalis,* Linn. *Eastern black Cuckow,* Lath. *Coucou noir des Indes* & *Coukeel,* Buff.

This bird is the *Coel* of India, and the *Coukeel* of Buffon.

103. *Eudynamys Sirkee. Centropus Sirkee,* Hardw. *Sirkeer Cuckow,* Lath.

Tribus Tenuirostres.

Fam. *Meliphagidæ.*—Genus *Chloropsis.*

104. *Chloropsis aurifrons,* Jard. & Selby. *Malabar Chloropsis,* Jard. & Selby.

This bird is the *Huréwa* of India, and is well described by Dr. Latham as the *Hurruwa Bee-eater.*

Fam. *Cinnyridæ.*—Genus *Cinnyris.*

105. Cinnyris Orientalis. *Cinn. capite, collo, dorsoque splendidè virescenti-purpureis; abdomine purpureo-atro; alis caudâque atris; fasciculo utrinque sub alis aurantiaco.*

Longitudo 4.

Eastern Creeper, Lath.

Cinnyris Gouldiæ. *Cinn. capite supra, gulâ colloque in fronte, regione auriculari, strigâ utrinque gracili ad latera colli usque ad humeros extendente, uropygio, caudæ tectricibus, rectricibusque duabus mediis elongatis purpureo et cœruleo metallicè splendentibus; capitis lateribus, occipite, nuchâ, scapularibus, dorso summo, ptilisque sanguineo-rubris; dorso imo, pectore, abdomineque sulphureis, his sanguineo sparsis; remigibus rectricibusque lateralibus fuscis.*

Longitudo circiter 5 uncias.

This species has been dedicated by Mr. Vigors to the accomplished artist, Mrs. Gould, who executed the plates of the Himalayan birds.

Ordo III. RASORES.

Fam. Columbidæ.

Genus *Vinago.*

106. *Vinago militaris. Columba militaris,* Temm. *Columbar Commandeur,* Temm. *Hurrial Pigeon,* Lath.

Genus *Columba.*

107. *Columba tigrina,* Temm. *Colombe à nuque perlée,* Temm.

108. *Columba Cambayensis,* Gmel. *Colombe maillée,* Temm.

109. *Columba risoria,* Linn. *Colombe Blonde,* Temm. *La Tourterelle Blonde,* Le Vaill.

Le Vaillant mentions a larger bird of this species which is common in Africa; the same thing occurs also in India, where there are two birds differing only in size.

110. *Columba humilis,* Temm. *Colombe terrestre,* Temm.

Columba leuconota. *Col. capite canescenti-atro; crisso caudâque nigris; nuchâ, corpore subtus, dorso medio, caudæque fasciâ latâ mediâ, albis; tegminibus alarum vinaceo-canis; dorso superiori scapularibusque brunnescenti-canis; remigibus, fasciisque alarum brunnescenti-fuscis.*

Staturâ *Col. Palumbi,* Linn.

Fam. Phasianidæ.

Genus *Pavo.*

111. *Pavo cristatus,* Linn. *Le Paon,* Buff. *Crested Peacock,* Lath.

Genus *Tragopan.*

112. *Tragopan Satyrus,* Cuv. *Meleagris Satyrus,* Linn. *Horned Pheasant,* Lath.

Tragopan Hastingsii. *Trag. dorso brunneo-fusco undulato, abdomine intensè rubro, amborum plumis ad apicem nigris in medio albo guttatis; cristâ crissoque atris, illâ ad apicem coccineâ, hoc albo maculato; collo posteriori coccineo; thorace aurantio; regione circum oculari nudâ, carunculisque pendentibus luteis; caudâ atrâ, lutescenti-albo undulatâ.*

This is a second species of the singular group of *Horned Pheasant (Meleagris Satyra* of Linnæus), peculiar to India.

Genus *Phasianus.*

PHASIANUS ALBO-CRISTATUS. Mas. *Phas. supra ater, viridi nitore splendens; dorso imo albo fasciato; cristæ plumis albis, elongatis, deorsim recumbentibus, basi subfuscis; remigibus corporeque inferiori fuscis; pectoris plumis lanceolatis albescentibus.*

Fœm. *Corpore supra cristâque breviori, fuscescenti-brunneis; abdomine pallidiore; gulâ plumarumque corporis apicibus et rhacibus albescentibus; rectricibus lateralibus atris, mediis brunneis albescenti undulatis.*

This is the true pheasant, indicated only by former writers from imperfect drawings and descriptions.

PHASIANUS STACEII. *Phas. stramineo-albus, supra frequenter, subtus parcè nigro fasciatus, dorso abdomineque imis rufescentibus; capite cristato fusco; caudâ fasciis latis nigris, ad basin internè rufis, ornatâ.*

Longitudo *corporis* ab apice rostri ad apicem caudæ, 3 pedes 4 uncias.

PHASIANUS LINEATUS, Lath. MSS. *Phas. supra cano-griseus; fasciis gracilibus nigris undulatus; capite, cristâ elongatâ, gulâ, collo anteriori, corporeque infra nigris; abdominis laterum plumis in medio lineis gracilibus albis notatis; caudâ albo nigroque undulatim sparsâ.*

Fam. TETRAONIDÆ.

Genus *Pterocles.*

113. *Pterocles exustus,* Temm. *Ganga ventre-brulé,* Temm.

Genus *Francolinus.*

114. *Francolinus Ponticerianus,* Temm. *Francolin à rabat,* Temm.

115. *Francolinus vulgaris,* Steph. *Le Francolin,* Buff. *Francolin,* Edw.

Genus *Perdix.*

116. *Perdix picta,* Jard. & Selby. *Painted Partridge,* Id. *Beautiful Partridge,* Lath.

117. *Perdix Hardwickii,* Gray. *Curria Partridge,* Lath.

118. *Perdix Cambayensis,* Temm. *Perdrix rousse-gorge,* Temm.

Genus *Coturnix.*

119. *Coturnix dactylisonans,* Meyer. *Common Quail,* Lath.

This bird is named *Ghagul;* it corresponds with the European species, and is not very common in India.

120. *Coturnix Coromandelica. Perdix Coromandelica,* Lath. *Perdix textilis,* Temm. *Caille nattée,* Temm.

This is the most common *Quail* of India, called *Bhuteir.* Dr. Buchanan named it *Perdix olivacea.*

Genus *Hemipodius.*

121. *Hemipodius Dussumier,* Temm. *Turnix Dussumier,* Temm. *Mottled Quail,* Lath.

Fam. STRUTHIONIDÆ.

Genus *Otis.*

122. *Otis Indica,* Ind. Orn.? *White-chinned Bustard,* Lath.?

This bird has usually been considered as the female of the *Otis aurita,* and has been so figured and described; but it is well known to be a distinct bird. It is the common *Leek* of India, called by the English *Bastard Florican.* I am not quite certain that Dr. Latham's *White-chinned Bustard* is the bird, but his description is so near, that I have not thought it proper to make it a new species.

OTIS NIGRICEPS. *Ot. corpore supra pallidè badio, rufo-brunneo graciliter undulato; collo, maculis parcis alarum, abdomineque albis; capite cristato, tectricibus alarum exterioribus, remigibus, notâque grandi pectorali nigris.*

Longitudo *corporis* ab apice rostri ad apicem caudæ, pedes 4; latitudo, 4½.

OTIS HIMALAYANUS. *Ot. niger; alis albis; dorso medio scapularibusque pallido-rufo, brunneoque variegatis; dorso imo pallido-rufo undulatim sparso; cristæ collique plumis anterioribus et posterioribus confertis, elongatis.*

ORDO IV. GRALLATORES.

Fam. GRUIDÆ.

Genus *Grus.*

123. *Grus Orientalis,* Briss. *Ardea Antigone,* Linn. *Indian Crane,* Lath.

Fam. ARDEIDÆ.

Genus *Mycteria.*

124. *Mycteria Australis. Ciconia Mycteria Australis,* Hardw. *Tetaar Jabiru,* Lath.

Genus *Ardea.*

125. *Ardea purpurea,* Linn. *Le Héron pourprè huppè,* Buff. *Crested Purple Heron,* Lath.

126. *Ardea speciosa,* Horsf. *Darter Heron,* Lath.

This bird is without doubt the *Darter Heron* of Dr. Latham; and the *Ardea speciosa* of Dr. Horsfield is, I think, merely the Javanese type of the same bird.

127. *Ardea Torra,* Buch. *Ardea Egretta,* Lath. Ind. Orn. var. *Ardea alba,* Linn. var. *Great Egret,* Lath. Indian variety *Torra* or *Bughletar.*

This is the Indian *White Egret,* and it differs only in size from the European species, being somewhat smaller. Dr. Buchanan named it *Ard. Torra,* and when without its filiform appendages on the back, *Ard. Putea;* so that these Indian terms appear to correspond with *Ard. Egretta* and *Ard. alba.*

128. *Ardea Caboga,* Penn. *Caboga Heron,* Penn. *Gibraltar Heron,* Lath. var. A.

The term *Caboga* is a corruption of the Indian term *Gao-buga, Cow* or *Cattle Heron,* in allusion to its frequently being seen amongst cattle, like the *Gibraltar Heron.*

Genus *Botaurus.*

129. *Botaurus cinnamoneus. Ardea cinnamonea,* Gmel. *Cinnamon Heron,* Lath.

Genus *Nycticorax.*

130. *Nycticorax Europæus. Ardea Nycticorax,* Linn. *Night Heron,* Lath.

C. NYCTICORAX MANILLENSIS. *Nyct. suprà castaneo rufa; collo in fronte, abdominis lateribus, femorum tectricibus, alarumque tectricibus inferioribus pallidiori-rufis; capite colloque suprà nigris, cristæ pennis longis pendentibus albis, apice nigro; pectore abdomine crissoque albis.*

Staturâ paulo major quàm *Nyct. Caledonica,* cui simillima; differt tamen colore cristæ, colli in fronte, tectricumque inferiorum alarum.

Genus *Tantalus.*

131. *Tantalus papillosa. Ibis papillosa,* Temm. *Bald Ibis,* Lath.

Fam. SCOLOPACIDÆ.

Genus *Rhynchæa.*

132. *Rhynchæa Orientalis,* Horsf. *Cape Snipe,* Lath. *Bécassine de Madagascar,* Buff.

RHYNCHÆA CAPENSIS, Sav. *Rhynch, remigibus angustis, fasciis latis flavis sex notatis, infrà griseis, nigro-vermiculatis, flavoque fasciatis; secundariarum maculâ pogonii externi, fasciâque pogonii interni, flavis.*

Long. corporis 9¾ unc.: tarsi, 21½ lin.: digiti unguisque medii, 20½ lin.

RHYNCHÆA PICTA. *Rhynch. remigibus sublatis, externis flavo latè 7-fasciatis, infrâ griseo nigroque vermiculatis, interno obsoletè flavo-fasciato: secundariarum apicibus, maculâ ultimâ fasciæ-formi pogonii externi, fasciâque pogonii interni, albis.*

Long. corporis 10½ unc.: tarsi, 19½ lin.: digiti medii, 19 lin.

The wing-coverts of both species are spotted with yellow in the young state; and in the adult state are metallic olive with black bands.

Genus *Tringa.*

133. *Tringa ochropus,* Linn. *Green Sandpiper,* Penn.
134. *Tringa Glareola,* Linn. *Wood Sandpiper,* Penn.
135. *Tringa pusilla,* Linn. *Little Sandpiper,* Lath.
136. *Tringa hypoleucos,* Linn. *Common Sandpiper,* Lath.

Fam. RALLIDÆ.

Genus *Parra.*

137. *Parra phœnicura. Gallinula phœnicura,* Lath., Ind. Orn. *Red-tailed Gallinule,* Lath. *Poule-Sultane de la Chine,* Buff.

138. *Parra Sinensis,* Gmel. *Chinese Jacana,* Lath.

139. *Parra Indica,* Lath., Ind. Orn. *Indian Jacana,* Lath.

Genus *Rallus.*

140. *Rallus niger,* Gmel. *Black Rail,* Lath.

Genus *Porphyrio.*

141. *Porphyrio hyacinthinus. Fulica Porphyrio,* Linn. *Purple Water-hen,* Edw.

Fam. CHARADRIADÆ.

Genus *Vanellus.*

142. *Vanellus Goensis. Tringa Goensis,* Lath. *Vanneau armé de Goa,* Buff.

143. *Vanellus ventralis. Charadrius ventralis,* Wagl. *Spur-winged Plover,* Hardw.

144. *Vanellus bilobus. Charadrius bilobus,* Gmel. *Bilobate Sandpiper,* Lath.

Genus *Cursorius.*

145. *Cursorius Asiaticus,* Gmel. & Lath. *Courvite de la Côte de Coromandel,* Buff.

Genus *Himantopus.*

146. *Himantopus melanopterus. Charadrius Himantopus,* Linn. *L' Echasse,* Buff.

Genus *Charadrius.*

147. CHARADRIUS HIATICULOÏDES. *Char. suprà griseo-fuscus; fasciâ frontali alterâque verticali, corpore subtùs, collarique nuchali albis; lineâ sub oculis ad aures extendente, fasciâ ad frontem, torqueque pectorali subgracili ad nucham extendente nigris; rectricibus, duabus mediis exceptis, albis, in medio nigro et griseo-brunneo notatis, fasciam semilunarem exhibentibus.*

This bird differs chiefly from the European species in size, being at least one third smaller, and in the narrowness of the pectoral band.

ORDO V. NATATORES.

Fam. ANATIDÆ.

Genus *Anser.*

148. *Anser Indicus,* Lath., Ind. Orn. *Barred-headed Goose,* Lath.

149. *Anser melanotos,* Gmel. *Black-backed Goose,* Lath.

150. *Anser Coromandeliana,* Gmel. *Sarcelle de la Côte de Coromandel,* Buff. *Anas Girra,* Hardw. *Girra Teal,* Lath.

Genus *Anas.*

151. *Anas arcuata,* Cuv. *Siley Teal,* Lath.

The name of this bird in India is *Siley* or *Silhei,* from its whilstling note; the English call it *Whistling Teal;* it scarcely differs from the Javanese species as figured by Dr. Horsfield.

152. *Anas Crecca,* Linn. *Common Teal,* Lath.

This bird is the *common Teal* of India, and agrees exactly with the British species.

Fam. COLYMBIDÆ.

Genus *Podiceps.*

153. *Podiceps minor,* Lath., Ind. Orn. *Little Grebe,* Lath.

Fam. PELECANIDÆ.

Genus *Carbo.*

154. *Carbo fuscicollis. Phalacrocorax fuscicollis,* Shaw. *Brown-necked Shag,* Lath.

Genus *Plotus.*

155. *Plotus melanogaster,* Gmel. *Black-bellied Darter,* Lath.

Genus *Sterna.*

156. *Sterna melanogastra,* Temm. *Hirondelle de mer à ventre noir,* Temm.

IX.—*Instructions for collecting and preserving Coleopterous Insects.*

Under the name of *Coleoptera* are designated all insects with hard wings, such as cockchafers, beetles of various kinds—Curculio, Melolontha, Copris, Lucanus Cervus, Scarabæus, Necrophagi, &c. They are found every where on flowers and leaves, under stones, the bark of trees, moss, and fallen leaves, in rotten wood, old mushrooms, in stagnant water, and among decomposing animal and vegetable matter.

Some interesting species live about the roots of plants, which must be extracted to get at them.

Places where trees have been cut down, should be explored, especially under the logs, and, in the sun, upon the exterior of the timber.

Many insects, in hot climates, hide themselves during the day in the ground, which should be dug up round insulated trees to the depth of a few inches :—the same kind of search should be made along the foundations of walls, &c. The detritus left along the bank of a river, or the sea shore, by retiring water, should be examined. A good number of rare *Carabi* are found on the banks of ponds,—buried in the sand, or concealed under the pebbles of a dry brook. The puddles formed by heavy rain, must by no means be neglected : they abound in interesting insects.

Besides the mode pointed out above, there are various others for collecting quickly a number of insects which live upon plants : thus holding a parasol or a handkerchief under a bush or a branch, and shaking the latter affords a ready method of getting at many curious insects : or a light bag, fitted to a hoop and handle, may be moved rapidly about the extremity of branches while shaken, and the *Coleoptera* will be entangled therein and easily made prisoners.

The *Necrophagi* are not often found in hot climates, where their place is supplied by ants. The way to procure them is to place wide-mouthed bottles, baited with pieces of flesh, out of the reach of ants, that is, hung up in the air, or insulated by being placed in a vessel of water. The smell of the meat will attract the insects.

Nocturnal Coleoptera are very rare in collections. To take them, a cloth should be spread towards night in the neighbourhood of a flower bed, and a couple of lamps placed on it : the insects settle upon the cloth where they must be made captive without loss of time. Searching plants in the night is also very productive.

Coleoptera should be pinned always *through the right wing*, proportioning the pin to the size of the insect, and taking care not to injure the feet and antennæ.

To save time during the chase, small insects may be put in a bottle, and pinned on return. They do not injure themselves, if a little moss or paper is introduced for them to hold by. In hot climates, the best time for *the chase* is, the morning or the evening. Nevertheless every moment of the day abounds with new species, and a zealous collector will vary the time of his visits abroad. There is no occasion to make long walks : it is better to explore thoroughly a circumscribed space, more especially if a rare individual has been discovered, because it is probable that another may be found in the same locality : there are generally many together.

Besides the travelling box, the collector should have a number of larger boxes for the preservation of his specimens. They should be three inches deep, and the bottom covered with a stratum of cork. In intertropical countries the cork may be replaced by sola, or by various spongy woods.

One box should be devoted to large *Coleoptera*, to avoid the injury their weight would cause to the smaller species if they should get loose in travelling.

Insects should not be put in the magazine boxes until they are dead ; they may then be put as close as possible to save space.

When the feet or antennæ prevent the specimens from being closed up, they should be placed for a time in a humid atmosphere, in a covered saucepan with a few drops of warm water, or in moistened sand :—the limbs will then become relaxed, and may be easily brought close to the body, where they must be held by pins until they have dried in the proper attitude.

For preserving *Coleoptera*, pinning is decidedly the best method, it is only large black hard insects that can be preserved in spirits : cotton, sand, sawdust, &c. are of no use whatever.

If a rare insect loses a leg or antenna, it should be carefully wrapped in paper, and pinned by the side of the mutilated animal. It is useless to collect grass-hoppers, flies, spiders, or bugs. These insects are very difficult of preservation, often too very large, and therefore only encumber the boxes uselessly.

When a box is sufficiently full of *Coleoptera* firmly fixed with pins, according to the foregoing directions, it should be accurately closed by pasting paper over all the joints, so as to prevent moisture, dust, or other insects from penetrating.

The above directions are translated from a paper transmitted to the Asiatic Society by a zealous French entomologist, Mons. Petit de la Saussaye, chef du bureau des travaux au Ministère de la Marine, at Paris, who was desirous of obtaining specimens of the Coleopterous insects from India, and who handsomely offered in return, duplicates from his own extensive cabinet. The following extract from M. Petit's letter to the Secretary As. Soc. read on the 4th Jan. may tempt some of our correspondents to comply with his request.

" Amateur zelé de l'etude de l'entomologie, je possède une des collections de Paris les plus riches en coléoptères, famille dont je m'occupe principalement.

Les relations que j'ai avec plusieurs parties de l'Afrique et de l'Amérique me donnent les moyens de faire des échanges avec les musées étrangers, et j'ai osé espercr que vous voudriez bien m'admettre au nombre des personnes qui correspondent de cette manière, avec le célèbre établissement que vous dirigez.

L'avantage que je puis vous offrir consisteroit moins dans la variété des espèces que je vous adresserai, que dans l'exactitude de la classification. Ma collection est nommée d'après le systême adopté par M. le Compte Dejean, dont les ouvrages sur les coléoptères sont connus de tous les entomologistes, et les envois que je fais sont classés avec le plus grand soin, ce qui facilite beaucoup à mes correspondants l'arrangement et l'étude des insectes.

De votre coté, Monsieur, il vous seroit bien facile d'enrichir ma collection, car je n'ai presque rien des belles contrées soumises à vos explorations, et les espèces moins rares auraient déjà pour moi le mérite de la nouveauté."

Collections or letters to M. Petit may be addressed under cover *à Mr. le Ministre de la Marine, à Paris.*

Meteorological Register kept at the Surveyor General's Office, Calcutta, for the Month of July, 1832.

Days of the Month.	Minimum Temperature observed at sunrise.					Maximum Pressure observed at 9h. 50m.					Max. Temp. and Dryness observed at 2h. 40m.					Minimum Pressure observed at 4h. 0m.					Observations made at sunset.					Observations in Calcutta, at 10h. 30m. p. m.					Rain Gauge, No. 1.	Rain Gauge, No. 2.
	Barometer reduced to 32°.	Temper. of the air.	Depres. of M.B.Ther.	Wind.	Aspect of the sky.	Barom. red. to 32°.	Temper. of the air.	Depres. of M.B.Ther.	Wind.	Aspect of the sky.	Barom. red. to 32°.	Temper. of the air.	Depres. of M.B.Ther.	Wind.	Aspect of the sky.	Barom. red. to 32°	Temper. of the air.	Depres. of M.B.Ther.	Wind.	Aspect of the sky.	Barom. red. to 32°.	Temper. of the air.	Depres. of M.B.Ther.	Wind.	Aspect of the sky.	Barom. red. to 32°.	Temper. of the air.	Depres. of M.B.Ther.	Wind.	Aspect of the sky.		
1	29,382	80,7	1,8	s.	cy.	,440	80,5	1,8	s. e.	rn.	,370	83,8	4,1	s.	cy.	,360	83,5	3,3	s.	cy.	,369	79,7	2,5	s. e.	rn.	,432	78,8	1,4	s. e.	rn.		
2	,421	78,	1,5	do.	rn.	,461	80,3	2,1	s.	n.	,435	80,	2,3	do.	n.	,397	79,7	2,	do.	o	,405	79,7	2,	s.	do.	,474	81,2	2,0	do.	do.	0,58	0,40
3	,451	79,3	3,1	s. w.	do.	,489	81,5	2,	cm.	rn.	,408	89,	8,	s. w.	cu.	,395	86,7	5,	s. w.	cu.	,414	84,5	3,8	s. w.	cu.	,437	83,2	5,0	s. w.	cu.	1,62	1,56
4	,432	76,5	1,8	s. e.	do.	,504	77,	2,5	s. e.	cy.	,445	85,5	5,5	s. e.	cis.	,441	84,	4,3	s.	cis.	,433	83,7	2,8	s.	do.	,506	84,5	7,5	do.	gl.		
5	,500	81,7	3,2	s. w.	cu.	,557	86,5	5,8	s w.	cu.	,494	90,3	8,8	s. w.	cu.	,444	89,5	7,6	s. w.	cu.	,469	85,	4,1	s. w.	do.	,548	84,4	3,4	s.	cl.		
6	,506	81,7	2,5	s. e.	cus.	,549	90,	6,8	do.	do.	,489	94,5	9,3	s. e.	do.	,472	90,5	6,5	s. e.	do.	,482	85,5	4,	s. e.	do.	,547	85,2	3,9	do.	do.		
7	,511	82,3	2,8	do.	ci.	,574	88,	5,1	s. e.	do.	,489	78,5	1,3	do.	rn.	,489	81,5	3,6	do.	n.	,497	79,5	3,5	do.	n.	,558	81,5	5,4	s. e.	cus.		
8	,500	78,	2,1	do.	rn.	,531	e1,3	4,1	do.	cus.	,494	90,5	7,8	do.	cu.	,476	88,	4,5	do	cu.	,488	84,7	3,5	do.	cis.	,550	84,3	4,4	s.	cuc.	0,12	0,10
9	,560	79,	2,3	s. w.	cus.	,606	85,5	6,	s. w.	cis.	,509	89,	8,8	w.	cis.	,505	86,3	5,6	n. e.	cis.	,508	83,3	3,1	n. e.	do.	,582	82,3	3,0	s. e.	cl.		
10	,567	79,7	1,8	n. e.	n.	,615	88,7	6,	n. e.	cu.	,562	83,5	2,6	cm.	rn.	,542	86,5	5,3	cm.	do.	,547	83,5	4,	cm.	do.	,607	81,7	1,7	e.	do.		
11	,598	80,	2,5	s. e.	cus.	,641	86,5	6,3	do.	do.	,574	86,5	6,8	s. e.	cu.	,551	88,3	8,4	n. e.	cu.	,558	82,	3,8	s.	cu.	,628	81,0	3,2	s. e.	str.		
12	,618	79,7	2,	n. e.	cy.	,686	84,	3,5	do.	do.						,623	8 ,3	3,1	cm.	cis.	,613	81,7	2,8	cm.	cis.	,711	81,0	2,9	e.	cis.	0,48	0,39
13	,597	79,5	1,8	s.	n.	,734	86,7	6,2	s.	do.	,653	84,7	4,	s. e.	cus.	,630	89,3	8,8	e.	cu.	,643	84,	4,8	s. e.	ci.	,708	81,0	3,2	s.	cl.	0,36	0,29
14	,656	79,5	2,	do.	cy.	,682	87,7	6,	do.	do.	,607	91,5	10,8	do.	cu.	,594	90,5	10,6	s. e.	do.	,609	84,7	3,8	e.	cus.	,681	81,0	3,0	do.	do.	0,22	0,15
15	,622	79,	1,8	do.	rn.	,667	87,5	6,	s. e.	cis.	,587	89,3	7,8	s.	do.	,567	87,	6,5	do.	cis.	,576	81,	3,8	cm.	cis.	,627	82,0	4,0	do.	str.		
16	,597	79,7	2,2	n. e.	cy.	,631	87,6	6,4	n. e.	cu.	,566	87,	5,5	n. e.	cus.	,547	86,	4,8	do.	cu.	,564	83,3	2,8	s, e.	cus.	,694	82,4	3,8	s. e.	n.		
17	,564	79,	1,8	s. w.	cis.	,607	87,3	6,1	w.	do.	,551	89,5	8,3	s. w.	cis.	,532	88,3	6,4	do.	do.	,538	83,	2,8	do.	cis.	,623	84,1	3,3	s.w.	cl.		0,40
18	,570	81,7	1,5	s. e.	cu.	,606	83,	2,8	s.	rn.	,515	86,8	5,3	cm.	do.	,479	85,7	4,7	cm.	cis.	,494	84,	3,3	do.	do.	,535	84,5	3,2	s.	cus.		
19	,474	80,5	1,8	do.	cus.	,516	87,8	5,3	n.w.	cu.	,451	85,3	3,8	s. e.	n.	,432	84,	3,1	e.	do.	,416	83,5	3,3	do.	cus.	,481	84,4	4,0	s. e.	cl.		
20	,454	81,	1,8	n. e.	cis.	,499	89,5	7,	n. e.	do.	,414	94,	11,3	n. e.	cu.	,390	90,5	8,8	s. e.	cus	,407	84,5	3,8	s.	cis.	,485	84,5	4,5	e.	do.		
21	,453	81,	1,9	do.	cu.	,501	88,3	6,1	do.	do.	,428	92,	10,8	do.	do.	,394	90,3	8,3	do.	do.	,401	84,	2,9	s. e.	cus.	,484	84,4	2,3	w.	do.		
22	,443	81,5	2,3	do.	do.	,484	86,	5,8	do.	cis.	,393	87,	5,5	do.	n.	,357	86,5	5,8	n. e.	do.	,381	86,3	5,8	n .	cis.	,474	83,8	1,3	e.	do		0,09
23	,438	81,3	1,8	do.	do.	,465	86,5	5,3	do.	cu.	,395	84,5	3,8	do.	cis.	,379	86,	4.8	do.	cis.	,371	85,3	5,1	d.	cus.	,470	83,2	3,5	s. e.	do.		0,29
24	,412	79,7	1,	cm.	cy.	,484	85,	4,3	do.	do.	,397	86,5	6,	do.	cu.	,393	85,	5,1	n.	ci.	,400	82,	2,8	d.	ci.	,465	82,0	2,7	do.	cu.		0,47
25	,416	80,	1,8	n. e.	ci.	,466	85,7	5,	e.	do.	,365	85,5	4,8	e.	rn.	,335	86,5	5,3	e.	cus.	,353	82,5	2,8	e.	n.	,451	82,5	2,7	do.	do.		
26	,430	80,3	2,1	do.	cu.	,462	85,5	4,6	n. e.	do.	,390	91,	8,8	n. e.	ci.	,365	87,	6,	n. e.	cu.	,358	84,5	3,8	n. e.	cu.	,453	83,2	4,0	e.	cl		
27	,374	80,5	1,8	do.	cy.	,406	85,	4,3	do.	do.	,345	88,	5,5	do.	cus.	,302	86,5	5,3	do.	cis	,302	86,	5.	do.	do.	,393	84,0	4,2	w.	cus.		
28	,293	79,7	1,	s. e.	rn.	,336	83,	2,8	s. w.	do.	,307	88,	6,5	do.	do.	,296	84,5	2,8	s. e	cus.	,313	83,5	3,8	s e	do.	,428	82,6	4,2	s.	do.	0,87	0,75
29	,405	80,7	1,8	s. w.	cu	,453	85,5	4,8	do	do.	,386	88,	7,8	s. w.	cu.	,371	86,7	6,	s. w.	cu.	,356	84,5	4,8	s w	cis.	,475	83,8	4,1	s w.	do.		
30	,427	81,	2,3	do.	do.	,486	83,5	3,8	do.	cus.	,416	81,	4,3	do.	cus.	,414	79,5	2,	do.	rn.	,383	79,	2,3	do.	do.	,452	82,0	2,6	w.	cu.	0,11	0,08
31	,401	80,5	1,6	do.	n.	,443	80,8	1,8	do.	n.	,389	84,	3,3	do.	n.	,367	83,2	2,5	do.	cis.	,353	82,	1,8	do.	cu.	,434	8 ,0	2,2	cm.	str.		
Mean,	29,489	80,1	2,0			,532	85,3	4,7			,460	87,3	6,3			,447	86,1	5,4			,452	83,2	3,5			,526	82,8	3,1			4,36	4,97

Abbreviations. In the column "wind," small letters have been used instead of capitals; *cm.* means *calm.* In the column "aspect of the sky," *cy.* is *cloudy; cl. clear; rn. rain, ci. cirrus ; cu. cumulus ; cs. cirro-stratus ; cus. cumulo-stratus ; cc. cirro-cumulus ; n. nimbus.*

JOURNAL

OF

THE ASIATIC SOCIETY.

No. 8.—*August*, 1832.

I.—*Progress of Indian Maritime Surveys.*

Amongst the events of scientific interest which have recently been announced in India, is the institution in England of a new Society, having for its object the promotion of Geographical Science, and called the Royal Geographical Society. Mr. Barrow, the reputed author of many valuable articles in the *Quarterly Review*, illustrative of the Geography of various parts of the world, and the adviser of those expeditions into the Arctic Seas, from the success of which in exploring the northern coasts of the American continent, so much credit has redounded to the British nation, is the President of this Society; and certainly, since the death of our own Major Rennell, there is no one whose reputation stands so high in this department of science, or whose zeal, acuteness, and rare tact in the discrimination of the value of materials promise more for the success of an association devoted to such objects. There has been issued already one number, containing the first fruits of the Society's labours; and the interesting papers it contains, added to the style of elegance and correctness in which the maps are executed, make us wish anxiously to see the continuation.

There is no branch of science so proper as geography to be taken up by an Association of this kind, because there is none in advancing which pure study and literary research can do so little, and the progress of which depends so much upon the accidental circumstances in which men of various attainments happen to find themselves placed. For nearly all that has been done, and for most that is still doing in geography, by land or by sea, we are indebted to the exertions of practical unpretending individuals, who finding the maps and charts they are using incorrect, or lighting by chance on new objects not laid down, employ a few leisure days in examining and noting what they thus illustrate or discover. Each in this way adds his little mite to the store of knowledge already accumulated, and, without the authentic record afforded by the published proceedings of a Society, these contributions might be withheld altogether from the world, or might fall into the hands of those who would misuse them. Henceforward the publications of this useful institution will afford a certain means of tracing discoveries to their source, and of ascertaining upon what authority additions are made in successive Maps and Charts. The compiler and publisher who has set his name ostentatiously in the corner, has too often hitherto got the credit for all the improvements introduced; while the adventurous voyager who has discovered, and the surveyor whose superior skill has delineated and assigned the true position to objects, have been defrauded of the fame which is their just due. The observation holds equally whether the addition to geographical knowledge be the result of measures taken by a Government officer, with the specific object of ascertaining or verifying a point, or of individual enterprise directed by zeal, or by accident, into this line of science. For, with exception to the large general surveys undertaken by Governments for military or for fiscal purposes, the results of which are given to the world, each with the pretension of out-doing all that has gone before, but of which the great expence must make the instances rare, the improvements effected by Government officers, are, like those by individuals, of isolated locality; and when the point has been ascertained, the result is incorporated in some general chart, and the time and manner of the survey is soon forgotten, or known only to those who from curiosity or from official duty may happen to be employed in ransacking the archives of state offices. For these reasons we look upon the establishment of a Society devoted especially to geographical science to be a most useful institution; and we hope that all who are engaged in the same pursuit, and who may become possessed of materials, or be placed in circumstances to be able to contribute any thing towards the advancement of this science, will furnish their results to the new Association, that they may be there digested and compared and verified, and so be turned to account, according to their value, in leading to a more accurate knowledge of the earth's surface—every advance made to this object being set down to the credit of the right owner.

The field of geographical inquiry is still a very wide one. The interior of many continents remains blank in our latest maps. The coasts of others are set down as handed from chart-maker to chart-maker without any recent verifications, and upon very doubtful original authority, while of more than half the islands on the earth's surface we have no more accurate knowledge, than the fact, that they exist in clusters of uncertain number and position, and of very dangerous approach. Nay, even in the great high-ways of commerce and of navigation, there are rocks and sandbanks and other perils, as to the existence and locality of which the evidence is balanced with most perplexing equality. Such things ought not to be in this age of philosophical research, and in a department more especially which admits of exact ascertainment. We look to the labours of the new Geographical Society to dispel the mist of uncertainty which now covers so much of the earth's surface, and by little and little to bring out the whole in clear and well-defined and undisputed outlines. Those who aid in this work, may be assured of the approving cheer with which the results of their labours will be hailed by all classes and all nations; for geography is a science, the benefit from advancing which none are so obtuse or so bigotted as not to acknowledge.

As a science, geography is entirely of modern growth. It has followed upon the advances made in the art of navigation; and to this circumstance only can we ascribe, the comparative backwardness of the ancients in the department, and the little they have left that is of value in it. Before the discovery of the compass and the improvements made in the construction of ships, and the numberless inventions which have made navigation a means of access to the remotest corners of the far distant ocean, the geographer's materials were confined to itineraries, and the confused records of military expeditions, and of laborious land-journies. Then mountains and rivers, and interior seas, deserts and lakes, were the objects of first discovery. Now we have the coasts and outward appearance, and the entire size of a continent thoroughly ascertained and delineated before we know any thing whatsoever of the interior. With the advance of navigation came the necessity of providing the means of accurately knowing, whereabout on the earth's surface the winds and waves had carried the adventurous voyager. Hence the discovery of instruments for determining latitudes and longitudes with a precision before undreamt of, and hence the ability to assign a place on the general map of the earth's surface to every object that presented itself to the navigator's observation.

The refined and scientific surveys on land, undertaken for the correct determination of the earth's figure, would never have been set on foot but for the discoveries previously made by navigation. They are but an extension of that science, and are effected through an application of the same intruments and materials, though these are prepared and used of course with much more elaborate care than for the common purposes of the practical voyager.

Seeing, therefore, how entirely dependent geography has been, and still is, and, for a long time to come, must be upon navigation, we learn to appreciate the labours of those marine surveyors and careful scientific navigators, through whom we have arrived at a correct knowledge of the positions of islands, and of the figure of continents, and of the bays and rivers, and rocks and sand-banks, which distinguish the shores of seas and oceans, and thus are enabled to compile a chart which shall accurately exhibit the phænomena of the earth's surface, and enable future voyagers to steer boldly to ports they have never before visited; astonishing the native inhabitants by the display of more information on the subject than they possess themselves.

There is nothing however more deceitful, or that ought to be received with more distrust than a chart or nautical survey, with the author of which and the materials of construction we are unacquainted. There is not a midshipman nor a captain's clerk in the mercantile navy that cannot take a latitude and a bearing, and with the help of the printed navigation tables, make an approximate calculation of the longitude. Nobody, therefore, that sails in a ship which happens to light upon strange lands, or upon objects of any kind not laid down in previous charts, fails to assign at once a locality to what he sees ; and if the time allows him to cast anchor, a chart is constructed from a series of bearings, and produced with as much confidence as if made from the best trigonometrical data. If the author of the discovery be a man of credit and intelligence, his chart is incorporated in those published to the world, and continues, with all its defects, to be given out as the best record possessed of the portion of the earth's surface delineated. This is exactly as it should be, and no one in his senses, would wish such information and materials to be suppressed ; but the difference is wide between the sketch of a casual voyager of this kind, put together from compass bearings, and logboard distances, and computed latitudes and longitudes, and the accurate delineation of the practised nautical surveyor employed to verify, and to ascertain once for all, the exact position and outline of what has been hitherto vaguely and imperfectly known and reported.

The Governments of British India are entitled to much credit, for the manner in which the means at their disposal have been employed in furthering the advance of our geographical knowledge, by surveys of this kind. The department has, in the seas to the eastward of the Indian peninsulas, been for many years under the direction and personal management of Captain Ross, Senior Commander in the Indian Navy, and Marine

Surveyor General to the Supreme Government. The reputation of this officer stands already too high to be affected by any commendations we might bestow upon the works he has produced. We look upon the charts as complete models in their kind, knowing them to be constructed with a care and a regard to scientific accuracy, creditable alike to himself, and to the Government, which approving his cautious methods, leaves him to prosecute his surveys as his own good sense may suggest, unembarrassed by minute instructions, and with merely the locality and direction of his investigations indicated beforehand. The result is, that charts are annually produced, which convert tracts of complete *terra incognita*, or coasts roughly laid down from the loose bearings and observations of casual voyagers, into lines of accurately defined and well delineated shore, with the mountains and highlands, the bays and harbours, the rivers and watering places, and all the towns or villages, within observation from the sea, correctly set down. Each of these charts is a new acquisition to geography, quite independent of the service done to navigation by laying down the real position and bearings of dangers, visible or hidden; and by enabling every nautical man, on approaching the coast surveyed, to know for certain where he is, and what course he should steer in prosecution of the voyage he has in hand.

A coast once laid down by the accurate methods pursued by Captain Ross, needs never to be surveyed a second time. Future investigators may complete what from circumstances may have been left by him imperfect. They may add a few new lines of soundings, but they will find nothing to find fault with or to require correction. Indeed, the confidence with which practical navigators, when once they come upon the ground included in his surveys, follow boldly his directions, and shape their course at pleasure, in the most intricate passages, is both a compliment to his industry and professional skill, and a proof of his well-earned reputation in the department.

Captain Ross was, we believe, first employed in surveying various portions of the China Seas, under the orders of the Court of Directors, issued as far back as in the year 1806. These surveys occupied him 14 years, and embraced all the most prominent dangers of the frequented passages of navigation to and from China, and all the most important coasts of that empire. The charts were separately published, as they were completed, but the whole were afterwards incorporated in the General Chart published by the hydrographer of the Company, and which bears Mr. Horsburgh's name.

In 1823, Captain Ross was appointed by the Court of Directors to his present office of Marine Surveyor General. His operations were necessarily interrupted during the Burmese war; but the following surveys have since been executed in succession under his superintendence, and mostly by himself personally.

1. The Rangoon river to its mouth.
2. The straits, approaches, and harbour of Singapore.
3. The Mergui archipelago, Tenasserim coast, and Martaban, with the river at Amherst and Moulmein. The sheets of this Chart cover a line of coast extending from Lat. 8°. 28′. N. to 16°. 32′. and include a vast number of Islands never before laid down or even visited by Europeans.
4. In the meantime, the coast of Ava from Negrais to Ramrí, and Sandowí, was surveyed by Captain Crawfurd, and Chedúba roads and Ramrí, by Captain Ross's assistant Lieut. Lloyd.
5. The coast of Arracan, north of the point to which Captain Crawfurd's Chart extended, was, in the past season, the object of Captain Ross's personal survey; and, in one or two seasons more, the entire eastern shore of the Bay of Bengal will have been laid down by this officer, or by those under his orders, with as much accuracy as can be claimed for the charts of the coasts of Europe and the Mediterranean.

All Captain Ross's surveys, and those made under his orders by junior officers of the department, are laid down from bases carefully measured on shore, where this has been possible, and are strictly trigonometrical; and though necessarily wanting that minute correctness aimed at in similar surveys on land, theypossess, nevertheless, an accuracy fully sufficient for the scale on which the Charts are delineated. The base lines on shore are measured on the most favorable level spots that can be found, by running a ten-foot rod along a cord, stretched tight between the extreme points, and kept in position by stakes, of which the direction is verified by a telescope at one end. Second and third bases are measured for further assurance, and in correction of the first.

If there be no means of measuring a base on shore, as when the locality of rocks and sand-banks, out of sight of land, may have to be ascertained, recourse is had to the measurement of a base by sound, which in a long line of 5½ to 6 geometric miles is a process affording more practical accuracy than would be supposed. The vessels being anchored at this distance, and a calm period chosen, the distance is taken between the flash and report of a gun, and upon the assumption that sound travels at the rate of 1140 feet per second, while with repeated

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Note.—The Andaman Islands were surveyed as far back as 1789, 90, and 1793, by Captain Blair.

experiments the time can be taken to a tenth of a second, the distance of the two vessels is obtained by this process to within at least 50 or 60 yards.

The angles subtended by the different points on shore, are taken always with the sextant, and the azimuth compass is only resorted to in order to lay down the true meridian. The practice of taking points by bearings of the compass, though common with many nautical surveyors of repute, is one that admits, comparatively with the sextant, of very little accuracy. The theodolite cannot be used on board ship.

Frequent observations for latitude and longitude, made both on shore and on ship-board, and as well from morning as from evening sights, afford further means of insuring accuracy ; and it has been stated, that upon the result of the survey made of the coast and archipelago of Mergui and Tenasserim, extending through a space of eight degrees of latitude, and of one or one and a half of longitude, and comprising upwards of 600 islands entered in the chart ; the difference in position of any two intermediate objects found trigonometrically, barely exceeded, when tested by careful observations for latitude, one quarter of a mile :—more than this cannot be desired for any purpose within the objects of a Marine Survey.

It has been usual for the Government, upon receiving each chart as it is completed, to strike off a few copies by lithography, and to send the originals to England, where they are engraved by the Court of Directors, and we presume, made accessible to the public. We have heard occasional complaint of difficulty in procuring copies, but whether that difficulty refers to their not being furnished from the Government offices in India, or to disappointment at not being able to procure them here to purchase, we confess that we do not thoroughly understand. The later Charts of Captain Ross, and in particular the very interesting survey of the Mergui archipelago and Tenasserim coast, are well deserving of the attention of the Geographical Society in England, from the additions they afford to the geographical information possessed of those countries ; and we hope to see them noticed with due acknowledgments by that Society. Did we possess the same facility of neat engraving, that publishers in England have at command, we should have thought it our duty to annex to this article, a sketch of the whole of this coast and of its islands, as now laid down, compared with the same as given in the latest previous Charts, in order that the extent of the improvement effected might be duly appreciated. The backwardness of India in this branch of art compels us to leave this to be done by others.

The progress of the maritime surveys on the western side of the peninsula of India, has not been less effectual in defining the outline and real bearing of the coasts, and the position of the islands, rocks, and sand-banks, between the Indus and the African shore, including the two inland seas of Persia and Arabia. We have not the means of stating the periods when each tract of this wide space was surveyed, or of giving the names of the officers employed upon the work; but we learn that a series of engraved charts, illustrative of a considerable part of the shore of Persia, has been lately received from the Court of Directors in England, and we know that a surveying establishment is maintained for those seas, quite independently of that under the Supreme Government at the head of which Capt. Ross is now placed.

That establishment, we may be assured, has not been idle, but it is the less necessary for us to enquire what may have been the result of its official labours, because we learn that a branch of the Royal Geographical Society has already been formed at Bombay, so that we may look forward to receive accurate reports of the progress making there in every branch of this science, either in separate publications for embodying the proceedings of the Branch Society, or in the communications and papers it will contribute to the pages of the parent Society in England.

The example of this diligence, ought not to be lost upon us ; and although the proceedings of our Asiatic Society, and several articles which this publication, or its predecessor, has been the means of laying before the world, sufficiently shew, that the interest and curiosity already directed to this field of science needs little further stimulus or excitement, yet we confess, that we think it might be adviseable for the Asiatic Society to form a separate committee of its members into a Geographical Class, whose labours should be specially directed into this channel, as is the case with the Physical Class already formed, and through whom correspondence might be opened with the Royal Geographical Society in England, and with the Branch Society more recently established at Bombay. This object is well worthy of the attention of those members of the Society who have devoted themselves to Geography, and who as navigators, travellers, and professional surveyors, may have already contributed, or may have the means of contributing to the stock of information already accumulated in this line. Their experience and talents cannot be more usefully employed than in comparing, combining, and publishing in a mature and digested form the materials which, if such a Committee of the Asiatic Society were in existence, would, there can be no doubt, be offered in abundance from many quarters.

II.—*On the Mammalia of Nepal.—By* B. H. Hodgson, *Esq. C. S.*

[Read in the Physical Class, 8th February.]

The geographical distribution of animals is, I observe, daily attracting, more and more, the attention of the ablest Zoologists; and reasonably, for this view of the subject has many relations of great interest and importance. On this account I am induced to offer to the Society, a summary enumeration of the Mammalia of Nepal. But as the territories comprehended within the dominions of the Gorkháli dynasty, and now universally denominated Nepal, possess an extraordinary variety of temperature and physiognomy, it will be necessary to preface my account of the animals found within its limits, by a brief description of the climate and physical aspect of the materially different parts of these territories. These parts are three, the juxta-Indian, the Central, and the juxta-Himalayan. The first embraces the Taráï or marshes, the Bháwar or forest, and the little hills with their subject valleys up to the base of the mountains, properly so called.

The marshes and forest are on the level of the plains of Hindústan, and possess their climate, with some increase of heat from deficient ventilation, especially in the forest; and with an excess of moisture, derived from numberless petty streams oozing out of the hills, and dissipating their waters in the soil of the forest and Taráï, for want of force to cut channels for themselves into the rivers.

About $\frac{1}{20}$ of the Taráï is cultivated: the rest is overrun with topes gone to jungle, brush-wood, and giant-grass. Large tracts of the grass land of the Taráï are annually subdued by fire, and afterwards depastured by thousands of cows and buffaloes, but only for about two months; after which the grass growing out of all compass, restores to these temporary pastures, the features of the surrounding wilderness.

The forest is entirely void of cultivation, and is a prodigious assemblage of noble trees woven together by immense creepers; and incumbered, above, with air plants; below, with underwood and grass from 6 to 10 feet high.

The *third* portion of this tract, comprising the small hills with their subjacent valleys, up to the base of the great or true mountains, has the same character with the forest, (save where, here and there, one of the valleys has been cleared and worked,) and the elevation of this tract is too inconsiderable to make any difference in its temperature.

The malaria prevails equally and terribly throughout all three parts of this region, from the middle of March to the middle of October; and whoever has traversed it must, I think, *feel* that the pestilence is generated by the undue and almost exclusive prevalence of vegetable exhalations in the atmosphere. There is no free ventilation; and the forest and the lesser hills (where the malaria is worst) are absolute wildernesses of rank vegetation, of so extravagantly rife an increase that in Oriental phrase, you may almost *see and hear it grow!*

Yet, it is worthy of remark, that in this pest-house, from which all mankind flee, during 8 months of every 12, constantly reside and are bred* some of the mightiest quadrupeds in the world. The royal tiger, the panther, the leopard, the elephant, the *arna* or wild buffalo, the rhinoceros, and stags of the noblest growth, abound: and, what to our fancies is less singular, the same malarious region cherishes Boa constrictors of the largest size, and other huge creatures of their kind.

The like is notoriously the case elsewhere: yet still we may reasonably insist on the fact, and ask what is it in the constitution of these large quadrupeds, (I omit the serpents in the argument,) carnivorous and herbivorous, which enables them to breathe healthfully the air that is death to man. Take *tame* animals of their very kinds suddenly into this region between April and October, and, like man, almost, they will catch the malaria and die. On the other hand, there are particular tribes of men bred in these or similar places, (such as the Thârû of the spot and the Dhângar of South Behâr,) who can *live* there, at least, if not flourish. They die not; neither do they pine visibly;

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* A friend, who is looking over my shoulder as I write, suggests to me, that Bishop Heber has observed in his Journal, that the malarious tract is entirely abandoned by wild animals, as well as by man and his flocks and herds, in the unhealthy season.

The Bishop probably was unaware that the malaria is not confined to the Taráï, properly so called, but rages thoughout the saul forest and the lesser hills, up to an elevation of some 3000 feet on the mountains: and that the wild animals, which are driven, by fire, out of the more open parts of the Taráï at the close of the cold weather, and cannot return till the rains have restored to them the shelter of a rank vegetation, retire during this interval to the covert of the forest and lesser hills.

If the elephants, rhinoceroses, wild buffaloes, and tigers, were to quit the malarious tract *altogether*, they must either ascend the huge mountains of the central region of Nepal, or, issue out into the plains of Hindústan: either of which suppositions is extravagant enough, one would think, to refute itself, were they not both of them, as they are unquestionably, refuted by notorious facts—such as the extraordinary depradations committed upon the crops of the Taráï by wild elephants and buffaloes issuing out of the forest at the height of the malarious season—the circumstance of European gentlemen seeking the tiger in his lair, on the confines of the forest, in March and April, at the hazard of their lives, because he is to be found *no where else*, &c. &c.

but they are poor specimens of humanity; whereas the great quadrupeds alluded to are the largest and most vigorous of their respective kinds.

These facts would seem to indicate, that the principle sought is that of inherited habits of body, or acclimatization, carried to such perfection by course of time, in respect to the great quadrupeds, as to have superseded their original and natural habits of body—carried to a much less perfect state in regard to the particular tribes of human beings in question. The elephant, tiger, &c. may well be supposed to have tenanted these recesses for countless ages—man has but recently attempted to divide the dominion with them. Yet, it must be confessed, that the notions broached carry the idea of physical adaptability to an extreme extent; besides contradicting the accepted opinion as to the superior capacity of man over the brutes in that respect. Let it be observed, that in these observations I wish merely to insist upon the singular fact, which I do not remember to have seen noted elsewhere, viz. that in the most noxious tracts of country, tracts in which man cannot live, some of the noblest quadrupeds abound and flourish—quadrupeds whose superior organization precludes the idea that the principle of life is differently modified in them and in man, and which consequently ought to be similarly affected with man by atmospherical causes. Why then, are they not so? Craving pardon for this digression, I now proceed briefly to characterise the region which I have denominated the central one.

This consists of a clusterous succession of mountains, varying in height from 3 to 10,000 feet, covered every where with a deep bed of mould, which feeds and sustains the most superb trees, and shrub vegetation, and grasses, in general, too rankly luxuriant to afford wholesome pasture.

The mountains are very precipitous, with extremely narrow intervals. There are no extensive high flats, such as we call table lands or plateaux, and only two low flats or valleys of any extent, which are those of Nepal proper and of Yûmila. The succession of the seasons is the same as in the first region, and in the plains of India; from which the central tract differs only in the material respect of temperature. Varying with the diversities of elevation, this region possesses a temperature from 10 to 20 degrees lower than that of Hindústan, and, with some allowance, its climate may be characterised as similar to that of the Mediterranean shores. It is as moist as the plains of North Behâr, and, upon the whole, as salubrious as most countries in the world. Not a $\frac{1}{50}$th part of its surface, probably, is under the plough. For some unexplained reason (I myself suppose the rankness of the pasture) neither the small nor large horned cattle flourish in it, in the domestic state: and the paucity of its wild mammalia would seem to indicate that animals of this class find its climate inimical to them even in the state of nature.

The third region of Nepal is the juxta-Himalayan, called by Buchanan the Alpine, and by the natives denominated the Kachár. From the crest or spine of the Hemáchal it extends, in breadth, about 10 horizontal miles. The mountains are of a like structure, and as splendidly wooded almost as those of the central region, but much higher, being, I should suppose, generally from 10 to 16,000 feet above the sea, up to the limit of habitability; where, of course, I stop. For half the year the summits of these mountains are buried under snow; and, *near* to the Æmadus, their sides and basal intervals also. The suite of the seasons is tropical, as before; and, occasionally, the heat is extreme. But the season of heat is short; and, upon the whole, the climate of this region more nearly resembles that of high than that of low latitudes. It has nothing tropical about it but the course of the seasons. Its grasses are short and wholesome: its underwood free from rankness; and hence probably its cows, sheep, and goats, are numerous, large, and fine; whereas, as already observed, they are few and poor in the proximate region, the succulent vegetation of which retains much of the tropical extravagance of growth. When the heats set in, in the central region, all the woollen-wearing inhabitants of the Kachár hie away to their own province; nor ever return till the approach of the cold weather. Ex uno disce omnes. It is the same with the birds as with the mammalia. There are peculiar ones to each of the three regions—a point which I insist on, because, those very persons who are so careful in mentioning the habitat of animals have described many procured from the kingdom of Nepal, without advertence to the particular part of that kingdom whence they were obtained.

I now proceed to my enumeration of the mammalia of Nepal, distinguishing such as belong to the lesser hills, forest, and Taráï, such as are found in the central region, and such as are peculiar to the Kachár. Let me begin by acknowledging that I am but an amateur zoologist, and have but recently turned my attention to the mammalia: but as I may be soon removed from Nepal, or may have my attention drawn off from Natural History to graver labours, I shall not let an idle conceit of accuracy prevent me from mentioning what has fallen under my observation, so far. My personal knowledge of these hills is chiefly confined to the central and northern regions above defined; and of the mammalia of the lower or juxta-Indian region, I have probably less knowledge than was possessed by Abel, Duvaucel, and others, now alas! no more; but whose investigations have, no doubt, survived them. Without professing therefore to give a full or exact enumeration of the mammalia of Nepal, I proceed to notice the result of limited observation. Should I remain here, and have leisure, I can and will follow up the subject.

CLASS MAMMALIA.

SUB-CLASS UNGUICULATA. *Family* Bimana. *Genus Homo.*

The great indigenal mass of the population of Nepal belongs to the Kalmak division of the vast mongolian variety of the human race. But the dominant tribe of Khas are mongrels; derived, on the male side, from the Brahmans and Kshetriyas of India, on the female, from the Aborigines, and chiefly from the Magar and Járiah clans of these.

These observations apply to the northern and central divisions of the country. The southern or juxta-Indian division is peopled, so far as it is peopled at all, either by the Hindús and Músulmans of the plains, or, by a peculiar race demominated Thârû, of probably similar origin with the Bhíls, Coles, and other rude mountaineers of the great Indian continent. The Thârû, however, though their language and physiognomy prove them to be a distinct race from the Hindús, have probably been much mixed with the latter; and, at all events, are fairer, less ugly, and less barbarous, than the Indian mountaineers in question.

Family QUADRUMANA.

There are no monkeys in the northern and central* regions; and those of the southern region are identical, so far as I know, with the ordinary species of the plains, viz. the *langûr* and the *bândar.* There are no others that I am aware of.

I am not acquainted with any animal of the genus *Lemur* in Nepal; but the, for the most part, nocturnal habits of these animals tend to withdraw them from observation. It is probable, that the slow-paced *Loris,* at least, inhabits the lower hills; and possible, that species of other sub-genera are tenants of that immense solitude.

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* Religion has introduced the Bândar into the central region, where it seems to flourish, half domesticated, in the neighbourhood of temples, in the populous valley of Nepal proper. My shooters were once alarmed in the Kachár by the apparition of a " wild man," possibly an ourang, but I doubt their accuracy. They mistook the creature for a câcodemon or rakshas, and fled from it instead of shooting it. It moved, they said, erectly: was covered with long dark hair, and had no tail.

Family CHEIROPTERA.

The genera *Galeopithecus* and *Phyllostoma* are, I believe, wanting. Of the four remaining genera of this family, viz. *Noctilio*, *Vespertilio*, *Pteropus*, *Rhinolphus*, there are abundance in the Taráï: but few in the central region, and fewer still in the northern. One species of *Rhinolphus* harbours in out-houses in the central regions, and occasionally enters dwelling houses at night when attracted by the lights. And one species of *Pteropus* appears in the autumn, and then only, to plunder the ripe pears in gardens. It is similar in characters with the great "fox bat" of the plains; but much smaller, and of a duller colour, or uniform dusky brown.

Family PLANTIGRADA.

There are no hedgehogs in Nepal. Moles are found only in the Kachár. Musk shrews abound in the lower and central regions, wherever there are human habitations. The shrew of Nepal is a smaller variety of the familiar stinking creature called ordinarily the musk-rat in the plains. It is the *Sorex Indicus*. No such animal is known to the Kachár. Bears (*Ursidæ*) of different kinds abound in all parts of Nepal, and are very dangerous and troublesome:—in the Taráï, *Prochilus Labiatus* and *Helarctos Malayanus;*—in the central and northern regions, *Ursus Isabellinus* and *Ursus Tibetanus*. And here we may notice those interesting animals of newly proposed subgenera, which serve to connect the bears with the civets and weasels. *Ailurus Fulgens* and *Ictides Albifrons* belong to the Kachár, though they are occasionally found in the central region also. This latter division is the exclusive habitat of a new species of *Paradoxurus*, coloured, especially in youth, like the *Mustela Hardwickii*. It is not fœtid, and prefers, in confinement, vegetable to animal food. When very young its tail is not convolate.

Family DIGITIGRADA.

Of the genus *Viverra*, or Civet, the *Zibet*, or Indian Civet, is common in the central region: but not known to the northern. It is probably found likewise in the lesser hills; but I am not aware of the fact. We have also, in the central region, a very small variety of the Indian ichneumon or *V. Mungos* of Gmelin.

The Taráï, Bháwar and lesser hills teem with all the known, large Indian species of *Felis*, such as the royal tiger, the panther, the leopard, the *cheeta* or hunting leopard, besides some described and undescribed species of smaller cats. To the central region the tiger is almost unknown, and so is the panther. But leopards abound in it; they however confine themselves almost entirely to the woods, seldom approaching inhabited places, or doing greater mischief than the occasional destruction of a village dog. They are much less dreaded than the bears.

Some of the small cats of the central region are numerous and beautiful; such as the *Felis Nipalensis.* The Múrmi cat (mihi) is peculiar to this tract, in which and in the northern region also is found a species of wild cat belonging to the section of the lynxes, or medial cats, with shortish tails and pencilled ears. It answers precisely to *Felis Chaus* of Ruphel, but not to the booted lynx, which has usually been held to be the same animal. The domestic cat is as common in Nepal as elsewhere, and has no peculiarity worthy of note. Judging by its marks, I should conjecture that it is derived from the *Felis Nipalensis ;* if so, it has lost by domestication the fine ground colour of that beautiful species. Strange as it may appear, it is unquestionably true that the royal tiger is found in the Kachár, close to the snows. But it must be remembered, that in that extraordinary region there are valleys of extreme depth and heat, as well as mountains of extreme height and coldness. Why this monster should avoid the central region, and yet seek the western one, may be probably explained by the paucity of ruminants in the former region, and by their comparative abundance in the latter: and it must be remembered, that there is free access from the Taráï and Bhâwar (the nursery of tigers) to the Kachár, by the means of the banks of the large rivers. The leopard is also found in the Kachár, and a variety of undescribed small cats. All the three regions of Nepal abound in weasels *(Mustelidæ)*, many of which are unknown altogether to Natural History.

We have, in the central region, besides *Mustela Hardwickii*, another species nearly allied to it, but of a fuller habit, and larger: and yet another similarly allied, but very small and beautifully coloured. The two last are undescribed. In the lower hills is found a new species, with shorter tail than the above, and more closely resembling the vulgar weasel of England: having a white stripe down the vertex and a white band across the forehead; and one species in the Kachár, also new. The polecat likewise is an inhabitant of the central and northern regions,—rare in the former, and common in the latter.

Of the genus *Lutra*, we have seven species, all differing from either of the two species found ordinarily in the plains, as well as with one exception, from those described by authors. The exception alluded to is the common otter, *(L. vulgaris,)* of which the largest Nepalese species cannot be considered more than a variety. This animal in Nepal reaches the length of five feet, inclusive of the tail ; and is upon the whole, the largest, though not the longest, species we have. It is peculiar to the lower region, where, also, three other species have their habitat. Two more belong to the central region : and one only to the Kachár. One species is yellowish white all over : the rest are brown, more or less dark ; some having the chin and throat, or whole inferior surface, paled nearly to white. They differ in extent from 5 feet to 1½ foot ; and not much less considerably in bulk, for some of them exhibit an almost vermiform habit of body ; and others are as stoutly made as the badger.

Genus Canis.

The only domesticated species of dog found in any part of Nepal south of the Kachár is the common village dog, or *chien de rue* of the plains, usually known there by the name of the pariar, a prick-eared cur belonging to every body and nobody. The Parbattiahs however prize the creature, and render it useful in hunting deer and antelopes. It belongs to Cuvier's 2nd section.

The noble beast usually denominated the Nepal dog is found only in the Kachár, where alone in Nepal he can live. It was introduced into the Kachár from Tibet, in which region it is indigenous, and in various parts of which there are several varieties. That of Lassa is the finest, and is almost always black, with tan legs, and a false or 5th digit before and behind.

Landseer has excellently figured a male and female of this dog, which were taken from the residency and presented to the king of England. The *mustang* variety is rather smaller, of a bright red colour, with wall eyes ; and he wants the 5th digit behind. Even in the Kachár, this dog degenerates rapidly ; and he can no more bear the heats of the central region of Nepal than his country-fellows of the human race. This would seem to be the dog whose extraordinary powers, ages ago, surprised Alexander and his Grecians. It is found throughout Tibet. This dog is justly placed in Cuvier's 3rd section of the *caninæ ;* but he ought surely to be classed under the variety mastiff, not bull dog. His superior size, moderately truncated muzzle, long fur, sunken eye, perfectly pendant ears, and 5th claw on the hind foot (in the Lhassan animal at least) seem decisive of this point. The chief character of the skull consists in the great development of the longitudinal and transverse cristæ. There is a species of wild dog* peculiar to each of the three regions of Nepal. That of the lower region is the smallest and darkest : that of the central tract is of a

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* *Canis primævus,* mihi. The *Búánsú* of the Nepalese.

deep ferruginous red; and that of the Kachár of a wolf-like reddish sandy yellow, as much larger than the wild dog of the central region, as that is larger than the species or variety belonging to the lesser hills and forest.

These dogs are very numerous, but so exceedingly shy of human habitations, that it is only by rusticating in the depths of the woods of Nepal that you have a chance of seeing or even hearing them. Through the kindness of the first minister of this state, I have obtained, alive, several individuals of them, especially of the variety peculiar to the central region, and have kept them in confinement for many months.

They are all alike distinguished by a double, thick coat; large, erect, wide, coarse, obtusely-pointed, ears; feet with hairy soles; a straight, very bushy tail, of medial length; and jackal-like odour, form, proportions, and aspect. And, if I may trust 5 skulls, of mature or old individuals, now in my possession, their dental system contradistinguishes them from all their congeners: for they have only six molars on either side of either jaw. The swell of the parietal portion of the skull is very great; and, as these primitive dogs have only a moderately elongated head, they must be arranged under Cuvier's second section of the *Caninæ.*

The jackal of the plains* is very abundant in the lower and central regions of Nepal, rare in the Kachár. In the Taráï, the small Indian insectivorous fox* is found; but not in the forest of lower hills; nor in the central mountains, nor in those of the northern region. Six years ago, I introduced it from below into the valley of Nepal; and it seems to thrive well. The Kachár has a large peculiar species of fox, which I have not been so fortunate as to see. The wolf of the plains is unknown beyond the limits of the level country, nor is there any other species or variety peculiar to Nepal; unless it be found in the Kachár: which I am not aware of. The like is true of the hyæna.

Family PEDIMANA.

This family presents, as far as I know, a perfect blank.

Family RODENTIA.

The common species of the genus *Hystrix* is frequent in the central and lower regions; unknown to the Kachár, I believe. In the Taráï,

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* We want descriptions of both of these, which differ as varieties, from all those described.

the ordinary small species of hare* of the plains abounds: and thence extends into the central division, where, however, it is very scarce.

There is a larger species very nearly resembling the English, in the central and northern regions; but rare in both. The genera *Kangarus*, *Castor*, and *Cavia*, are unknown to us. In the southern region the common, little, striped, squirrel of the plains abounds. In the central region we have an animal of the same size and characters, but of an unstriped earthy-brown colour, tipped with golden yellow: and in both these tracts the beautiful flying squirrel is found—a large species, rich deep red-brown above, and golden yellow below; belonging to the sub-genus or subdivision *Sciuropterus* of the younger Cuvier. It is not known to the Kachár, but is most common in the central region.

Of the genus *Mus* we have none of the numerous sub-genera except *Mus* proper and *Arctomys;* the latter, confined to the Kachár. The rat of Nepal is a small variety of the common type (Norway rat), and is very numerous and troublesome. The *Mus giganteus*, or bandicoot of the plains, is unknown to it. House mice are rare, and no way peculiar: field mice, common. I have already noticed, in its proper place, the musk-rat, or, more properly, musk-shrew.

Family EDENTATA.

Genus *Manis*. The short-tailed species of *manis* is of frequent occurrence in the hills of the lower region, and in the mountains of the central tract. It is unknown, I believe, to the Kachár. The received opinion, that it has no external ears, is a mistake. I am not aware that any of the other genera of this family are found in any part of Nepal.

Family TARDIGRADA.

The solitary genus of this family† *(Bradypus)* is not, so far as I know, known to Nepal.

SUB-CLASS UNGULATA. *Family* PACHYDERMATA.

The elephant and rhinoceros abound in the forest and hills of the lower region of Nepal, where they breed, and have their fixed abode; and whence, in the season of the rains, they constantly issue

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* Like the Indian fox and jackal, it still remains to be accurately described and distinguished.

† N. B. Arrangement is no part of my object; and, in want of books, I follow the tabular synopsis of the Mammalia given in the GLEANINGS IN SCIENCE, No. 29. It is sufficiently near to the most accredited and notorious system to be generally intelligible, in the way in which it is used by me.

into the cultivated parts of the Taráï to feed upon the rice crops. Both these genera are entirely unknown to the central and northern regions. The elephant is that so well known as the Indian variety, and as such is contra-distinguished from the African variety. But it may be questioned, if there be not two distinct varieties or species in India alone, viz. the Ceylonese, and that of the saul forest. The former differs materially from the latter by having a smaller lighter head, which is carried more elevated, and by higher forequarters. It is also said to be larger, and of a more generous and bold temper. The difference of size, however, is certainly a mistake. I cannot speak to the point of temper. The rhinoceros is of the unicorn species. The two-horned is unknown.

The rhinoceros (as I had the good fortune, eight years ago, to have an opportunity of ascertaining in the menagerie of the Rajah of Nepal) goes with young from 17 to 18 months, and produces only one at a birth. When born, and for a month afterwards, the young has a pink suffusion over the dark colour proper to the mature hide. At birth, it walks pretty firmly, and measures three feet four inches long (exclusive of tail), and two feet high at the shoulder. At a month old, it is very active and vigorous, and measures 3 ft. 10 in. by 2 ft. 5 in. I have just seen and carefully examined this young animal. He is now eight years and a month old, but is certainly very far from being adult. His length (without the tail) is 9 ft. 3 in.—his height, at the shoulder, 4 ft. 10 in. utmost girth of the body 10 ft. 5 in. length of the head 2 ft. 4 in. and of the horn 5 inches.

The rhinoceros continues to suck its mother for nearly two years, and is believed to live at least 100 years ; having been in one instance, taken mature and kept at Kathmandu 35 years, without exhibiting any symptoms of approaching decline. If reared in confinement, or taken young, the rhinoceros is perfectly tractable, and may be driven out to graze, through the streets of a crowded city, by a single man without even a halter to restrain it.

Of the remaining genera of the *Pachydermata*, we have only the wild hog, which is common to all the three regions of Nepal, and is plentiful in all. It resembles that variety found in the plains of India, which is or ought to be distinguished by small tushes and a nearly horizontal back, the other Indian variety being conspicuous for the elevation and weight of its forequarters, and the superior development of its canine teeth or tusks.

Family RUMINANTIA.

The great forest of Nepal is the nursing mother of numberless animals of the genus *Cervus*, which, in the rainy and cold months, when cover abounds, thence issue into the Taráï; and in the hot months, when fire is effectually employed to clear the Taráï, and forest too in a less degree, of grass and underwood, retreat into the recesses of the lower hills.

Besides the Chittra, the Lagna or Páda, and the Súgoriah of the plains of Hindústan, (the spotted *Axis*, the spotted and the brown Porcine *Axis*, respectively,) to the lower region of Nepal belong, the Bárah Sinha, a splendid variety of the common stag or *Cervus Elephus;* three species of the *Rusa* group of Major Smith, denominated collectively Jarâï by the Nepalese, and contradistinguished by the epithets Phûsro, Râto, and Kâlo, or hoary, red, and black; of which the first is the *Cervus Hippelaphus* of Cuvier; the second, possibly, Major Smith's *C. Equinus;* and the last, undescribed, the Bahraiya, a new osculant species, serving with *C. Wallichii*, to connect the Elaphine and Rusan groups of Smith; and, lastly, a new species of Muntjac described by me under the local name of Ratwa.

There is no deer proper to the central region but the Ratwa, which, though it occur in the hills of the southern division, and in the lowest valleys of the Kachár, is the more peculiar inhabitant of the middle tract. I can make nothing of Sir W. Ouseley's musk deer of Nepal, referred by Smith to the Muntjacs, and named *C. Moschatus*.

The Râto Jarâï is sometimes found in the mountains; but it, and the other two species of Jarâï, belong decidedly to the lower region.

In the Kachár there is no species of *Cervus;* the Nepal deer or *C. Wallichii* being, I am pretty sure, trans-Himalayan; and the Râtwa being, as already hinted, a vagrant there.

Of Antelopes, the Ghoral (*A. Ghoral*, Hardwicke) belongs exclusively to the northern and central divisions; the Thár (*A. Thár*, mihi) properly to the central, though he occurs also in the northern and southern regions; and the four-horned and black antelopes, (*A. Chikara* and *A. Cervicapra*,) exclusively to the lower region. The former keeps to the open plains of the Taraï; the latter, to the cover of the saul forest. And there are no more antelopes in Nepal; for the Chírú (*A. Hodgsonii*, Abel,) never passes the Himalaya, nor even approaches that stupendous chain of mountains; it being confined to the open plains of north-eastern Tibet. The Thár, much more properly than the Ghoral*, belongs to Major Smith's *Nœmorhœdine* group, and bears an extreme resemblance to the Cambing Ootan of Sumatra. The females of the Thár species, however, have four teats, and carry horns. Wherefore, those indicative characters of the group, set down with a note of interrogation by its author (viz. females hornless and with two mammæ), would seem to be incorrect. In the Thár the bony core of the horns is cellular, and connected with the frontal sinuses; and the horns arise very decidedly behind the orbits; material deviations from *Antilope*, and approximations to *Capra*, agreeing with the generally Caprine character of the external attributes of this species, which is indeed linked to the antelopine genus only by its horns and suborbital sinuses. In respect to that beautiful little animal of the *Tetracerine* group, called Chouka in Nepal, Chikara in the plains, I am enabled, by means of a beautiful specimen, to say that the distinction of species attempted to be established upon the Duvaucellian and Hardwickian specimens and drawings cannot be maintained.

To the northern division are exclusively confined the wild goats and wild sheep of Nepal; of the former of which genera there is one species only, viz. the Jháral (*Capra Jharal*, mihi), and of the latter, two species, viz. the Bharal and the Nayaur, or, *Ovis Argali*, Pallas, and *Ovis Nayaur*, mihi. The latter, however, is probably only a variety of the former. The common domestic goat of the Kachár, called by the Parbattiahs, Sínál, is a tall largish species, with ordinary horns; long, flowing, straight hair, drooping, longish ears, and semi-erect, short tail. A small variety of the Chángra, or shawl goat, is not uncommon in the same quarter. Neither of these can endure the heat of the central, and far less of the southern region, except in the cold season.

These latter regions have no domestic breed of goats in any respect peculiar to them. The species found in them is the common little goat of the lower provinces of the Bengal presidency. It is rare and thrives not; though it does better than the goat of the upper provinces; which can scarcely be bred as a luxury or curiosity by the rich.

The domesticated sheep of the Kachár or Baruál, is a stout, middle-sized, short and narrow-tailed species, with chaffron extremely arched, massive horns, retaining the primitive character of the wild

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* M. F. Cuvier is mistaken in supposing the Ghoral to have suborbital sinuses. It has none. The ears are striated.

race, and very short, semi-truncated ears, depressed by the incumbency of the horns.

The rams are celebrated for their courage and pugnacity. The wool is good, but far inferior to that of the Hûniah or Bhoteah sheep, which, though naturalized in the Kachár, is of trans-Himálayan origin, and still scarce as compared with the Baruál, immense flocks of which native species are reared in the Kachár.

The Hûniah is a large, tall breed, with slender, compressed, spirally-twisted, horns, and short narrow tail. The colour is almost invariably white. Individuals of this species are apt to have 3, 4, and even 5 horns. The Hûniah cannot bear the heats of Nepal, south of the northern division, and will doubtless flourish in England, where the experiment is making of naturalizing it. Its wool is superb*. The tame sheep of the central region, or Kágo, as it is named by the Parbattiahs, is a small breed, bearing all the characters of the Barual; from which variety it evidently sprung at no very remote period : horns and tail, as in the Baruál : ears longer, pointed, directed forwards and downwards : chaffron less arched : fleece finer, shorter, spirally curled, almost always white.

The lower hills have no peculiar breed of sheep. Goats and sheep, rare in the central, are almost unknown in the southern hills: but both, and especially the latter, are very numerous in the northern division.

The domesticated cows of the Kachár are large and variously colored like those of England : the cows of the central region small, and black or red, like those of the Highlands of Scotland. But in the second, the hump is conspicuous ; and not absent in the first. The *Bos grunniens* or Yak of Tibet likewise flourishes in the Kachár : but not south of it. It is a mere foolish error to suppose the milk of the Yak not good.

There are no wild animals of the Bovine kind in any part of Nepal, save the southern, where, as far as I know, the wild buffalo alone represents the genus—the Gayál or wild Bull of the Indian mountains being unknown to us.

Family Solipeda.

Wild animals of this family are utterly unknown to Nepal ; and in the domesticated state we have only some small varieties of the Tibetan pony, called here Tánghan : and though coarser and heavier, somewhat

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* N. B. Should this paper meet the eye of any wealthy and spirited individual in England, who may be disposed to forward the experiment in question, I beg to say, I shall be happy to assist him. Let him refer to Messrs. Mackintosh and Co. Calcutta.

resembling in size and character the Shetland pony. This breed is found from the confines of China to the Bilú Tag: on the western side of which range of mountains it increases in size, and becomes the Chougosha horse of the Turks. The Tânghan is bred exclusively in the Kachár division of Nepal: and but very rarely.

We have no tame asses or mules; man being, in Nepal, the sole "beast of burthen;" by reason of the steepness of the mountains, and the want of made roads.

III.—*Memoir of Giuseppe d'Amato.*

[Extract of a private letter from Major H. Burney, Resident at the Burmese Court, dated Ava, 9th April, 1832.]

I grieve to tell you, that the good Italian priest died last week at Moun-lha, one of the small Catholic villages up the Moo river, near Dibayen, and about 30 miles to the north-west of this city. It is a pity that some account of the life of this humble missionary cannot be communicated to the civilized world. He was a native of Naples, and his name was Giuseppe d'Amato, although he was better known to his Catholic flock, who understand only Burmese and the native dialect of Portugueze, by the style and title of Padre Don José. He and another priest, Luizi de Grondona, or as he was styled Don Louis, were deputed from Rome by the Society *De Propagandâ Fide*, at the peace of Versailles in 1783. They went to England for a passage to this country, where they arrived sometime in 1784. Soon after, the wars of the French revolution put a stop to all communication between them and Europe, and for upwards of 30 years they received no assistance whatever from their Parent Society, and were obliged to trust to their own exertions and to the charity of their followers, who are most of them in a state of poverty themselves, for the means of subsistence. They were both skilled in medicine and surgery, but particularly Don Louis, of whom very honorable mention is made by Colonel Symes in his second mission in 1803, and by Captain Canning, on several occasions. Don Louis died in this city about nine years ago.

Don José usually resided in the midst of his flock, which occupy five small villages, distant from each other from four to 10 miles, and situate in the district of Dibayen to the north-west of this city. The names of these villages and number of houses in each are stated to be as follows:

Moun-lha,	25 houses.
Khyoung-Yo,	15
Khyan-ta-roowa,	100
Khyoung-oo,	15
Nga-bek,	20
Total	175 houses,

which are said to contain a population of about 960 souls. Most of them at one time professed the Catholic religion, but of late years many have apostatised, as D'Amato complained to me.

Besides the above-mentioned villages, there is a small one containing about 40 or 50 souls, called Mengalágoure, situate close to the western walls of this city, near the British residency. To this village, in the centre of which are a Chapel and Parsonage, built of bambús and leaves, Don José paid an annual visit about Christmas, and it was here that I first saw him in December, 1830.

He was then about 73 years of age, and I was particularly struck at observing how lively all his recollections of his native land still were. He described Naples and a celebrated piece of sculpture there, with a degree of gesture and youthful animation that quite surprised me. "Dear Italy," was always a favorite theme with him; when he first heard Mrs. ——— play on the piano forte, he burst into tears, and he wept like a child for half an hour, begging all the time that the music should not cease.

He shunned the court, and never went near any of the great men here, if he could avoid it. He lived always among his flock like one of themselves, and was venerated by them in no common degree. His dress consisted of a pair of trowsers with a black cotton gown, and Burmese sandals on his feet. He said he found stockings very uncomfortable, and could not wear them even during the cold season. His amusements consisted in drawing and painting, gardening, and when he was in the country, in driving about in a Burmese cart drawn by oxen. He said, that he had never been sick for even a day until the year I first saw him, when his constitution was evidently breaking. But even then, he walked about a good deal, and made no use of spectacles.

The district of Dibayen, in which he lived, was at one time much infested with banditti, and Bundoolah has the credit of having put them down, and settled that part of the country just before the late war. D'Amato's knowledge of medicine enabled him to do a great deal of good among the population in his district; and although the village in which he resided was repeatedly plundered, he was himself never infested but on one occasion, by a robber who did not know him, but who was soon checked by the rest of the gang. When Dr. Richardson went from hence to the frontiers of Manipúr last year, he heard every where on his route the most pleasing accounts of the charity and active benevolence of old D'Amato. The Burmese of all classes respected him greatly, and when he was seized and put in irons by an officious officer, at the time the English army was advancing from Pagan, the moment the king heard of the circumstance, he ordered D'Amato to be released, observing, "He is like a *god;* why should we molest him?"

He was intimately acquainted with both the Pali and Burmese languages, and was allowed to be deeply read in Burmese scriptures, knowing more about them, a *Woongyee* once told me, than some of the best informed among themselves. He gave me some curious drawings and explanations in Burmese of the Búdhist cosmogony, geography, &c. I hope to send them to you some day with my translations.

D'Amato was a respectable painter, and as he knew something of natural history, he had made a collection of drawings of about 300 non-descript plants and flowers, and about 200 animals, writing down at the same time all he could learn as to the *habitat*, properties, &c. of each. He had bound the whole in four folio volumes, two containing the drawings and two the explanations. These volumes had occupied his leisure hours for nearly forty years; but when the late war broke out in 1824, he was apprehensive of some accident to himself, and he delivered these books to the charge of one of his flock residing at the village of Men-ge-la-goun. After the last Burmese army was defeated at Pagan, the king ordered some additional defences to be constructed around this city, and all the approaches to it were cleared; Men-ge-la-goun was burnt and plundered: a private soldier, it was said, got possession of D'Amato's books, and the prettily coloured drawings in them induced him to carry them to the Queen's brother, Mengagyee, who gave the soldier a *patsho* or cloth, and kept the books. Report added, the Mengagyee had cut out most of the pictures, and stuck them up in different parts of his house.

The moment I learnt all this from D'Amato, I applied to the king himself, and to all the ministers, urging them, in the strongest terms, to have these books restored to their poor owner. I told them plainly, that as these books contained no political information, but related entirely to objects of general science, the king and the whole of his court would be considered as a set of the greatest barbarians by every civilized nation, if works of such a description, belonging to a priest, were not forthcoming. The king repeatedly ordered every search to be made, and the ministers, to do them justice, exerted themselves to recover the books, but without success. Mengagyee denied all knowledge of them, and had me taken into the inner apartments of his house to prove to me that they contained no such drawings as those belonging to D'Amato. I believe the king and his ministers were sincere in their desire of recovering the books; but I am sorry to say, that I have never been able to discover what has really become of them, although, supposing that they might have fallen into the hands of some private individual, I offered a very large pecuniary reward to any one who would produce them. It was pleasing to see, when I gave up the inquiry, with what pious and Christian-like resignation poor D'Amato submitted to this loss of the fruits of so many years' labour.

D'Amato is to be buried in great state, and his body is preserved in honey, until the whole of the Christians in this quarter can assemble, and pay the last honors to the remains of their venerated pastor.

I may mention here, that the inhabitants of the five Catholic villages in the district of Dibayen are the descendants of certain French and other prisoners, whom Alompra took at Syriam, in 1756, and brought up and settled here. Many of these Christians still show their descent in the light colour of their hair and eyes; but besides the descendants of the Syriam captives, it is reported, that in those villages, and at another village near Mouttshobo, there are many persons with light-coloured hair and eyes, who have a tradition, that their fathers were shipwrecked somewhere on the coast of Arracan, and brought up and detained in this part of the country, so far back as in the reign of some *fortieth* king from the present monarch. Possibly some of them may be descended from those English establishments which Dalrymple relates as having existed at Ava and to the northward, on the borders of China, about the beginning of the 17th century.

In the month of June, last year, D'Amato was joined by two young colleagues from Rome. They came to Rangoon viâ Egypt and the Red Sea, accompanied by a *Bishop* of *Ava* by name Frederico Cao, and another priest, who are now residing at Moulmein. The two priests who have come up here, Antonio Ricca and Domingo Tarali, are natives of Italy, and appear to be intelligent, amiable young men. The Pope must have strengthened his Ecclesiastical

Establishment in this kingdom, with a view, I presume, of making converts. Hitherto, the Catholic clergy here appear to have confined their labours to their own flock, without any desire of increasing it. Besides the number of Catholics in Dibayen and here, there are about 260 souls at Rangoon under a Padré Don Ignatio; and many of these are wealthy enough to build themselves a good brick Chapel, which they have lately done. The Catholics near Ava live and dress like Burmese, from whom, I am sorry to say, they cannot be distinguished by any superiority in moral or intellectual qualities. Pére Domingo is now residing at Khyan-ta-roowa, and Pére Tarali at Ngabek.

IV.—*Oriental Accounts of the Precious Minerals.*

[Translated by Raja Kalíkishen; with remarks, by James Prinsep, F. R. S. &c.]

I have been favored by Raja Kalíkishen, with some interesting extracts from oriental works, respecting the precious minerals, which I have embodied in the present notice, with such modifications, as appeared necessary to suit the mineralogical reader, and with the addition of a few remarks in elucidation of the subject arising from a reference to the original works obligingly lent to me by the Raja, as well as from an examination of the rough minerals themselves, where I could procure them from the native jewellers. I trust that the Raja will continue his translations from similar works, both Persian and Indian, as nothing can conduce more to a right knowledge of that, at present, obscure subject, oriental mineralogy. A great variety of mineral substances are sold in the bazars of India, and included in its materia medica, of the proper classification of which we are as yet altogether ignorant.

The information contained in the present notices is extracted from three books, of different ages: 1, the *Ajáib-ul-makhlukát o Gharáib-ul-moujudát*, an ancient Persian work on natural history, written by *Zakarya*, a native of *Kufa*, date unknown; 2, the *Aqul-i-ashreh*, a work on science, by Mahomed of Berar, An. Hej. 1084, (A. D. 1673;) and 3, the *Jawáhir-námeh*, a modern anonymous compilation, containing much useful matter in a condensed form: it was probably written at one of the native courts, either Delhi or Hydrabad, since it mentions the opening of recent mines in India.

The two former volumes comprise sketches of all the different sciences known to the ancients. The third, as its name denotes, particularly treats of mineralogy. The Raja has not attempted to give a verbal translation of either, and I shall follow his example in merely gleaning the facts which appear curious, or peculiar to oriental ideas.

The Diamond.

A. *almás ;* G. *αδαμας ;* S. *híraka ;* H. *híra.*

In Arabic and Persian works of natural history, Aristotle is generally quoted as the chief authority whence information is drawn, and the most vague and fabulous tales of the origin and qualities of natural substances, are laid to his account; many no doubt with justice, but more without any authority whatever. Thus, of the diamond, some authors assert, that when Alexander visited the mountain *Zulmát*, (others call it *Sarandíp*,) where the inaccessible valley of diamonds is situated, he directed pieces of flesh to be thrown in as the only means of procuring the gem:—vultures picked up these with the precious stones adhering to them, and dropped them in their flight, on various parts of the earth, where alone they are now discovered! It must be confessed at least that we have no theory of the *origin* of the diamond to offer in lieu of this oriental hypothesis.

The *Aqul-i-ashreh* does mention in general terms, that there are mines in the south-east of *Hindust'han*. The *Jawáhir-námeh* is more explicit, and notices a new mine opened in southern India, at *Kompila*, between *Mahali* and *Bijapúr*, near *Masulipatam*.

The *Jawáhir-námeh* describes the mode of digging for the ore, and washing the sand or gravel. The similarity between the diamond and rock crystal, both met with in the same matrix, has given to the latter the appellation of *kacha*, or *unripe*, and to the real gem, that of *pakka*, or *ripe*, diamond.

The diamond is supposed by some to be a preservative from lightning, and to cause the teeth to fall out when put in the mouth, but this is objected to by one author, on the ground, that diamond powder has been used for tooth-powder with no bad effects.

The *triangular* (tetrahedral) form of the pulverized fragments is noticed: also the natural cleavage, which is adroitly taken advantage of by the native *hakáks*, in forming table diamonds, by striking the stone between two sharp-edged tools.

Some knowledge of the combustible nature of the diamond might almost be inferred from a passage in the *Ajaib-ul-makhlukát*. "If it be exposed to the strong heat of a wind furnace, it will be melted*,"

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* The original passage is as follows, and I am not sure that I have given the correct translation :—

اگرالماس را دردم نفيس اندازي و براتش عرضه کنی گداخته شود وان نافع
از براي دفع منغص وفساد معدم

probably alluding to the rounding of its edges by slow combustion. *Zakarya* also says, that if mixed (fused ?) with pure sal ammoniac, the diamond will dissolve, but not with lead, *sarb ;* probably the oxide of lead is intended.

" The great mart for diamonds formerly seems to have been at *Kalbargah*, to the west of Hyderabad, where a clear rough diamond of two carats would sell for 7 *filori*, (a gold coin ; the etymology of the word is not evident, perhaps it may be a corruption of florin.) When dressed, the same stone would fetch 15 *filori.* The European lapidaries are stated to be the only workmen who can by cutting and polishing fully develope the brilliancy of the diamond."

RHOMBOHEDRAL CORUNDUM OR SAPPHIRE.

A. *yaqút ;* G. ακαυσα? S. *manikya ;* H. *manik.*

Under the name of *yaqút* are comprised all those stones of the sapphire and ruby species, which are distinguished (or rather connected, as being chemically one) by the epithet *oriental*, in English books of mineralogy, and are now classed together under the general head of corundum, because they are composed of the same earth, alumina, as the corundum or *kúrún* of the Indians. The natives, like our own mineralogists, distinguish four principal species of *yaqút ;* red, blue, yellow, and white, or colorless.

The first, or ORIENTAL RUBY, A. *yaqút-ahmar*, H. *manik ?* exhibits seven varieties of colour, viz. *mihrmátí*, striped ; *arghwání*, hyacinth ; *rumání*, bright-red, or pomegranate ; *rúí*, brass-colored ; *khamrí*, red-wine-colored, the AMETHYST, H. *nagína ; lahmí*, flesh-colored ; and *khylí*, or asafœtida-colored.

" Not to be deceived in rubies, is a work of difficulty, because there are spurious ones of polished crystal, which much resemble the true gem ; these are called *âyn-ul-raján :* but a skilful lapidary will easily recognize them. When placed in the fire, a true ruby becomes invisible, but when immersed in water, it appears to glow with heat : it also shines like a coal in the dark."

The second is the ORIENTAL SAPPHIRE, A. *yakut-arzaq* or *qabúd*, *safír ;* G. σαπφειρος* ; H. *nilam.*

Of this, there are enumerated five varieties, viz. : *taüsí*, peacock-tail

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* It is doubted whether the σαπφειρος of the ancients was not rather *lapis lazuli* than the gem now called sapphire :—it was called χρυσοπαρος from the yellow spangles in it. (*Theophrastus.*) Pliny includes it among the *cyani*, a general name for all blue stones : he says, " Causam nominis afferunt quod usque ad *vini colorem* accedens priusquam eum degustet, in violam desinat." If the word is derived from the name of a colour, it may be from *asfar ;* but that would signify *yellow* rather than *purple* wine.

blue; *asmání*, azure; *nílí*, indigo; *chaklí*, grey or collyrium; and *sabzí*, greenish.

The third or ORIENTAL TOPAZ, A. *yaqút-asfar* or *zard*, H. *pokhraj*, has four tints, viz. *narinjí*, orange; *káhí*, straw; *shamâí*, flame or lamp; and *turanjí*, citron-colored. This variety is said to stand the fire better than the others.

If the *yaqút akhzar*, or ORIENTAL EMERALD, be esteemed the fourth variety, then there is a fifth, "of more variegated tints but of less value," comprising probably such as are not transparent, common corundum, adamantine spar, *salam* [*silan*, or *ceylon*] *stone ?* &c.

Gladwin translates *yaqút* and *yaqút surkh* as "topazes," in his English version of the *Ayeen Akbery ;* the *yaqút rumani* (written *rahmání* in the MS. belonging to the College of Fort William) and the *yaqút kabúd* he calls the "sapphire :" and on one occasion he renders the *yaqút surkh*, "amethysts :" showing the confusion which prevails on the subject of these gems. That different species of the corundum, however, were intended by all, is evident from a table of specific gravities quoted by Abu Fazl from a work of *Abu Rihan-al-Birouni*, which closely agrees with modern results, and proves that the term *lâl* (hereafter to be noticed) is confined to the Balas or spinelle ruby : the table reduced to decimal expressions is as follows :

Name of Jewel.	*Spec. Grav. by Abu Rihan.*		*Spec. Grav. by European tables.*	
Yaqút rumani,	3.98	oriental sapphire,	3.97	Mohs.
Yaqút súrkh,	3.75	ruby, topaz, &c.	3.90	do.
Lâl,	3.52	spinelle ruby,	3.52	do.
Zamarûd,	2.75	rhombohedral emerald,	2.73	do.
Bilor,	2.50	rock crystal,	2.58	do.

The *Jawáhir-nameh* includes among the varieties of *yaqút*, the *âyn-ul-hireh* (cat's eye) and the *turmali*, from which latter word may, perhaps, be derived our *tourmaline*, though applied by us to a different mineral.

The *âyn-ul-hireh* (H. *lahsúnia*) is evidently that variety of the sapphire which mineralogists designate *chatoyant*, or *opalescent sapphire*, and which, when cut en cabochon, shews a silvery star of six rays, and is then termed ASTERIA. This must be distinguished from the common cat's-eye, a chatoyant variety of quartz with which it has probably been confounded by the oriental jewellers. Pliny also adverts to the two minerals: of the first he says, "proxima candicantium est *asteria :* nata est in Karmania, &c." and he distinguishes it from an inferior sort of *astrios*, resembling common crystal, which comes also from

India and "Pallenes littoribus." There were several inferior sorts : 1, those called *ceraunia* in the east; 2, the *astroites* much praised by Zoroaster; 3, the *astrobolos* of Sadines, resembling the eye of a fish, &c. : all of these appear to have been varieties of the quartz cat's-eye. "The jewellers appraise the value of the *âyn-ul-hireh* according to the number or perfection of the threads *(zanâr)* visible in it, which should give the stone, when turned about, the appearance of a drop of floating water." This description accords with the quartz cat's-eye rather than with the asteria; but there is some difficulty in reconciling the uncertainties regarding this mineral, and I have not been able to obtain the actual name of the *asteria* for the want of a specimen of the stone.

The *âyn-ul-hireh* probably, however, comprises both of the above minerals; in the same manner as the *turmali*, next to be mentioned of the varieties of *yaqút*, apparently embraces both the zircon and tourmaline families.

"To the *turmali*, as being of a greenish yellow tinge, people frequently give the name of *zabarjad*, or beryl ? It is found in small rounded pebbles in the same rock or matrix as the other Ceylon stones."

An uncut specimen of *turmali* and several polished stones, obtained from a native jeweller in Calcutta for examination, proved to be the "jargoon of Ceylon," or precious zircon. It had a specific gravity 4.56; hardness 7.0; fracture vitreous; colour greenish, some quite transparent and clear; form rounded, amorphous: inalterable before the blowpipe per se. The colorless *turmalí* is cut and sold as a false diamond, in the bazars of India. Davy says, that "the yellow varieties of the zircon are sold by the inhabitants of Ceylon as a peculiar kind of topaz; the green as *tourmalines**, the hyacinth red, as inferior rubies, and the very light grey, as imperfect diamonds; the natives being altogether ignorant of the true nature of this mineral. It is most abundant in the district of Matura, whence it has its common name in Ceylon of *Matura diamond*†."

Of the localities of the *yaqút*, it is only stated in two of the works before us, that the gem comes from the hottest part of the globe, "from the south near the equator." In the *Jawáhir-nameh*, however, the large island of Ceylon is said to be its only habitat, where it is generated in caverns from the suppuration and solidification of the essence of water! "The natives dig wells in these places, and wash the *sand*

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* In Rees' Encyc. the Singalese name for tourmaline is stated to be *tournamal.*

† In speaking of the hyacinth (which among us is a variety of the zircon) Pliny says, "Hunc colorem Indi *sacon* vocant, et talem gemmam *sacodion.*"

extracted from below, for the various minerals which are disseminated in it."

The medical properties of this gem are remarkable: "it purifies the blood, strengthens, quenches thirst; it dispels melancholy reflections; and, as a talisman, averts dangers, insures honor and competence."

In hardness it only yields to the diamond: it is unaltered by the fire, the red and yellow varieties, if any thing, improving in color therefrom. The blue, or sapphire, when pure, is of equal value with the diamond. The Arabs are fond of engraving their names upon it.

Besides the *Sílaní* or Ceylon *yaqút*, there is stated in the *Jawáhir-nameh* to be "another ruby, now very much in vogue, which is extracted from a mine in Bengal, near *Tahat-ul-Suráa,* in the vicinity of which is an island, called *Rakhang*, nigh to which is a stream, where also the ruby is procured." *Tahat-ul-suráa* may mean a deep mine; Rakhang is the Arracan of Europeans. "It is greatly valued in *Hindústhan.* Jewellers assert, that its nature is soft, and that fire will dissolve it, but from its appearance or touch no idea can be formed of these defects." This account may refer to the spinelle ruby about to be described, or to a species of garnet.

DODECAHEDRAL CORUNDUM OR SPINELLE RUBY.

P. *lâl;* H. *manik ?* or *lâl.*

Concerning this gem there is considerable incertitude among oriental authors, which an acquaintance with mineralogy alone can dissipate. Jewellers of the present day apply the term *lâl* to all rubies of a fine red color. It is evident however from the books before us, that the *lâl* is quite distinct from the *yaqút*, and that it properly designates what we term the *spinelle* ruby.* The *lál rumani*, scarlet or pomegranate-coloured ruby, is probably the true SPINELLE; while the *lâl Badakshání*, or ruby of Badakshan, of a rose color, is what Europeans call the BALAS RUBY; indeed it appears possible that Balas may be a corruption of the latter name; for, the French Encyclopedia says, the name is derived from the kingdom whence the rubies come, supposed to be situated, vaguely, somewhere between Pegu and Bengal. *Balkh*, the capital of Badakshan, might have been written *Balach* in French, and afterwards softened to *Balas* by the same process which has converted the *Khan* into the *Cham* of Tartary.

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* The etymology of the word *spinelle* is obscure—Tavernier describes among Indian varieties of the ruby, the "*espinels* or *mothers of rubies.*"

The Persian authors are particular in their description of the locality and origin of this stone. "The mine of this gem was not discovered until after a sudden shock of an earthquake, in *Badakshan*[*], had rent asunder a mountain in that country, which exhibited to the astonished spectators a number of sparkling pink gems of the size of eggs. The women of the neighbourhood thought them to possess a tingent quality, but finding they yielded no coloring matter, they threw them away. Some jewellers, discovering their worth, delivered them to the lapidaries to be worked up, but owing to their softness the workmen could not at first polish them, until they found out the method of doing so with *mark-i-shísá,* marcasite or iron pyrites. This gem was at first esteemed more than the *yaqút,* but as its color and hardness were found to be inferior to the latter, it became less prized."

There are many varieties of color: red, yellow, and greenish, but the *piazi,* reddish yellow or onion-colored, (the *rubicelle ?)* and the *mina,* violet-colored, (the *almandine* ruby ?) are held in the highest estimation ; of the red there are given eight tints, wine color, date color, Brazil wood color, &c. which it is needless to enumerate. The author of the *Jawáhir-nameh* says : "as the *lâl* ruby did not exist in the time of *Jemshíd,* no mention of it is to be found in ancient works ; modern physicians ascribe to it the same medicinal qualities as the *yaqút* possesses."

In a manuscript history of Cashmír and the countries adjacent, by Abdúl Qádir Khan, Benares, 1830, is the following description of the manner of extracting rubies from the *Badakshan* mines : it professes to be taken from an oral account by Mirza Nazar Báki Bég Khán, a native of *Badakshán,* settled at Benares.

Having collected a party of miners, a spot is pointed out by experienced workmen, where an adit is commenced. The aperture is cut in the rock large enough to admit a man upright : the passage is lighted at intervals by cotton *masháls* placed in niches ; as they proceed with the excavation, the rock is examined until a vein of reddish appearance is discovered, which is recognized as the matrix of the precious gem. This red colored rock or vein is called *rag-i-lál,* or, the vein of rubies ; the miners set to work upon this with much art, following all its ramifications through the parent rock.

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[*] The *Manaif-ul-ahjár* dates this occurrence "350 years ago," but the date of the work is not given : the *lál* is not mentioned by *Zakarya.* Since the above was written, Mr. H. H. Wilson has favored me with a sight of another work on jewels, entitled *Khawás-ul-hejár,* translated by himself, in which the *lál* is treated of under the name of *balaksh* (*Balakshan* being synonymous with *Badakshan).* This leaves no doubt as to the origin of the word Balas. *Banaksh* is also described as a variety of inferior quality and no value. The word is not used by other authorities.

The first rubies that present themselves are small, and of bad colour: these the miners called *piadehs* (foot soldiers): further on some larger and of better colour are found, which are called *sawars* (horse soldiers); the next, as they still progress in improvement, are called *amirs*, *bakshis*, and *vazirs*, until at last they come to the *king jewel*, after finding which, they give up working the vein: and this is always polished and presented to the king. The author proceeds to describe the finest ruby of this kind that had ever fallen under his observation. It belonged to the Oude family, and was carried off by Vizir Ali; he was afterwards employed in recovering it from the latter: it was of the size of a pigeon's egg, and the color very brilliant; weight, about two tolas; there was a flaw in it, and to hide it, the name of *Julâl-ud-dín* was engraved over the part; hence the jewel was called the *lál-i-jaláli*. A similar ruby to this, but considerably larger, is in the possession of *Runjit Sinh*, and has the names of five emperors engraved upon it.

The bright-red spinelle ruby, *lâl ramáni*, is called by modern jewellers *yaqút narm*, or simply, in Hindústani, *narmeh*; also *lâlrí*: it comes from Pegu* and Ceylon, and less frequently from the north.

THE RHOMBOHEDRAL EMERALD.

P. *zamarúd*; G. σμαραγδος; S. *markat*; H. *panna*.

The mines of this gem are stated in the Persian works to be situated in the "extreme west," in Barbary, and the upper parts of Egypt. It bears a higher value in India, on account of its entirely foreign origin; it is soft and seldom free from flaws, sp. gr. 2.70. The medical and talismanic properties of the emerald are, averting bad dreams, giving courage, curing palsy, cold, and bloody flux. There is a close connection between the *zamarúd* and the *zabarjad*. Zakarya says, the names are synonymous, and that the true color of the *emerald* is a *brilliant yellow*, (chryso-beryl?) adding on the authority of Aristotle, that it is frequently met with in gold mines.—Mahomed of Berar says, that "the *zabarjad*, although reckoned the best kind of emerald, is, in fact, another stone of higher value, and now scarce." The *Khawás-ul-hejár* describes it as possessing none of the qualities of the emerald, and of an inferior greenish color. The name of *zabarjad* is therefore probably applied indiscriminately to varieties of the beryl, the chrysolite, and the topaz†.

As no separate mention is made of the topaz, it must be considered as really classed in the same family with the emerald and *za-*

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* *Taht-ul-Suráa*, mentioned in a former page, may be a corruption of *Syriam* in Pegu, the great mart for spinelles and *yaqúts* from the Capellan mountains.

† The topaz of the ancients is supposed to have been the chrysolite of moderns, and vice versâ. Pliny classes it among his *gemmis viridibus non translucentibus*. "Egregia etiamnum topazio gloria est suo virenti genere."

barjad. This may be easily accounted for by the similarity of their prismatic crystallization: beryl or aquamarine, a variety of emerald, passes from green into a yellow color; and the striated prisms of topaz pass from a deep golden yellow to a pale green color. Their difference in specific gravity and chemical composition could not be known to a lapidary; their hardness is nearly the same, and they occur in the same mines in Egypt and elsewhere: indeed the term beryl was applied to both by Werner. The aqua marina or beryl is called *berúj:* specimens shewn me had a specific gravity 2.70. The Indian name for topaz is *púkhraj*, whence has been taken the modern Arabic appellation of topaz, *buszák.*

THE TURQUOIS.

P. *firozeh*[*]; G. καλλαις; S. *péroj?*

The name *Firozeh* is said in the *Jawáhir-nameh* to have been given to this stone by Firoz Shah, but this must be matter of doubt; as also whether the Sanskrit synonyme in Hunter's Dictionary, *péroj*, is not a corruption of *berúj*, beryl, quite a different stone. From the localities and from the characteristics of the two varieties in the books before us, it might be conjectured, that the two species of this mineral known to European mineralogists, as the *calaite*, or mineral turquois, and the *odontolite*, or bone turquois, are equally familiar to the Persian jewellers, under the epithets of *Abu-Is'haqi* and *Badakshání.*

The *Abu-Is'haqi*, (father of Isaac,) or genuine turquois, is the produce of the mines of *Ansar*, near *Nishapúr*, in Khorasan, (the same place mentioned as *Michebourg*, in Tavernier's Travels in India.) All authorities concur, that these are the only turquois mines in the world: the stones are said to vary from pale blue to green and white, but all except the azure are worthless. A curious fact is mentioned also, which, from the nature of the mineral[†] may be readily believed, though it has not been observed in Europe: "the real blue turquois of *Nishapúr* changes its color when kept near musk or camphor, also from the dampness of the ground, as well as from exposure to the fire[‡]; the inferior stones become discolored even without this test," by gradual decomposition or efflorescence. The *Khawás-ul-hejár* makes the clearness or dulness of the turquois vary according to the atmospheric changes. "It brightens the eyes; is a remedy for ophthalmia and bites of venomous animals; it is used in enamelling sword handles, &c."

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[*] *Firozeh nakis*, an inferior turquois, is enumerated amongst the mineral products of *Tibet*, by *Abdul Kadir Khan*, in the History of Cashmir before quoted.

[†] Vide GLEANINGS IN SCIENCE, II. 375.

[‡] Pliny also remarks of the *Callais;* " quæ sunt earum pulchriores, oleo, unguento et mero colorem deperdunt."

" The *Badakshání* turquois essentially differs from the *Nishapúri* in being able to withstand the heat of a fire for ten days without alteration: for this quality it is much esteemed, although in other respects not so good as the produce of *Ansár*."

Now the *calaite*, which contains 18 per cent. of water, would be entirely destroyed by such an operation, while the *bone turquois* is actually made in many places, by exposure to the fire of fossil bones impregnated with iron ; and the fossil bones brought from the north of the Himalayan range, when exposed to a red heat, are found to assume the very appearance of *odontolite** : it is possible, therefore, that a supply of this artificial gem may find its way into Persia through Balkh, and take its name from that country as its known market.

Arguments are not wanting on the other hand to shew that the *Badakshani* turquois is nothing more than *lapis-lazuli*, or *lájaward*, and the descriptions of the two are mixed up together in the books before us, like those of the emerald and topaz.

Lapis-lazuli.

P. *lájaward ;* S. *vaidúrya.*

" The country of *Badakshan* abounds in mountains, and contains several rivers. On the Jihún (Oxus) river, near where the Samarkand road crosses it, is the mine of *lapis-lazuli.* This mineral has different shapes ; one, like the egg of a hen, which is covered with thin, soft, and white stony coats, is reckoned the best when pounded, it needs neither washing nor polishing ; the others are without covering and must be washed.

" The method of washing is this : first to pulverize it and afterwards to keep it wrapt in silk cloth, besmeared all over with gum sandarach, which should be previously softened in very hot water, and then rubbed over or kneaded with the hands ; it is kept in the water for three days, until all the foreign matter has been washed out."

This is exactly the process for manufacturing ultramarine from lapis-lazuli, given in Ure's Chemical Dictionary. " There is also a mine of *lájaward* in that part of Káshán called *kharúd*, or minor. It is difficult to distinguish the *Kashání* from the *Badakshání* mineral, but there is a considerable difference in their value :—the following test is prescribed to recognize them :

" First rub the specimen on a piece of stone without water, and if in doing so it becomes dark, this immediately marks its spuriousness ; secondly, put it in the mouth, and afterwards throw it into the fire ; when it becomes red, take it out, and if it be not discolored, its

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* Vide Journal As. Soc. I. 77. Theophrastus enumerates *fossil ivory* of a lighter or darker colour, as distinct from the sapphire, evidently shewing, that the *odontolite* or bone turquois was intended by ελεφας ορυκτος.

genuineness is established." "The *Káshání* mineral is of an antimonial colour, and is ground up for the painting of glass and porcelain." It is possible that this description may refer to the *zaffre* mineral or sulphuret of cobalt.

This last cursory notice, although foreign to the subject of the precious gems*, arouses a curiosity to know a little more of the contents of the *Ajáib-al-Makhluqát*, and I trust the Raja will continue his labours, confining himself as far as possible to a literal translation of his text.

V.—*Proceedings of the Asiatic Society, Physical Class.*

Wednesday, 15th August, 1832.

Sir Edward Ryan, President, in the chair.

The proceedings of the last meeting having been approved, the following letters were read.

1. *From Capt. P. Gerard, dated Kotgurh, 23rd July,* announcing, that he had dispatched to the address of the Society, a box containing 164 paper parcels of fossils from the Himalaya, by direction of his brother, Dr. Gerard, their discoverer. He further acquaints the Society, that Dr. Gerard had forwarded from Cabul the first paper of his promised paper on the valley and section of the Spítí, illustrative of these fossils, and that the remainder is expected from Bokhara.

2. *From W. Cracroft, Esq. to Sir E. Ryan, President, dated Chirra Punjí, 25th June,* announcing further discoveries of coal beds in the Kasya hills.

The present site is near a place called *Monthan,* where the coal seams occur between the sandstone beds, accompanied as usual with bituminous shale, limestone, and indurated clay; the coal strata altogether are six feet in depth: this locality is so far interesting, because it has been hitherto a desideratum to obtain coal near the foot of the hills equally good with what is found above: the specific gravity of this coal is stated to be only 1.31.

3. *From Dr. Alex. Turnbull Christie, dated Madras, 14th August,* stating, that he had been entrusted by the Geological Society of London with the charge of a series of casts of the fossil bones discovered in Ava by Dr. Crawfurd, for presentation to the Asiatic Society: further, in his own name, begging its acceptance of a small collection of fossil shells from the tertiary formations of France and Italy.

[The package has not yet reached Calcutta.]

4. *From G. Swinton, Esq. Chief Secretary to Government,* communicating a letter from the Rev. Wm. Vernon Harcourt, Secretary of the British Association for the Advancement of Science, by direction of the Central Committee, transmitting a copy of their first Report, and requesting his assistance in extending to India the operation of the plan detailed therein, by the formation of a Committee to correspond with the Association,

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* Lapis-lazuli, or azure stone, as has been already remarked, has been supposed to be the *σαπφειρος* of the Greeks.

to promote its objects, and to aid it in carrying on upon a common system, in the most distant parts of the empire, the extensive investigations which it meditates. Copies of the report have been also addressed to Sir E. Ryan, Major Benson, Dr. Christie, Captain Herbert, and Messrs. Calder and Prinsep, who have been requested to coalesce with Mr. Swinton as members of the Indian Committee.

The purport of submitting this letter to the Physical Class was to give publicity to the objects of the British Association, through the circulation of the Society's proceedings, that all who are inclined to undertake any of the trains of investigation pointed out in the published "recommendations*," may know where they may address inquiries, or transmit the results of their observations.

Mr. J. Calder brought to the notice of the Society, as connected with the communication just made known, that since the death of Doctor Voysey, the situation of Geologist and Naturalist to the grand Trigonometrical Survey had remained vacant. He trusted that the present Surveyor General would not lose sight of the great advantages to science of such an appointment, when he should be preparing to continue his grand arc through the unexplored regions of Central Hindústhan.

5. *From Dr. Strong,* with copies of correspondence with Col. Sir Thos. Anburey, Chief Engineer, respecting the pay of the men of the Sapper and Miner Corps employed in the boring experiment.

6. *From G. Swinton, Esq.* forwarding on the part of Colonel Watson specimens of Kasya iron ore, smelted iron, and coal; also some native caoutchouc, manufactured into bottles, and thin sheets, at Chirra Punji.

The latter may become a valuable article for many purposes; the sheets are very thin, pliant, and impervious to air or water.

The coal is of the slaty kind, sp. gr. 1,447, containing volatile matter 36, carbon 41, and a copious white ash, 23 per cent.

7. *From Dr. J. T. Pearson,* submitting his suggestions on the improvement of the Museum of the Asiatic Society.

After some discussion, and a vote of thanks to Dr. Pearson, for the labour he had taken in the consideration of a subject of such vital importance to the Physical branch of the Society,—Messrs. Calder, Troyer, Tytler, Everest, Wilcox, and C. Hunter, in conjunction with the President and Secretaries, were nominated a Committee to report upon the best mode of giving effect to the very desirable plan proposed by Dr. Pearson, previous to coming before the general meeting of the Society, with any application on the subject.

Dr. Pearson exhibited a part of his entomological collection, as an example of what might be effected towards the preservation of specimens in this country.

A fossil was presented by the Rev. R. Everest, supposed to be the vertebræ and ribs of a saurian animal.

Papers read.

1. Description of the *Canis primævus* of Nepal, by B. H. Hodgson, Esq.

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* These were printed at length in the last number of the Journal.

This interesting paper gives a particular account of the wild dog, of which a notice will be found in Mr. Hodgson's paper on the Mammalia of Nepal published in the present number: it is accompanied by accurate drawings of the animal, and, by way of comparison, of the "chien de rue," and the jackal; and of the skeletons of the head of each.

VI.—SCIENTIFIC INTELLIGENCE.

1.—*Gold Mines of North America.*

Several new sites of gold ore have, within a few years, been discovered in the United States.

The gold mines of North Carolina, are acquiring importance rapidly, through the improvements in mining introduced by foreign miners. In Virginia also, since 1827, considerable attention has been attracted by the discovery of the precious ore along a belt of country extending through Spotsylvania and the neighbouring counties. In the latter State it is diffused over large spaces, and has not been found sufficiently in mass, except in a few places, to make mining practicable; but in North Carolina the produce has increased from D. 2,500 a year to D. 128,000 in 1829, and 204,000 in 1830.

The mint returns for 1830 state the receipt of gold from "the gold region of the United States," to be D. 466,000, of which D. 212,000 was from Georgia, whence no specimen had ever before been received; D. 24,000 from Virginia and D. 26,000 from South Carolina. The gold country was estimated by Prof. Olmsted, in 1825, at only 1,000 square miles, but it has since been found to be vastly more extensive, and a succession of mines has been discovered in the country east of the Blue Ridge, extending from the river Potomac into the state of Alabama, and ending in Tennessee. The gold works in the counties of Burke and Rutherford are *washings:* the gold is found in small and pure particles mixed with the sand, which lies in deposits, occupying as it were the beds of ancient streams, creeks, &c.

The counties of Mecklenberg, Rowan, Davidson, and Cabarras are the richest in what may be properly called gold *mines;* that is, where the gold is found in *ore*, and distinguishable by the eye, and where it is separated by pounding, and amalgamation with mercury, separating the latter from the gold by distillation in an alembic in the usual manner.

The gold region abounds in quartz, which contains cubical pyrites. These cubes are sometimes decomposed, and the cells thus created are filled with gold. The greatest portion of the metal, however, occurs in veins in slate.

"The best veins of gold are not horizontal, nor often vertical, but have a dip of about 45 degrees. They vary in width from a few inches to several feet: they are not confined to hills at all, but are found also in low lands. These veins are often parallel to each other at unequal distances: their depth in most places has not been ascertained, no shafts having yet pierced lower than 120 feet. The mining required a great deal of skill and experience in economizing the perforations and galleries. There are no less than thirteen different languages spoken at these mines, so speedily have adventurous miners been attracted from Germany, Switzerland, Spain, England, &c. Mills for grinding the ore, propelled by water or by steam, have been erected, and in one establishment alone more than 600 hands are employed. The state of morals among this heterogeneous mass of adventurers is represented to be deplorably bad.

"There is indubitable evidence, that these mines were known and *worked* by the aboriginal inhabitants, or some other people, at a remote period. Many pieces of machinery, which were used for this purpose, have been found. Among them are several *crucibles* of earthen-ware, surpassing in durability the best Hessian crucibles."

We have extracted the substance of the above notice from "*The American Almanac and Repository of Useful Knowledge, for the year* 1832;"—a small octavo volume, which puts to shame all the almanacks of our own country, with the exception of that published under the auspices of the *Society for promoting Useful Knowledge*, by the immense mass of information, calendral, statistical, and physical, which it contains, as well as by the method of its arrangement and the neatness of its execution.

2.—*Analysis of the Copper Ores of Cuba, in the* Cerco *of* Villa Clara. By *Don Ramon de la Sagra.*

The specimens produced belong to the class called green copper (*cobres verdes*), or the carbonate of copper of mineralogists. Some pieces have an earthy appearance, and are soft, friable, and of a whitish-green colour, like certain copper ores of Rio Tinto, in Spain, commonly called "*verde de montana.*" Others are more compact, of a sea green, and sometimes a metallic grey. The oxide of iron with which it is combined is very perceptible to the eye. In order to separate it, I pounded specimens of both descriptions of ore, then distilled and calcined two grammes of each, to ascertain the quantity of water and of carbonic acid, and dissolved the mass in boiling nitric acid: after concentrating the solution, filtering it, washing the residuum, and mixing together the water employed in the washing, I obtained 65 centigrams of precipitate from one mineral, and 38 from the other, by means of liquid ammonia. These quantities of ammoniate of iron corresponding to 32 and 18 centigrams of metal respectively, or 16 centesimals of iron from the former, and 9 from the latter. The whole contents being,

1st Specimen.		2nd Specimen.	
Green copper, earthy ore.		*Green copper, compact ore.*	
Sub-carbonate of copper, (hydrated.)	64 5	Sub-carbonate of copper, (hydrated.)	56 5
Oxide of iron,	22 5	Oxide of iron,	13 0
Silex and earthy residuum,	13 0	Earthy residuum,	30 5
	100 0		100 0

3. *Coal from the district of Guanah, in the island of Cuba, analysed by Don Ramon de la Sagra.*

Texture laminar, of a bright lustre, like the best coal of England—fracture cubical—specific gravity 1.18.

CONTENTS.

Carbon or combustible matter of coke,	60
Betun mineral, (Tar,)	20
Water,	4
Incombustible ashes,	12
Gas,	4
	100

VII.—*Progress of European Science.*

Electricity.

Our journal has hitherto adverted but little to the subject of European science. Our space has been too fully occupied to admit of copious extracts from the scientific periodicals of England, and of the continent; we have confined ourselves to the reprinting of such notices in natural history, as were immediately connected with India. There is consequently a large arrear to bring up in other branches of science, and we must seek the means of doing so rather in the shape of a general review, than of broken and detached extracts. Fortunately, the materials for such a review are for the most part prepared to our hands, in the papers and essays read at the Academie, the Royal Society, and the Royal Institution; and in the annual addresses of the Presidents of other scientific bodies. It is a commendable rule of the French academy, that all works and papers presented, instead of being read at random and at length, are first referred to a *commission,* whose report generally condenses the original matter into a short and lucid abstract, much fitter for perusal before a mixed audience, or by the general class of readers. It is from such sources that we propose to gather our information.

Electricity is one of those invisible agents of nature, to the development of the effects of which attention is at this moment powerfully directed, on account of the discovery of several new phenomena, partly by accident, but chiefly by well-conducted experimental investigation. We shall endeavour to lay before our readers the progress that has been made, in these researches, under two heads:—1st, as connected with chemistry;—and 2nd, as connected with magnetism. The time seems near at hand, when the principle which actuates the *triune* sciences of galvanism, magnetism, and chemistry, will be acknowledged to be one only, under the name of *vis electrica,* subject to as simple and invariable laws as those of the gravitating principle, although like the latter its actual nature may ever remain a mystery to our limited comprehension.

1.—*Electro-Chemistry.*

If anything proves how far we are from a right understanding of the theory of the development of electricity in the voltaic pile, it is the diversity of opinions among philosophers who have especially engaged upon this inquiry.

Volta conceived that the simple contact of two solid conductors, such as the two metals, zinc and copper, produced electricity; and he thought that the liquids interposed between the couplets of the pile served only to transmit the electricity of one to the next.

An observation made in France, by Messrs. Biot and Fred. Cuvier, proved the influence of atmospheric oxigen in the charge of the pile; for having placed it in a receiver full of air, resting upon water, the action of the pile went on diminishing as the oxigen of the air became fixed on the zinc, and finally stopped when nothing but azote was left in the receiver.

Wollaston sought to prove, that the electricity of the pile proceeded from the chemical action of the liquid, interposed between the couplets, on the metals of the latter.

Davy, while admitting the principle of Volta, regarding the development of electricity by contact, recognized the necessity of a chemical action between the liquids and the metals which formed the pile, to produce a charge.

Lastly, M. Nobili starting from the fact, that *an electric current is established in a metallic bar unequally heated,* concludes that, in the pile, the action of liquids on metals develops electricity, because it develops heat, which is unequally communicated to the metals.

The electricity of the pile then has been attributed to three causes, viz. to simple contact, to chemical action, and to heat.

M. Becquerel, for the last ten years, has been engaged in a train of researches which have greatly added to electro-chemical knowledge: it is he who has proved, in an incontestible manner, *the development of electricity in chemical action,* a fact of the highest importance; he has proved besides that, if it be true, as asserted by Davy, that an acid and a solid alkali, become, by contact and before their mutual combination, the first electro-negative, the second electro-positive; it is not true, as the illustrious English philosopher has maintained, that at the moment of combination their electricities neutralise each other, for his experiments prove on the contrary, that *a current of positive fluid then arises from the base to the acid.*

He has shewn besides, that *two liquids of different nature may assume different states of electricity, and thus form the elements of a pile.*

These discoveries, the fruit of very delicate and ingenious experiments, naturally led their author to study the pile, not so much in respect to a general theory, as with a view to an experimental analysis, such as should determine with some precision the causes that influence its charge.

M. Becquerel, in the first chapter of a work submitted to the French academy, treats of such of these causes as are due to chemical action; and his experiments are directed to submit one element of the pile, as much as possible, to the influence of a single cause productive of electricity.

Speaking of the action of different liquids on one another, he gives a sufficient number of experimental results, from which it appears that *an acid conducts itself with a saline solution with which it mixes, as it would with a salifiable base with which it would combine,* that is, *it is positive towards it.* It seems also, that phosphoric acid is positive, relative to the muriatic, nitric, and sulphuric acids; a fact curious enough.

M. Becquerel, in examining the electricity developed by the contactof metals, and of those acids which attack them, or of metals and saline solutions, proves in general, that in the action of an acid on a metal, particularly when this action is not very strong, *the greatest part of the electricity developed, proceeds not from the action of the metal on the acid, but from the mutual action of the solution of salt produced and the free acid.*

Copper, lead, bismuth, zinc, and iron plunged in their respective nitrates become *negative* by the addition of a few drops of nitric acid; while those metals which decompose water, iron, zinc, and manganese, plunged in their respective sulphates, become *positive* as soon as some drops of sulphuric acid are added.

M. Becquerel then takes up the subject of the electric effects produced when two metals, connected by means of the wire of the multiplier, are partly plunged, either in the same liquid or in different liquids communicating together. In this case it is *generally the mutual action of the liquids, and not the action of either liquid upon the metal, which produces the greatest electric effect.*

He observed also, that in a pile formed of copper and zinc, the maximum electro-magnetic effect is obtained when the copper is plunged in nitrate of copper, and the zinc, in sulphate of zinc; because, if the copper and the zinc become, one positive, the other negative,—the nitrate of copper by its contact with the sulphate of zinc becomes positive, whilst the second becomes negative, consequently the sum of electricity developed is then the greatest.

M. **Becquerel** perceived that one way to preserve electrical effects sensibly constant during a certain interval, in a voltaic element formed of two metals, was to prevent their surfaces from becoming covered with solid deposits : unfortunately the process he adopted to obviate this defect is not of easy application in the ordinary construction of the pile, nor is it explained in the report.

Before entering upon the processes of electro-chemistry that he has employed to produce new chemical combinations, he describes an old experiment by **Bucholz**, founded on the same principles.

Bucholz, having introduced into a narrow receiver, containing a solution of sulphate of copper surmounted by plain water, a plate of copper, so that its upper part was immersed in the water, and the lower part in the sulphate, observed, that this part became soon encrusted with metallic copper : M. **Becquerel** supposes that, in this case, the two liquids form a voltaic couple, of which the solution is the positive pole and the water the negative.

When the slip of copper is immersed, a current of positive electricity is established from below upwards ; thus the plate becomes a pile of which the base is negative, and the summit positive ; and as a simple consequence, the copper is transported to the negative pole.

The possibility of thus establishing piles of single pairs formed either of two solids, or of two liquids,—and the property enjoyed by oxigen of travelling quicker than do the acids to the positive pole of these piles, which have always a very feeble tension,—led M. **Becquerel** to avail himself of electro-chemistry, to obtain several compounds of a remarkable nature, whether from their resemblance to the natural products met with in the strata of the earth, or from their similarity to certain products of the chemist's laboratory. As an example,

He put into a closed tube some concentrated muriatic acid, and a piece of charcoal fixed to a slip of silver by a wire of the same metal ; the open end of the tube was then drawn out to a fine thread with the blowpipe, but not closed. At the end of several months, there were formed upon the lamina of silver, octohedric crystals of chloride of silver, 0.001 metre (0.04 inch) in diameter, which resembled exactly those of nature ; while from the charcoal was disengaged some gas supposed to be carburetted hydrogen. The rationale is as follows : the charcoal and the silver form together a pile, of which the former is the negative pole; hence the hydrochloric acid is decomposed,—the chlorine goes over to the silver with which it combines, while the hydrogen goes to the negative pole. When copper is substituted for silver, protochloride of copper is deposited in tetrahedric crystals.

Protoxides of copper, of lead, the oxide of zinc, &c. have all been obtained in crystals by the following process : taking copper as an example : in a glass tube, a convenient portion of deutoxide of copper is placed, and a saturated solution of nitrate of copper, along with a slip of the same metal which ought to touch the deutoxide. The tube is then hermetically sealed ; the nitrate in contact with the deutoxide gradually passes to the state of insoluble subnitrate : then the lower part of the solution being less charged than the upper, acquires negative electricity, whilst the upper becomes positive ; a current commences therefore from above downwards, so that the lamina is itself a pile, of which the positive pole is below, and the negative above. It is natural, therefore, that the protoxide of copper should transport itself and crystallize on the upper extremity of the lamina.

Finally, M. **Becquerel** has formed double chlorides, bromures, iodures, sulphurets and cyanurets, crystallized under the influence of electro-chemical forces. Thus to obtain a double chloride of copper and sodium, he takes a tube curved like the letter V. He fills the curved part of it with *kaolin*, (porcelain clay,) previously boiled in acid ; he then fills one branch of the syphon, with a solution of chloride of sodium—the other with one of nitrate of copper ; lastly, a bit of copper-wire is put into each, and the openings are closed with mastic.

The two solutions upon their gradual mixture acquire different states of electricity: the wire plunged in the nitrate becomes negative, while that in the chloride remains positive ; the nitrate of copper is decomposed, and its metal deposited upon the wire which is plunged into it, whilst the oxigen of the base transports itself to the positive wire plunged in the chloride and thus produces a *double* chloride, because a portion of this chlorine unites with the metallic wire, and the chloride of copper resulting combines with the chloride of sodium. The greater part of the nitric acid remains free in the branch where the copper is deposited.—*Journal des Savans, Jan.* 1831.

In the proceedings of the Royal Institution of February last, we also find the following notice of some experiments made by Dr. Richie, on the laws of action in an elementary galvanic battery, and their application to the laws of a compound battery.

" Dr. Richie's experiments proved, that Volta's electro-motive theory was incorrect, and that decided voltaic effects could be produced by one metal and one fluid. He attempted to account for the deflection of the needle and the decomposing powers of an elementary battery, without supposing any *actual* transfer of the electric fluid from the zinc through the fluid to the copper plate, by the definite arrangement of the molecules of water. He shewed that the electro-magnetic effects are nearly inversely as the square roots of the distance between the plates : and that the effects of two unequal batteries were nearly as the square roots of their lengths. When their lengths were much extended, as is the case in an elementary battery, the increase of power begins to deviate from this law, and to verge to a limit beyond which any increase in the number of plates would diminish their powers."

II.—*Electro-Magnetism.*

In the *Philosophical Transactions* for 1831, is an essay by Mr. Barlow, on the Probable Electric Origin of all the Phenomena of Terrestrial Magnetism, which gives so clear a view of the progress of researches on this most interesting branch of electricity, that we regret our limits do not allow us to present it to our readers at length : the following is a summary of its contents.

The facts relative to terrestrial magnetism collected during the scientific travels of M. Humboldt were the first to awaken inquiry as to the laws of terrestrial magnetism. The difficult task of reducing that eminent traveller's results to calculation fell to the lot of M. Biot.

" Considering the earth as a magnet, he assumed an indeterminate distance to represent the distance of its two poles ; and then, supposing their power to vary inversely as the square of their distance from the point on which they acted, (a law which had been already established,) he obtained a general expression for the direction of a magnetic needle ; he then made his indeterminate distance vary ; and comparing at every step his results with those observed, it was found that the nearer the poles were made to approach, the nearer the computed and observed results corresponded ; and finally, that the errors were reduced to a minimum when the two poles were coincident, or indefinitely near to each other." This important result demonstrated that the earth was not a magnet, according to the common property of which the poles are distinct and distant from one another.

The intricate formulæ of M. Biot when simplified, were found to agree with an empyric relation discovered by M. Kraft of Petersburgh, in examining some observations of the magnetic dip in different parts of the world; namely, "*that the tangent of the dip of the needle in any place is equal to double the tangent of the magnetic latitude of that place.*" It followed also from Biot's formulæ, that *the intensity of the dipping needle ought to vary inversely as the square root of four,* minus *three times the square of the sine of the dip; and that of the horizontal needle, inversely as the square root of three,* plus *the square of the secant of the dip:* conditions which have in a great measure been verified, but which call for further confirmation in every quarter of the globe.

These laws are entirely inconsistent with those of a permanent magnetic body; while Mr. Barlow shows, they are the fundamental laws of a body which receives its transient magnetism by induction; and resemble precisely the conditions of the iron sphere upon which his experiments were made in 1819*, where the remarkable fact was pointed out, that all the magnetic power of an iron sphere resides on its surface.

Still an insuperable obstacle seemed to oppose itself to any rational hypothesis, relative to the cause of the earth's magnetic power. At that time only one means of inducing magnetism was known, which was by the approximation of a permanent magnet to a ball, or mass of simple iron, and of one or two other metals; the cause, therefore, remained inexplicable, until the important discovery of M. Oersted, that *a wire conducting an electric current was during the interval of transmission in a state of magnetic induction.* A number of interesting facts were immediately brought to light, founded upon this grand discovery, by the researches of M. Ampere, Biot, and Faraday. Mr. Barlow sought in it directly for the explanation of the phenomena of the iron sphere; and after many experiments to prove, that *the force of each particle of the galvanic wire on each particle of the needle varies inversely as the square of the distance,* and that the nature of the force is tangential, that is, such as would place a needle always at right angles to the direction of the wire, (facts more fully elicited by M. Ampere's investigations,) he applied it to the construction of a globe which should exhibit the whole phenomena of terrestrial magnetism as due to the superficial action of galvanic currents. This idea was put to the test of experiment with the most satisfactory results. A wooden globe of 16 inches diameter was encircled by a series of coils of wire in circles representing the latitude lines of the actual globe or parallels to the earth's magnetic equator. When the two ends of the coils of wire were connected with the two poles of a galvanic battery, a state of magnetism was induced precisely resembling the state of things on the earth: and a small needle placed in any situation upon its surface assumed the dip and variation corresponding to the locality.

Thus Mr. Barlow was the first to prove the existence of a force competent to produce all the phenomena of terrestrial magnetism, without the aid of any body usually called magnetic; and indeed it had been shewn by M. Biot's laws, that no position of a single magnet, nor the arrangement of any number of such bodies within the globe, could cause an exhibition of the same phenomena, particularly as relates to the intensity of the needle's magnetism.

As far as the discovery of M. Oersted went, however, it did not appear how a system of electrical currents could have existence on the earth, without a particu-

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* Essay on Magnetic Attraction, 1820.

lar arrangement of metals, acids, and conductors. This difficulty was removed by a subsequent discovery of Professor SEEBECK, of Berlin, only inferior in importance to the first, that the mere application of heat to a circuit composed of two metals was competent to produce the same development of galvanic and magnetic effects as those of the pile. Thus if instead of the coil of conducting wire on the globe above described, each parallel were made complete in two metals, all the phenomena might be represented by the application of heat only. A still farther simplication has been made by Mr. STURGEON of Woolwich, who has produced all the effects of a compound metallic combination, with a rectangle of bismuth only, *unequally heated:* a fact according wonderfully with the galvanic plate, described in M. Becquerel's experiments, of a single metal acted on by saline solutions of irregular composition.

"M. SEEBECK's discovery brings us therefore," says Mr. BARLOW, "a step nearer to our object, by referring us to the sun as the great agent of all these phenomena, and indeed only one link seems wanted to connect together the chain, and thereby to reduce to simple and intelligent principles what has hitherto been considered amongst the most mysterious laws of nature."

Since the publication of Mr. BARLOW's paper, Mr. FARADAY has taken up the subject of *volta-electric* and *magneto-electric induction*, and although we have not a full account of his experiments, the notice of them in the report of the Royal Institution already prepares us for a train of highly curious results; indeed, the grand desideratum of converting magnetism into electricity seems in his skilful hands on the points of attainment.

"If two wires (A and B)be placed side by side, but not in contact, and a voltaic current be passed through A, there is instantly a current produced by induction in B, in the opposite direction. Although the principal current in A be continued, still the secondary current in B is not found to accompany it, for it ceases after the first moment; but when the principal current is stopped, then there is a second current produced in B, in the opposite direction to that of the first produced by the inductive action, or in the same direction as that of the principal current. These induced currents are so momentary that their effect on the galvanometer is scarcely sensible; but when they are passed through helices containing unmagnetised steel needles, they convert them into magnets.

If a wire connected at both extremities with a galvanometer be coiled, in the form of a helix, round a magnet, no current of electricity takes place in it. This is an experiment which has been made by various persons, hundreds of times, in the hope of evolving electricity from magnetism, and, as in other cases in which the wishes of the experimenter, and the facts, are opposed to each other, has given rise to very conflicting conclusions.—But if the magnet be withdrawn from or introduced into such a helix, a current of electricity is produced whilst the magnet is in motion, and is rendered evident by the deflection of the galvanometer. If a single wire be passed by a magnetic pole, a current of electricity is induced through it, which can be rendered sensible."

Thus is obtained the result so long sought after, *the conversion* of magnetism into electricity; whenever a metallic body moves near a magnet, so as to intersect the magnetic curves, electricity is evolved, according to very simple laws. Similar results have been obtained even with the magnetism of the earth; on these subjects Mr. FARADAY had recently read a paper before the Royal Society, and he intended (in February) bringing them forward experimentally at the evening meetings of the Royal Institution.

The induction of electricity by the momentary passage of a magnetic pole, so analogous to that of the induction of magnetism by a current of electric fluid, leads at once to the consideration of another branch of magnetic phenomena which originated with Mr. ARAGO, and has since been studied assiduously by Messrs. HERSCHEL, CHRISTIE, BARLOW, and STURGEON, and others, namely, the magnetic effects of metallic plates in rotation, with which we think should be classed, the practical methods of magnetising steel bars, by the motion of magnets over them.

That magnetism existed in brass had been pointed out by Mr. BARLOW in 1823, but the magnetic force in most metals except iron, nickel, and cobalt was far too feeble to be detected by the simple application of the most delicate needle. Mr. ARAGO judiciously applied the principle of the *magnetic momentum* generated by the rapid motion of discs of these metals, and demonstrated that all possessed magnetic energy in various degrees*. The novel phenomenon of a magnetic needle rotating on its pivot by simply placing it above a revolving plate of copper, had something in it so fascinating, and presented so striking a similitude to the electro-magnetic rotations then familiar to philosophers, that for a while it was doubted whether or not the revolving plate possessed electric properties. Another mode of solving the problem was, that the copper plate, like all ferruginous bodies, actuated the needle through what is called *induced* magnetism by the influence of the earth, and that the needle was put into motion by a rapid succession of transient magnetic poles induced in the plate. When however it was found that light copper discs would of themselves rotate when suspended over a revolving horse-shoe, or other powerful magnet, it occurred that all the phenomena emanated from the action of the magnet employed, exciting transient polarity in the metals under examination.

Mr. STURGEON, from whose paper the foregoing facts are drawn, was from the want of an adequate hypothesis led to examine the distribution of magnetic polarity in metallic discs, by making them revolve or oscillate between the poles of a horse-shoe magnet, and trying the conditions of various parts of the plate by a small dipping needle. The number of vibrations performed by a thin copper disc under the influence of a magnet, were reduced even five-fold when compared with its free vibrations in air.

This subject is still under investigation, and will doubtless receive fresh elucidation from the able men engaged upon it: we have already found that magnetism is but another name for electricity, and shall soon know how to elicit it from every substance, and perhaps to draw benefits as important in mechanical as the polarity of the needle is in nautical science. What can be more wonderful than the prodigious mechanical force set in action by what appears a very inadequate cause,—the elector-magnet, an instrument now familiarly known, in which a coil of wire is wound round a horse-shoe of soft iron, and connected by its two extremities with two small plates of zinc and copper. One of these instruments, constructed by Mr. WALSH of Woolwich, was exhibited at the evening meetings of the Institution, which when the plates were dipped in weak acid, sustained a weight of between 300 and 400 pounds, though before the application of the voltaic power it did not support an ounce.

The last fact to be noted in the progress of electrical knowledge, is the production of sparks from the magnetic needle in Italy: Signor NOBILI's announcement has been confirmed by Mr. JAMES D. FORBES' experiments, before the Edinburgh Royal Society, in April, 1832. And the power of drawing sparks from the natural magnet is now established. All we know as yet of the procedure is that, it " rests upon the recent discoveries of our distinguished countryman Mr. FARADAY."

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* W. Sturgeon, Phil. Mag. April, 1832.

Meteorological Register, kept at the Surveyor General's Office, Calcutta, for the Month of August, 1832.

Days of the Month.	Minimum Temperature observed at sunrise.					Maximum Pressure observed at 9h. 50m.					Max. Temp. and Dryness observed at 2h. 40m.					Minimum Pressure observed at 4h. 0m.					Observations made at sunset.					Observations in Calcutta, 10h. 30m. P. M.					Rain Gauge, No. 1.	Rain Gauge, No. 2.
	Barometer reduced to 32°.	Temper. of the air.	Depres. of M. B. Ther.	Wind.	Aspect of the sky.	Barom. red. to 32°.	Temper. of the air.	Depres. of M. B. Ther.	Wind.	Aspect of the sky.	Barom. red. to 32°.	Temper. of the air.	Depres. of M. B. Ther.	Wind.	Aspect of the sky.	Barom. red. to 32°.	Temper. of the air.	Depres. of M. B. Ther.	Wind.	Aspect of the sky.	Barom. red. to 32°.	Temper. of the air.	Depres. of M. B. Ther.	Wind.	Aspect of the sky.	Barom. red. to 32°.	Temper. of the air.	Depres. of M. B. Ther.	Wind.	Aspect of the sky.		
1	29,389	79,7	1,2	cm.	rn.	,440	84,	3,5	n.	cu.	,346	89,7	5,5	s.	cu.	,332	86,	3,5	n.	cu.	,307	81,8	2,1	n.	n.	,397	80,5	3,3	w.	cus.	1,72	1,45
2	,321	79,5	1,8	n. e.	do.	,391	86,	5,3	n. e.	do.	,321	89,3	7,8	n. e.	do.	,325	83,	3,5	n. e.	n.	,328	81,	1,8	n. e.	cis.	,407	82,0	2,8	e.	n.	0,32	0,21
3	,357	79,7	1,5	do.	cy.	,415	83,8	3,9	do.	cus.	,359	82,5	2,	s.	rn.	,341	84,3	3,3	s.	cus.	,357	82,	1,8	s.	cu.	,412	80,	1,9	e.	cl.	0,64	0,28
4	,411	79,	1,3	s. e.	rn.	,469	85,	5,1	s. e.	cu.	,421	84,5	4,8	s. e.	cis.	,413	83,3	3,8	e.	cis.	,434	81,5	2,3	s. e.	cis.	,514	82,2	3,6	e.	cis.	0,14	0,05
5	,506	80,	1,5	s.	cu.	,550	85,5	5,8	s.	do.	,449	88,5	7,6	do.	cu.	,437	87,	6,3	s. e.	do.	,463	84,	4,3	s.	ci.	,534	83,	3,2	s. w.	cis.		
6	,454	79,	1,8	s. w.	rn.	,492	82,	2,5	s. w.	do.	,419	83,	3,	s. w.	n.	,411	82,3	2,8	s. w.	do.	,406	80,	1,8	s. w.	cis.	,448	81,2	2,2	s. w.	cis.	0,38	0,28
7	,416	80,	2,3	do.	cu.	,451	84,	3,8	s.	cus.	,355	81,3	2,8	do.	cis.	,335	80,7	2,2	do.	n.	,343	78,7	1,	do.	rn.	,358	80,	1,8	s. w.	rn.		
8	,380	77,	1,8	do.	rn.	,441	81,5	2,6	s. w.	rn.	,410	81,8	2,1	s. e.	do.	,410	81,7	2,2	s. e.	cis.	,405	80,5	1,8	s. e.	cus.	,526	80,	2,1	w.	rn.	2,63	2,33
9	,551	77,	1,3	s. e.	do.	,599	80,5	2,3	e.	do.	,550	83,	3,1	e.	cus.	,524	84,5	3,6	e.	do.	,524	81,	1,8	do.	ci.	,624	82,	3,0	e.	cu.	3,00	2,83
10	,604	80,	1,5	do.	cu.	,669	87,5	5,8	s. e.	cu.	,601	89,3	8,3	s. e.	cu.	,572	87,5	7,5	s. e.	cu.	,572	83,5	4,3	do.	cis.	,653	83,1	3,8	cm.	ci.	0,40	0,20
11	,606	81,7	1,5	s.	do.	,646	86,5	7,	s. w.	do.	,537	90,5	9,8	w.	do.	,523	89,5	8,3	do.	do.	,519	82,	3,3	do.	n.	,588	83,4	4,5	s. w.	cis.		
12	,508	81,	2,3	n. w.	ci.	,558	82,7	3,5	n. w.	cus.	,445	84,7	4,8	n. w.	cus.	,435	83,	2,8	s. w.	cis.	,427	82,	1,8	s. w.	cis.	,504	81,4	3,6	s. w.	ci.	0,37	0,25
13	,438	79,5	1,6	n. e.	cy.	,475	85,	5,5	w.	cu.	,398	87,5	5,6	n. e.	cis.	,349	86,3	4,6	do.	do.	,368	85,3	4,4	do.	cu.	,463	83,8	4,4	s. w.	ci.		
14	,422	81,5	2,	do.	cu.	,481	87,	4,8	n. e.	do.	,401	92,5	10,6	do.	ci.	,399	87,	7,1	s. e.	cus.	,415	85,	4,3	cm.	ci.	,499	84,6	5,3	w.	do.	0,22	0,13
15	,420	81,	1,8	do.	do.	,458	82,5	3,3	do.	do.	,367	90,5	9,8	do.	cu.	,342	90,	9,2	n. e.	cu.	,381	85,5	5,8	n. e.	cu.	,390	81,5	4,3	e.	cl.	0,14	0,09
16	,411	79,7	1,8	do.	cy.	,449	84,7	5,2	do.	do.	,355	87,5	6,3	do.	do.	,335	88,	7,	do.	do.	,366	85,	6,3	do.	do.	,416	82,3	5,3	n. e.	n.	0,21	0,15
17	,394	81,	2,8	do.	cu.	,473	84,3	3,8	do.	do.	,432	89,3	8,4	s.	do.	,430	89,	7,5	s.	ci.	,443	85,5	5,8	s.	ci.	,539	83,2	5,7	n.	cl.		
18	,502	80,7	1,8	s. e.	do.	,548	87,	6,	s. e.	cus.	,468	88,5	6,	s. e.	cis.	,440	87,8	6,1	s. e.	cis.	,433	85,	4,3	s. e.	cis.	,502	84,2	3,2	cm.	do.		
19	,448	81,7	2,	s. w.	do.	,496	85,5	7,3	s. w.	cu.	,425	81,5	2,6	cm.	rn.	,413	81,7	2,8	s.	cy.	,400	81,	2,3	do.	rn.	,508	82,	3,1	s. w.	n.		
20	,466	81,	2,1	do.	cus.	,547	79,	1,8	do.	rn.	,471	31,	2,8	s.	cis.	,472	82,3	3,4	s. e.	cis.	,477	83,	2,8	do.	cis.	,554	81,8	3,8	s.	cl.	0,24	0,14
21	,547	81,	1,8	s.	cu.	,615	87,3	6,3	s.	cu.	,530	87,3	6,6	do.	cu.	,528	86,7	5,2	s.	do.	,533	85,3	5,4	s.	do.	,605	84,	3,0	do.	do.		
22	,556	81,5	2,6	do.	ci.	,624	87,	6,5	do.	cus.	,510	88,7	7,7	do.	cis.	,510	88,	6,8	do.	ci.	,499	86,	4,5	do.	cu.	,575	85,6	5,6	s. w.	cus.		
23	,550	81,5	2,3	s. w.	cu.	,627	78,5	1,3	cm.	rn.	,518	78,7	3,2	w.	do.	,479	79,7	2,2	w.	cu.	,505	79,3	1,8	w.	rn.	,577	79,6	1,6	n. w.	rn.	2,97	2,65
24	,510	78,	1,5	n. e.	rn.	,569	83,	3,5	n. w.	cu.	,444	88,	6,5	do.	cu.	,436	88,	7,	do.	do.	.437	84,	3,5	do.	cu.	,523	79,	1,9	s. e.	do.	0,62	0,54
25	,431	79,3	1,4	do.	cus.	,481	85,7	4,9	n. e.	do.	,385	90,7	7,5	n. e.	do.	,367	90,3	8,6	n. e.	do.	,396	84,	3,3	n.	do.	,468	82,	3,0	cm.	cu.		
26	,408	80,3	1,6	s. e.	do.	,450	87,	6,5	s. e.	do.	,371	88,9	7,4	s. w.	do.	,357	85,7	4,5	s. e.	cis.	,384	84,7	4,	s. e.	cis.	,460	83,2	3,8	n.	do.	0,58	0,45
27	,434	79,	1,1	cm.	n.	,476	81,8	2,1	do.	do.	,438	84,7	5,2	do.	cus.	,438	84,	4,	do.	cu.	,487	82,	1,8	do.	ci.	,553	82,2	2,9	e.	do.	0,38	0,26
28	,533	79,7	1,	s.	do.	,602	86,	4,8	e.	do.	,534	85,5	5,5	s.	do.	,530	84,7	3,2	s.	cis.	,523	82,5	2,8	cm.	cus.	,598	82,2	2,0	s.	rn.	0,68	0,55
29	,564	79,5	1,3	s. e.	rn.	,614	83,	3,1	s. e.	cus.	,526	88,	6,3	s. e.	ci.	,513	85,7	4,8	s. e.	do.	,528	81,7	3,5	s. e.	rn.	,576	83,5	4,0	n. e.	cu.	0,37	0,28
30	,508	81,3	2,4	s. w.	cu.	,562	80,	1,5	cm.	rn.	,444	85,7	6,5	s. w.	cis.	,444	85,5	4,8	s. w.	cus.	,445	82,5	2,8	s. w.	cus.	,529	83,2	2,7	cm.	cl.	0,34	0,34
31	,465	79,7	2,	n.	do.	,529	86,	5,1	n.	ci.	,412	90,	7,3	n. w.	cu.	,405	87,7	5,5	n.	do.	,406	83,5	2,3	n.	n.	,512	83,2	3,0	do.	do.		
Mean,	29,468	80,0	1,8			,522	84,2	4,3			,440	86,5	5,9			,427	85,5	5,0			,436	82,9	3,2			,510	82,2	3,4			1644	1346

Abreviations. In the column "wind," small letters have been used instead of capitals; *cm.* means *calm.* In the column "aspect of the sky," *cy.* is *cloudy; cl. clear; rn. rain, ci. cirrus; cu. cumulus; cs. cirro-stratus; cus. cumulo-stratus; cc. cirro-cumulus; n. nimbus.*

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I.—*Analysis of the* KAH-GYUR. *By* H. H. Wilson, *Sec. As. Society.*

(Continued from page 8.)

SHER-CHIN.

AT a former meeting of the Society, a summary of the contents of the DUL-VÁ, or first part of the large Tibetan collection, the KAH-GYUR, derived from the more detailed catalogue of Mr. CSOMA DE KÖRÖS, was presented to the Society. Since that period Mr. CSOMA has completed the catalogue of the whole work, and I propose on the present occasion to offer an abstract of the information thence obtained.

II.—THE SHER-CHIN.

The second portion of the KAH-GYUR is entitled the *Shes-rab kyi pha rol tu phyin pá*, or by contraction *Sher phyin*, pronounced *Sher-chin.* In Sanscrit *Aryá Bhagavatí Prajná Páramitá*, or simply *Prajná Páramitá*, the two first words implying the venerable goddess, epithets applied to *Prajná*, wisdom or understanding; also styled *Páramitá*, or that by the means of which life is traversed and emancipation obtained, from *Páram* beyond, and *Ita* gone; and which may be rendered therefore Transcendent or transcendental wisdom.

The Chinese explain it correctly, "le moyen de parvenir a l'autre rive par la science: parvenir a l'autre rive est une expression mystique pour indiquer—l'absorption du contemplatif et sa delivrance finale."—*Journal des Savans, Mai*, 1831.

This class consists of six different works, in twenty-one large volumes; of these, the first five all bear the same title *Aryá Bhagavatí Prajná Páramitá*, and are only discriminated by the titles expressing the number of stanzas which they contain. The sixth division is of a more miscellaneous character.

The first work, entitled the *Shes-rab kyi pha rol tu phyin pá—s'tong phrag Br. gya-pá* (or *H. bum*), or in Sanscrit *Aryá Bhagavatí Sata Sahasriká Prajná Páramitá*, consists as the designation imports of 100,000 *slokas* or stanzas. It occupies 12 volumes, divided into 75 books and 303 sections.

The second work is nothing more than an abridgement of the preceding, in which the number of stanzas is 25,000, whence its name the *Panchavinsati Sahasriká.* It occupies 3 volumes.

The third work is also an abridgement of the first, in 18,000 stanzas, or *Asthadasá Sahasriká.* It likewise occupies three volumes.

The fourth work in one volume is the *Dasá Sahasriká*, an abridgement of the second work in the collection, in which the 25,000 stanzas are reduced to 10,000; and the fifth work is a final abridgement of the whole, in which the number of stanzas is brought down to 8,000, contained in one volume.

The twenty-first and last volume of this division of the Kah-gyur is entitled *S'na-ts-hogs*, or the miscellany. It comprises 18 different treatises, all of the class of *Sútras**, (original preceptive authorities,) and explanatory of the doctrines taught in the preceding volumes, in a summary form and commonly in verse.

As might be expected from their more compendious form, several of these are of more general currency than the original, and they may be regarded as the popular representations of the metaphysical speculations of Buddhism. Thus the fifth tract, entitled the *Vajrachhediká*, the cutter of adamant, in which the true sense of the *Prajná Páramitá* is explained by Sákya to his disciple Subhuti in 18 leaves, is frequently met with in Tibet, in a detached form. The five last treatises are denominated from the *Bodhisatwas*, to whom they are addressed, the *Prajná Páramitá* of *Surya-gerbha*, *Chandra-gerbha*, *Samanti-bhadra*, *Vajrapáni*, and *Vajraketú.* In one of the number, a specimen of mysticism occurs. It is called the *Prajná Páramitá Sarva Tathágata Ekakshari*, or the mono-literal transcendental wisdom of all the Buddhas, and refers the essence and origin of all things to the first letter of the alphabet, or A. For this being the first element of speech, all instruction is derived from it, all wisdom obtained, and it is hence to be regarded as the mother of the *Bodhisatwas*, the essential means of final liberation, and the substance of the *Prajná Páramitá.*

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* Mr. Hodgson says, *Sútra* is often explained *Múla* (root) *Grantha,* and *Buddha vachana,* or words of Buddha.—As. R. vol. xvi.

A careful examination of the original *Prajná Páramitá*, or a translation of one of the abridgements of it, is the only means of determining the real purport of the native doctrine of the Buddhas, as taught by SÁKYA. It is indeed urgently required, in order to save many eminent scholars from the unsatisfactory labour of endeavouring to compose a regular system out of the *disjecta membra* placed within their reach, by the study of inferior authorities or oral communication*. It is to be hoped, therefore, that Mr. CSOMA may be prevailed upon to undertake the task, however difficult and irksome it may prove, not only from the inherent obscurity of the subject, but the very desultory and vague manner in which it is treated by SÁKYA, or his disciples—a style of discussion which renders it impossible to give a satisfactory analysis of the contents of the *Sher-chin.*

Speaking generally, the volumes of this division contain the metaphysical and psychological doctrines of the Bauddhas, as taught by SÁKYA to his pupils, and to other Bodhisatwas and Buddhas. There are especially one hundred and eight leading topics *(Dhermas)*, which with numerous subdivisions admit of argument, of affirmation and negation. Thus of aggregation or body, five predicates may be asserted —shape, perception, consciousness, faculty, and discrimination. The senses are said to be six—sight, hearing, smell, touch, taste, and understanding†; there are also six organs of sense, six objects, and eighteen regions. There are six elements, earth, water, fire, air, ether, and spirit, (or intellect†.)

There are twelve concatenated causes of existence, whether of matter or spirit—1. ignorance; 2. faculty; 3. discrimination; 4. definite form; 5. sensation; 6. perception; 7. knowledge; 8. desire; 9. privation; 10. vitality; 11. birth; 12. old age and death. There are six transcendental virtues—1. charity; 2. gentleness; 3. patience; 4. vigorous application; 5. meditation; 6. wisdom. To these four others are sometimes added—method, salutation or prayer, fortitude, and prescience.

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* Mons. REMUSAT states in a note on his Review of Mr. HODGSON's Sketch of Buddhism, in the Transactions of the R.A. Society (Journal des Savans), that subsequently to its publication, " il a paru dans le Journal Asiatique, et dans les Memoires de l'Academie de Petersbourg, plusieurs morceaux ou l'existence d'un Dieu supreme, dans le Buddhism est discutcè contradictoirement."

† This is contrary to the statements hitherto published: disputed points between the Nyayikas and Bauddhas being the number of the organs, reckoned by the former, six, including mind, and by the latter, five, excluding mind; and the including of the *ákás* as a distinct element, which the Bauddhas do not recognise.

Of the great dogma of Buddhism, the determination of *Sunyatá*, emptiness or unreality, eighteen varieties are enumerated.

The specification of these varieties however does not furnish a very precise notion of what is meant, and it is not easy to understand what is intended by the doctrine that "nothing is," especially when associated with the eternity of matter, and even of an eternal first cause. In one point of view, it is a mere logical subtlety. All things are liable to change, the only state of which eternal identity can be predicated, is non-existence—nothingness. That which never is can never perish, and is therefore the only one enduring invariable principle in creation.

Sunyatá may also be regarded in a figurative sense, as the illusory nature of all corporeal and mundane existence.

These and the other speculations contained in these volumes are said to have been taught by SÁKYA in his 53rd year, 16 years after he had attained the degree of a Buddha, when he resided on the mountain of *Gridhra-kúta*, near *Raja Griha*. In some cases he delivers his instruction direct; in others he replies to questions put to him by propositions, which his disciples discuss, and thus elicit the answer for themselves.

The first compiler of the *Prajná Páramitá* was KASYAPA, the successor of SÁKYA in the hierarchy. The work was translated in the ninth century by the Indian pundits JINAMITRA and SURENDRA BODHI, and the Tibetan interpreter YE-SHES-DE. As I had occasion to notice, on a former occasion, the Society is in possession of the Sanscrit original of the *Sata Sahasriká*, or work in 100,000 stanzas; one entire copy and three sections of a second in the *Lan-ja* character; and one entire set in *Devanagari*, in five large volumes.

III.—PHAL-CH'HEN.

The third division of the KAH-GYUR is called in Tibetan *Sangs-gyas phál po ch'he*, or by contraction *Phál ch'hen*. In Sanscrit *Buddha avatansaka*, the crest or diadem of the Buddhas.

In the general account of the KAH-GYUR, the term is given *Buddhavata-Sanga*, association of Buddhas, but the present is probably the correcter reading.

It is of much less extent than either of the preceding portions, containing only six volumes of a connected series, which detail in 45 sections legends relating to different *Tathágatas* and *Bodhisatwas*, and a description of the different regions of the universe, agreeably to Buddha cosmology, interspersed with recommendations of the moral practices of the system. These legends and lessons are narrated chiefly by

Sákya, either on the summit of mount *Meru*, or in the *Tushita* heaven; and accordingly are intended only for the benefit of the highest order of aspirants to the perfection of a Buddha.

This work is also termed a *Mahá Vaipulye Sútra* or Scripture of great extent: it was translated in the ninth century by the pundit Surendra Bodhi and Lotsava Bairotsana Rakshita.

IV.—Kon-tsegs.

The next division, although of no greater extent, is more diversified in its character, and contains in six volumes 44 different treatises; the whole collection is entitled *D. kon M. ch'hog Br. tsegs pá*, or simply *Kon-tsegs*. In Sanscrit *Retna-kúta*, the jewel peak, or pile of precious things. These precious things are the instructions of Sákya, on a variety of moral subjects, delivered by him on the mountain *Gridhra-kúta* to his disciples. Many of them are in the form of dialogues, and more are in the shape of a reply to a question put by one of the disciples. One of the inquirers is the Hindu sage Vyása, who is enlightened by Sákya on the topic of charity and alms-giving. Others are of all descriptions, from a Bodhisatwa to a young girl. The topics are various, generally moral, as in the first article on the three obligations; the eighth on the ten virtues: sometimes legendary, as the 5th, 6th, and 12th, which give an account of the regions of the Buddhas, *Amitábha* and *Akshobhya*, and the Bodhisatwa *Manjú Sri.* Treatise four is upon the interpretation of dreams. No. 13 describes the meeting of Sákya and his father Suddhodana, after the former had become a Buddha; and in number 20, Sákya explains to his disciple Upáli the order in which the chapters of the Dul-va are to be arranged.

The translations of the *Kon-tsegs* are regarded as the work of the ninth century, by the pundits Jinamitra, Surendra Bodhi, Danasila, and others, and the Tibetan interpreters Ye-shes-de, and D. Pul; Br. Tsegs.

V.—Do.

The next portion of the Kah-gyur is entitled *M. Do-de; Sans. Sútranta*, or simply, *M. Do Sútra*, a term implying properly aphorism or rule, but here applied to a collection of treatises considered as of an authoritative, preceptive, or scriptural character. According to one classification of the Kah-gyur, the *Do* class comprehends all the portions of the entire collection, except the *Gyut*, the last and Tántrika class; but in the present instance, as a distinct division, it comprises 251 different treatises, collected in 30 volumes.

They are all supposed to have proceeded originally from Sákya, and to have been committed to writing shortly after his death by his disciple

Ananda. The first volume *B. skal, B. zang*, or *S. Bhadra Kalpika*, the age of happiness, is called also a *Mahá-yána Sútra*, or a great chariot precept: the phrase which is commonly used in Buddha literature to denote a scripture of the first order, the metaphor implying that such works act as conveyances to bear the spirit beyond the bounds of existence.

The principal subject of this work is the enumeration both in prose and verse of a thousand Buddhas, of whom four have existed, the rest are yet to come. The circumstances related of each of these are classed under 15 heads, or—1. his name; 2. the place of his nativity; 3. his tribe; 4. the extent to which the radiance emanating from him proceeds; 5. his father; 6. his mother; 7. his son; 8. his attendants; 9. the most intelligent of his disciples; 10. the one amongst his disciples best versed in working miracles; 11. the number of his disciples collected on any particular occasion; 12. the duration of his life; 13. the period during which his doctrine prevails; 14. the relics remaining of him; 15. the shrines built for their reception. About 300 leaves are occupied with these details; they are preceded by 150 on the general perfections of a Buddha, and are followed by about 100, describing the first step taken by the Buddhas particularised to attain divine perfection. The work is supposed to have been repeated by Sákya in reply to the questions of a *Bodhisatwa*, and in the presence of a large concourse of followers of both sexes, gods, demons, Bodhisatwas, and Buddhas, in a grove between Sravasti and Vaisali.

In the enumeration of the Buddhas anterior to Sákya in this volume, it is worthy of remark, that only three are specified, or Krakuchchanda, Kanaka, and Kasyapa. Sákya is the fourth. It would seem from this, that the existence of the three first of other lists Vipasyi, Sikhi, and Viswabhu′ was not universally recognised in Tibet, any more than in Ceylon or to the eastward.

According to Mr. Schmidt, they do not occur in the Buddhist writings of the Mongols, but this seems doubtful, and Mons. Remusat states that they are specified in Chinese works.

The second volume of the *Do* class is chiefly occupied with the *Lalita Vistára*, or the account of Sákya, a piece of autobiography, related at the request of the gods by the sage himself. It is unnecessary to advert to it more particularly, as it furnished many of the details read at the last meeting on the subject of Sákya's life and actions. It is one of Hodgson's nine *Dhermas*.

The volume contains also three other short works, yet nevertheless styled *Mahá-yána Sútras*—1. *Arya Manjúsri vikrídita; 2. Arya Man-*

júsri vikurvána ; 3. *Buddha kshetra nirdésa.* The two first relate to the actions and past lives of MANJU' SRI', a Bodhisatwa of some repute, who is the chief interlocutor in them with SÁKYA. The third is an account of the virtues of the place of Buddha's abode. These tracts contain various metaphysical discussions on the nature of life and spirit.

The third volume contains two works. The abridged title of the first may be *Bhagavan jnyána retna*, the jewel of the holy wisdom of Buddha. In this the omniscience of SÁKYA is eulogised and illustrated, first by his disciple GANG-PO, in a course of instruction given to a pious householder at a fabulous city called 'Excellent Virtue,' and afterwards by the *Nágas*. SÁKYA himself gives proofs of his power, as well as explanations of his doctrines, to both his new and old disciples.

The second work *Sarva Buddha jnyána áloka alankára*, the ornament of the light of knowledge of all the Buddhas, originated in a question put by MANJU' SRI' to SÁKYA, as to the meaning of the phrase, There is no beginning nor end to a *Tathágata ;* or in other words, a Buddha is subject to neither life nor death. SÁKYA in reply maintains argumentatively the superiority and imperishableness of all the Buddhas.

The fourth volume comprises five different works of comparatively small extent and little importance; the two first are explanations of the doctrines delivered by SÁKYA to his disciples. The third contains a dialogue between SÁKYA and a little child found in a deserted house, and whom SÁKYA instructs in the usual topics. In the fourth, a Bodhisatwa describes the different regions of the Buddhas; and the last, entitled 'the eight *Mandalas*,' contains little more than a recommendation to make these *Mandalas* or diagrams, as the means of securing prosperity; a rite which belongs to the mystical rather than the metaphysical class of Bauddha notions.

The fifth volume comprises three different works. In the first, the *Sandhi nirmochana*, or resolution of combinations, an assemblage of Bodhisatwas is described; several of whom propose subjects to SÁKYA, on which he expatiates.

Thus in the ninth chapter, SÁKYA at the request of AVÁLOKITESWARA explains the ten *bhumis* or stages of perfectibility of a Bodhisatwa and Buddha; and in the 10th, SÁKYA expounds to MANJU' SRI' the meaning of the term *Dherma káya*, the body or substance of righteousness. The second treatise, the *Lankávatára*, contains the doctrines taught by SÁKYA to a prince of *Lanka ;* and the third explains the meaning of the term Bodhisatwa given by SÁKYA to MANJU' SRI' on the hill *Gaya Sirsha*, whence it is called the *Gaya Sirsha Mahá-yána Sútra.*

The sixth volume has three treatises. The first discusses the nature of life and the soul: the second is of mixed character, being as much legendary as philosophical; it is termed *Mahá karuna pundaríka*, and describes the approaching death of Sákya, and the conversations that took place between him and his disciples or the gods.

Thus on Brahma's coming to condole with him, Sákya asks him who was the creator of all things, and whether he had any hand in creation. Brahmá declares that he had none, and in turn inquires the birth of Sákya. The sage replies, that creation depends upon the acts of created beings; that is, as long as retributive justice is rendered necessary by the weakness or vices of existent beings, they must continue to be born and die, and the world consequently to endure. He adds also, that the whole is illusion, there is no reality, all is *Sunyatá*, or emptiness; he then dismisses Brahmá, desiring him to take care of the world on his behalf.

Sákya then gives instructions to his pupils Ananda and Kasyápa, as to the dissemination and compilation of his doctrines, and desires them in communicating his oral lessons, to use this formula, "I myself heard this, at such a time when Chom-dan-das (Sákya) lectured at such or such a place, when his auditors were such or such persons, all of whom when the discourse was over rejoiced greatly, and concurred in his doctrines." The third treatise bears the same name *Karuná pundaríka*, and relates to the same subjects.

The seventh volume contains six different works. In the first, Maitreya and Manju' Srí' are introduced, discoursing on the marvellous perfection of Sákya, and the six great or transcendental virtues, charity, morality, patience, diligence, deep meditation, and clearness of intellect.

Other disciples appear in the work, of whom Sákya foretels the estimation in which they will be held. He also describes the conduct, and relates the lives of former Tathágatas. The work is considered of high value, and is called Sad Dherma Pundarí'ka, the lotus of the piety of the holy. The other works in this volume are of a similar character. The fourth, the *Karanda vyúha*, is held in high veneration by the Tibetans, containing many eulogies by Sákya on Chenre'sik Vángchhuk, their patron saint.

The ninth volume in like manner contains seven different works, and all to the same purpose. The two first were delivered by Sákya when on the point of death. The third or fourth, although ascribed originally to Sákya, are stated to have been rendered from Chinese into Tibetan. The ninth volume contains six, and the tenth, seven different treatises.

Each of the succeeding volumes is similarly distributed amongst a greater or smaller number of different works. Thus, the 15th contains nineteen tracts, the 16th, eighteen, and the 26th, thirty-three. They are all of too similar a character to need particularization. Each is a lecture on some topic of Bauddha belief or practice, delivered by SÁKYA, at the request of some of his followers, or in reply to their inquiries. A few particulars of some of them may be noticed.

In the 13th volume and 14th article is narrated a dialogue between SÁKYA and an old woman at *Brij.* She puts many philosophical enquiries, to the astonishment of SÁKYA's pupil KUN-GAH-OO, on which SÁKYA tells him that she had been his mother in former ages for five hundred generations.

The 11th number of the 15th volume, the *Chandrottara dáriká Vyákarana*, contains a prophecy, that a girl named CHANDROTTARÁ and one of his followers shall become a Buddha ; there are similar predictions of other persons in this volume.

In the *Lokana Samana Avatára*, the 19th article, in the same volume, SÁKYA explains to MANJU' SRI', his spiritual son, the considerations which induce the Buddhas to conform their practices to the conceptions of mankind.

The 19th volume commences with the *Dherma Sangíti*, or treatise on moral merit: in this, the different virtues are enumerated, and an account given of the advantages to be derived from their exercise. A discussion is also detailed between two Bodhisatwas on the nature of the *Tathágatas* or Buddhas, and in what sense the description of their birth, life, and death is to be received.

Most of the treatises in the 20th volume are intended for the benefit of the Bodhisatwas, and shew them by what moral and virtuous observances they may soonest attain the perfection and degree of a *Buddha.*

The first article in the 21st volume is entitled *Buddha náma sahasra pancha, sata chatúr, tri panchasat*, and is, as the name implies, the enumeration of 5,453 epithets of a Buddha or *Tathágata*, each being descriptive of some fancied or real excellence, and being accompanied with a reverential formula. Thus,

I adore the *Tathágata*, the universally radiant sun.

I adore the *Tathágata*, the moral wisdom.

I adore the *Tathágata*, the chief lamp of all the regions of space— and so on, for 137 leaves.

The second book in the 22nd volume, entitled *Achyuta Rájá*, gives an account of the periods of time prevailing in the different *Lokadhátus*, or regions of different Buddhas.

The region of SÁKYA is the *Sahaloka dhátu*, the world of mortals under the viceregal supremacy of BRAHMÁ. In the same volume occurs the *Sapta Buddhaka Sútra*, in which the seven Buddhas VIPASYI and the rest, at the solicitation of a Bodhisatwa, appear and communicate *Mantras* severally for averting evil. Three other tracts are successively devoted to eight, ten, and twelve Buddhas, but these are the holy personages of the region, and have no connexion with SÁKYA and his direct predecessors.

The twentieth work, in the 22nd volume, commences the *Saddherma Smrityupasthána*, or the influence of recollection over the discharge of true virtue. The work is continued through the whole of the 23rd and 24th volumes, and the greater part of the 25th, and may be considered as the moral code of SÁKYA. In this he describes the ten virtuous and ten vicious acts, and their consequences ; the different degrees of transmigration ; the scale of rewards and punishments ; the division of heaven and hell ; as well as the suffering experienced in this world ; and illustrates his subject by numerous legendary tales. These volumes contain little speculative matter, and belong to the external or practical portion of the Bauddha doctrines. The last portion of the 25th volume contains, amongst other treatises, two belonging to the *Esoteric* doctrine—on *Súnyatá* and *Mahá Súnyatá*, emptiness and great emptiness, or the total unreality of material existence.

The 1st article in the 26th volume is an account of the life and actions of SÁKYA, and of the origin of the SÁKYA race. The details agree generally with those in the 3rd volume of the DUL-VA, and in the 2nd of the Do class, or *Lalita Vistára.*

The 29th volume is occupied with four tracts, to three of which the term *Avadána* is applied : they are of a legendary character : thus, the *Suhárika Avadána* narrates the story of a divinity of one of the inferior heavens, named *Suhárika*, foreseeing that he is to become a hog in his next migration ; his anticipated degradation plunges him into great distress, when he is advised by INDRA to have recourse to SÁKYA : he does so, and upon his death, not only escapes his threatened humiliation, but is elevated to a higher heaven, or that of *Tushita.*

The 30th volume contains 25 treatises, most of them legendary ; the first five are in commendation of charity, the 11th is a narrative of SÁRD'ULANÁSA, the son of TRISANKU, a former chief of the *Súdra* race, who by his talents obtained the daughter of a celebrated Brahman for his wife. This story is related in justification of Sákya's disciple and successor Ananda, who married a girl of the *Súdra* caste. The tract contains an enumeration of castes and citations of several Hindú works. In the 23rd and 24th, the *Surya* and *Chandra Sútras*, the sun and moon, apply to Sákya when seized by Ráhu, and are liberated from the demon at the command of the sage.

Two or three of these works are described as translated into Tibetan from Chinese, but with these exceptions they are rendered professedly from Sanscrit, and the names of the pundits and translators are given. They are much the same as those met with in the *Dul-va* class, or Jinamitra, Surendra Bodhi, Dána-Síla, Prajnyáverma, Muniverma, &c. Few names of the *Lotsavas* or Tibetan interpreters are given; the chief is Ye-shes-de, the translator of the *Lalita Vistára* and other principal articles in this class.

The *M. Do* class of the Kah-gyur may be considered as that part of the course of Buddhist scriptures which is especially addressed to the lay votaries of this faith. It is not like the Dul-va, intended for the guidance of the priests, nor is it like the Sher-chin, addressed to the philosophers, whilst it is also distinguished from the last great division of the *Kah-gyur*, by being free, with one or two slight exceptions, from any taint of mysticism. Although some of the treatises are of a speculative and metaphysical tendency, yet by far the greater number have a more practical bearing, and either in the legends they narrate or the lessons they convey, are evidently composed to enforce belief in Sákya, and consequent diligent practice of those virtues which it was the end of his mission to inculcate.

Several of the works contained in this collection belong to the *Nava Dherma*, or nine Dhermas, mentioned by Mr. Hodgson, as objects of adoration, as well as high authorities in Nepal; such are the *Lalita vistára*, *Lankávatára*, and *Sat Dherma Pundaríka.*

VI.—MYANG DAS.

The smallest division of the Kah-gyur is the *Mya-nan-las-daspá*, or *Myang Das:* in Sanscrit the *Maha-parinírvána*, or simply *Nirvána Sútra*. It is confined to two volumes, which give an account of the concluding scene of Sákya's life; his *Nirvána* or attainment of that state of spiritual quiescence which constitutes the *summum bonum* of the Buddhists. Sákya's death took place in Asam or *Kusa*. The possession of his relics was disputed by several of the cities and princes of India, and finally distributed amongst them. Stately *cháityas* or mausolea were erected for their reception.

VII.—Gyut.

The seventh and last portion of the Kah-gyur is of a very different description from either of the preceding, constituting an extensive collection of works on mystical worship, corresponding to the *Tántrika* system of the Hindús, from which it is probably derived. The works are also of a more modern date, and less legitimately Bauddha character. The series consists of 22 volumes, each containing a number of small tracts. Most of them as usual are ascribed to Sákya.

The first volume contains 14 works, the first of which is an enumeration of the names of Manju' Sri', a person who was very possibly concerned in grafting *Tantra* rites on Buddhist speculations. The third work is called the *Paramádibuddha uddhrita Sri Kála Chakra*, a *Tantra* delivered by Sákya, at the request of Da-zang, a king of Shambhala, a fabulous city in the north; but the original is said to have proceeded from the first Supreme Buddha. It was introduced from the north, it is said, into India, in the 10th century, and into Tibet, in the 11th. How this is reconcileable with its being delivered by Sákya does not appear. Its modern date is unquestionable, as it makes mention of *Mekka*, and describes, in the form of a prophecy, it is true, the rise, progress, and decline of the Mohammedan religion. The work contains a variety of details in cosmography, astronomy, and chronology.

The second volume contains four works, the *Laghu-samvara*, the *Abhidhána*, the *Samvara*, and *Vajra Daka*, in which the worship of certain spirits, as Heruka, Samvara, and Vajra-Daka, with that of the female sprites and witches of the *Tantras*, the Yogi'nis and Dákinis, is enjoined, and the *Mantras*, or mystical formulæ for invoking them, communicated. These different beings are considered equal to the Buddhas in power and sanctity by some classes of Buddhists.

The third volume has also four works of similar purport. In the first the *Herúka Anubhúta*, or appearance of Heru'ka the speaker, is Vajrasatwa, also styled Samvara and Bhagaván, who, in answer to the questions of Váráhi', a goddess, explains her origin, her names, the import of the male and female symbols (*Linga* and *Bhaga*), the mystical power of different letters, illusion and union by Yoga with the deity: this and the other tracts also describe the different divinities worshipped, the *mandalas* or diagrams to be formed, and the *Mantras* to be repeated. The *Mantras* are also given, that of *Vajra-váráhí* commences " *Om* Nama, goddess Vajra-várái', holy and invincible mother of the three worlds. Great goddess of all wisdom, the remover of terror from all created beings." This *Mantra* is reputed to be of peculiar sanctity and efficacy.

The first article of the fifth volume is the *Sri-chanda Mahároshana Tantra.* In this the *Bhagaván* VAJRA-SATWA instructs the BHAGAVATI' PRAJNYÁ PÁRAMITÁ how to worship the wrathful deity called CHANDA MAHÁROSHÁNA, and in what manner a person may be initiated into the same knowledge by his spiritual guide. There are also speculations on the nature of body and spirit, and the means of re-uniting the human with the divine spiritual essence.

The first article of the sixth volume describes the subjugation of NILAMBARA-DHARA, VAJRAPÁNI and INDRA, by SÁKYA. In the second, the *Mantras* of several Hindú gods are given, or *Om* BRAHMÁ—*Om* VISHNU—*Om* salutation to RU'DRA—*Om* KÁRTIKEYA—*Om* GANAPATI—*Om* salutation to INDRA—*Om* MAHÁKÁLA—*Om* salutation to BRAHMÁ, and the like. In the fourth, especial injunctions are given to the novice, to persevere; the advantages of which are illustrated by the adage familiar to most nations, "In time a large stone is hollowed by small drops of water." "Gutta cavat lapidem non vi sed sæpe cadendo." In this also *Mantras* or incantations are given for procuring abundance, curing disease, overpowering an enemy, and the like.

The first and second tracts in the seventh volume are styled *Krishna Yamári, and Yamári Krishna Karma Sarva Chakra Siddhahara,* the black foe of YAMAR, and the wheel of the black foe of YAMA or death, for accomplishing all acts. The fourth is the *Rakta Yamári Tantra,* or of the red foe of death. The third is the *Vajra mahá Bhairava Tantra,* and fifth, *Bhagaván Ekajatá,* the god with the braid of hair: all, indications of close alliance with the followers of SIVA.

In the ninth volume, the sixth article is the *Mahá Vairochana Abhisambodhi,* a work of some extent, and sometimes regarded as a *Sútra.* It is ascribed to the Bodhisatwa VAIROCHANA, and was delivered by him at the request of VAJRAPÁNI. The chief interest attaching to this work arises from its containing the passage published in Europe in 1722, and most egregiously mistranslated by European scholars, as described in a former number of the Journal.

The tenth volume contains some treatises that seem scarcely to belong properly to this division; they contain prayers ascribed to different *Tathágatas* for the welfare of all animal beings, and repeated by SÁKYA at the request of MANJU' SRI'. There are indeed many such tracts in the collection, some of which are met with in the other divisions, as the 4th and 8th of the 11th volume, the *Vipula pravesa,* which occurred previously in the 2nd volume of the Dul-va, and the *Sapta Buddhastava*, short prayers or *Mantras* attributed to each of the seven Buddhas which had a place in the 22nd volume of the Do class.

The fifteenth article in the 11th volume is one of the numerous proofs afforded by the catalogue of the intimate connexion of Manju' Sri' with this part of the Buddhist ritual. It is styled *Aryá Manjú Srí Múla Tantra*, the primary *Tantra* of the holy Manju' Sri'. It is described as delivered by Sákya in the highest heaven, in the course of a conversation with Manju'Sri' in the presence of the assembled Bodhisatwas and gods. Besides descriptions of *Mandalas*, and of various ceremonies, accompanied with numerous *Mantras*, it contains a system of astrology, an account of the planets and lunar constellations, of lucky and unlucky periods, and the characters of men born under different planetary combinations. Sákya in this part of the work predicts the birth of some illustrious characters in Indian literature or history, as Pánini and Chandragupta; also of some eminent personages in his own faith, as Nágárjuna and Arya Sanga, entitled by Mr. Csoma, the Aristotle and Plato of Buddhism, and said by him to be the teachers of comparatively rational systems, speculative or practical, in the *Madhyámika* and *Yogácharya* schools, of which they were severally the founders. Nágárjuna is a person who enjoys a very extensive but rather unintelligible celebrity in Hindustan. In the south of India, he is the reputed author of works on alchemical medicine, and in the introduction to the almanacks of Benares, he is commonly mentioned as the institutor of a *Sáka* or era yet to come, the last of the *Kali* age. Nothing else is known of him to the Hindús. According to the Bauddhas he flourished four centuries after Sákya, in the south of India, and lived 600 years, traditions evidently connected with those of the peninsula. Arya Sanga, according to Mr. Csoma, lived in the 6th or 7th century after Christ.

This *Tantra* is held in high estimation by Tibetan writers, and contains a number of interesting particulars relative to the princes of India, who fostered or who persecuted Buddhism. It was translated by order of a Raja of Tibet, named Chang-chu-bhot, at Tholing, in Gu-ge above Gerhwal and Kamaon, in the 11th century, by Kumára Kalasa Pundit, and the Gelong, Sákya Lo-gros.

The 12th volume contains two works of the same name and substance, but differing in their source; one being translated from Chinese and the other from Sanscrit. The Tibetan title is, *Dehi shing kim kwang med jwahi shing wang kyang*. The Sanscrit, *Aryá Suverna prabhása*

Uttama Sútra Indra Rájá náma Maháyána Sútra, or the great holy *Yána Sútra*, the prince of the best of *Sútras*, resplendent as the radiance of gold. This is one of the nine *Dhermas* of the Nepalese, and is very popular with all Buddhists. It contains a course of dogmatic instruction delivered by Sákya at *Gridhra-kuta*, to his disciples and hearers, including the goddesses Saraswati and Lakshmi, and the four kings of Mount *Meru*, Vaisravana, Dhritaráshtra, Viru'dhaka, and Viru'páksha.

The 13th volume contains 71 different works: many of them are but of small extent; some of them not more than two or three verses, the greater number being *Dháranis*, short incantations, or prayers of supposed protective efficacy, and not unfrequently carried as amulets about the person. Thus the 25th article, the *Aparájitá Dháraní*, which occupies about eight leaves, is a collection of formulæ addressed to the different Buddhas, which are preservatives against thieves, water, fire, poison, weapons, foes, famine, disease, lightning, sudden death, earthquakes, meteors, princes, evil spirits,and gods. Articles 28, 29, and 30 are *Dháranís* for the cure of fever, ophthalmia, and hœmorrhoids, whilst they are preceded by the *Sarva roga prasaminí*, No. 27 a cure for every malady. Some of these are ceremonial, to be used on circumambulating or consecrating a temple or mausoleum. In 42, is a *Dháraní* for the augmentation of the understanding, *Prajná verdhani;* this occupies but one page. The chief secret lies in the repetition of the *Mantra*, *Namo retna trayáya*, *Namo aryá Avalokiteswaráya*, *Bodhisatwáya*, *Mahá Satwáya Mahá Karunikáya*, "Salutation to the Three Holies. Salutation to the venerable Bodhisatwa, the purified and compassionate *Avalokiteswara*." No. 65 is a *Dháraní* of two verses. No. 71 is a great *Dháraní*, *Mahá Dháraní*, delivered by Sákya to his disciple Ananda, as a defence against all sorts of evils. These works are mostly ascribed to the same translators, as those of the large and more standard works; but Mr. Csoma thinks they had no part in these translations, the subjects being so dissimilar, and it being universally admitted by Tibetan writers, that the princes of the 9th and succeeding centuries discouraged the promulgation of *Tántrika* works.

The 14th volume contains 53 works of a similar character in general as the preceding. From No. 3 to 10, they are lists of the names, 108 in number (like those of Siva), of different characters, in the Buddhist mythology, or *Avalokiteswara*, *Maitreya*, *Akása-gerbha*, *Sámantabhadra*, *Vajrapání*, *Manjú Srí*, *Sarvávarana*, *Vishkambhi*, *Kshetragerbha*. No. 15 is called the *Mahámegha*, the great cloud, being the name of a Buddha. In this a rather unusual office is assigned to the *Nágas*, or serpents, the charge of the rains, which they are made to promise they will send down in due season, in *Jambudwípa*, or India. Nos. 18 and 19 are the *Mahá Ganapati Tantra* and *Ganapati Hridaya*, and describe the worship of Ganesa, and the prayers sacred to him. Works with similar titles are not uncommon in Hindústan. The first was introduced into Tibet in the 11th century. No. 25 furnishes another analogy in nomenclature, being the *Devi Mahákáli' Dháraní.* This goddess, however, is called the sister and wife of Yama, the mother of Mára or Love, and queen of the region *Kámarúpa.* She is described as visiting Sákya, and receiving instructions and *Mantras* from him.

There are some other tracts on the same subject. Towards the end of the volume are several *Dháranís*, of which the hero is the Bodhisatwa Avalokiteswara or Chen-re-sik, who is reputed to be the particular patron and tutelary divinity of Tibet. The last numbers are dedicated to the goddess Tárá, the mother of all the *Tathágatas*, and origin of many things; her names (108) are enumerated, and worship described, and *Mantras* addressed to her repeated.

The fifteenth volume is chiefly devoted to the *Tántrika* worship of Amoghapása and the goddesses Saraswati and Mahásri'. One article, the last, entitled *Bhuta damana*, treats on the means of bringing *Bhuts* or imps, ghosts and goblins, under human controul. Part of the process is the use of the sundry gesticulations known in the Hindú system by the term *Mudrá.*

The 18th volume contains but one work, the *Bhagavatí Aryá Tárá Múla Kalpa* :—a detailed description of the powers of Tárá the goddess, the incantations addressed to her, and mode of offering her worship. It is attributed to Sákya, and was revealed by him to his disciples, when Avalokita was sent to him by Amitábha from the *Sukhávati* region.

In the 19th volume, the two first works are the *Dháranis* of Mánibhadra, the *Yaksha*, and son of Kuvera. The *Mantra* of this personage is *Namo Retna trayáya, Namo Manibhadráya Maháyaksha Senapatayè.* Salutation to the Holy Three—salutation to Manibhadra, general of the *Yaksha* host. The 12th article, *Sarva Mandala sámánya Vidhána*, or general ritual for all *Mandalas*, is a copious account of the figures of these diagrams, mode of making them, and ceremonies to be observed on the occasion. In one place the symbols of different deities to be placed in the divisions of the diagram are described, as a *trisul* or trident for Rudra, a discus for Vishnu, a lotus for Brahmá, a spear for SAMVARA, a thunderbolt for INDRA, a furnace for AGNI, a club for YAMA, a sword for NAIRRITA, a noose for VARUNA, a banner for VAYU, a staff for KUVERA, &c. No. 14, the *Susididhikara Mahá Tantra,* is a work on the usual *Tantrika* subjects, but held in high estimation.

The 20th volume is interesting for its antiquated style, its different purport, and its being authority only with the *Nyig-má-pa,* the oldest Buddhist sect in Tibet. It contains three works; the *Sarva dherma Mahásánti bodhi Chitta Kulaya Raja,* the royal instructor of the understanding in the great quiescence of all virtue. The second has a still longer title, with its equivalent not only in Tibetan but in what is called the *Bruzha* language, a language of which Mr. CSOMA could obtain no information. It is also said to be translated from that language. The third has a simple denomination, the mysteries of all the *Tathágatas.* It is regarded however as a continuation of the second. The mysticism of these works is of a different character from that of the others, and is doctrinal, not ceremonial. They also belong to theistical Buddhism, being revealed by the Supreme Soul, the Creator of all things, and who has existed from all eternity, in answer to the question of VAJRASATWA the chief of the five Buddhas, styled elsewhere the *Dhyáni* Buddhas. The first was translated in the 8th or 9th century by SRI SINHA PRABHA and the interpreter VAIROTSANA, the second (from the Bruzha language) by DHERMA BODHI DÁNA RAKSHITA and the interpreter CHHE'-TSAN-SKYES.

The 21st and 22nd volumes contain severally four and fifteen works of the same description as those which preceded the contents of the 20th; they do not need any particular specification. In the fourth line of the 22nd volume directions are given for the representation of the five Buddhas, VAIROCHANA and others, with their symbols. The Buddhas, Bodhisatwas, and others, who are the interlocutors in these works, or the objects addressed by them, are as before VAJRASATWA, VAJRAPÁNI, MANJU' SRI', HERUKA, and VAJRADHARA. The doctrine or worship of Illusion or *Máyá* occurs in the *Vajrasatwa Máyá jála Guhya Sarvá dersha,* the mirror of the mysteries of the net of illusion of *Vajrasatwa,* the 3rd article of the 21st volume, and in the 1st of the 22nd, the *Mahamáyá Tantra.*

Thus terminates the great collection, the KÁH-GYUR, a vast specimen of misdirected talent and time. Imperfect as the summary view given of its contents must necessarily be, it is evident from it, that there is no very great variety of subject, and that the general character of the composition is monotonous identity. The patience and perseverance of Mr. Csoma, in going over the whole of these bulky volumes in the manner he has done, will entitle him, I have no doubt, to the thanks not only of the Society, but of a considerable number of the learned of Europe, who are at this moment warmly interested in the investigation of Buddhism. He will have a still stronger claim upon their acknowledgments, if by the translation of some of the philosophical works, he enables them to appreciate what Buddhism really is.

Besides the catalogue of the Kah-gyur, Mr. Csoma has made occasional translations at my request, for the illustration of particular points. These are also submitted, as an account of the life and death of Sákya, the origin of the Sákya tribe, and some passages from the Sher-chin.

II.—*On the Ancient Roman Coins in the Cabinet of the Asiatic Society. By* James Prinsep, *Sec. Ph. Cl.*

(Read, July 4th.)

Having been lately engaged in decyphering the inscription of an antique copper coin found at Kanouj, by Mr. E. V. Irwin, C. S. and presented to us by Captain Sanders, Executive Engineer at Cawnpore, I was led into an examination of the contents of the Society's small cabinet itself, which, although it boasts but a very insignificant collection of Roman coins, and those mostly without any record of the exact localities in which they were found, or of the parties who presented them, is entitled to some interest from the circumstance of the Indian origin of all that it contains. It was not until the year 1814, that the Society opened a museum, and publicly invited contributions to it of the natural productions, antiquities, coins, and other curious monuments of the country: it is the less surprising, therefore, that its collection should not hitherto have attained any magnitude or consideration. Most private individuals, who have interested themselves in collecting medals and coins, have carried their spoil to England, where, indeed, they may be mortified in finding them swallowed up and lost among the immense profusion of similar objects in the public and private cabinets of European antiquarians ;-and they may perhaps regret that they did not leave them where, from their rarity, they would have been prized, and, from their presence, have promoted the acquisition of further stores for antiquarian research from the wide continent of India. The greater part of the late Colonel Mackenzie's collection was thus consigned to the museum of the Honorable Company in Leadenhall Street. Doctor Robert Tytler also presented to the same museum a valuable cabinet, chiefly of Roman coins, procured by him with great industry while Civil Surgeon at Allahabad. Col. T. Wilson, C. B. lately carried hence some curious coins; and many other private collections might be mentioned, without alluding to the extensive cabinet of Major Tod, which cannot be said to be lost to India, but rather to be returned to us more valuable than before, through the plates and notes in elucidation of them published in the Royal Asiatic Society's Transactions.

The publication of a *catalogue raisonné* of the contents of our drawers, although it may expose our present poverty, will, I doubt not, by a wholesome re-action tend to our future enrichment, both by establishing a nucleus to which the antiquities henceforth discovered will be naturally attracted, and by affording to inquirers, who may not have the opportunity of consulting books on the subject, some clue, however insufficient, to the decyphering of worn and imperfect medallic remains, which appear to a novice to defy scrutiny.

We here possess the advantage of reference, in the Society's library, to the splendid numismatic works that were printed in Europe, during the last century, when numismatology was a favorite study. The copious volumes of Vaillant, Patin, Mezzabarba, Hunter, and Banduri, leave hardly a possibility of doubting the exact epoch of a Roman coin, when the device on either side, or a few letters only of the inscription are still visible. It is by means of these works, that I have been able to decypher and classify the greater part of the coins in the following catalogue:—I have added to the list several that were the private property of Mr. Wilson, Col. T. Wilson, or myself, found in different parts of India: I have also availed myself of a manuscript catalogue of the Society's coins, drawn up by Dr. R. Tytler, in the year 1826, which includes the mention of twelve Roman coins.

The number in the cabinet at present amounts to between 50 and 60: they extend in antiquity through a period of more than 1000 years, from the Augustan age down to the decline of the lower empire. The accompanying plates exhibit the greater number of them faithfully delineated, of their real dimensions and appearance, with all the defects of workmanship and the injuries of time. There are few among them which would be objects of primary interest among professed medallists at home, who, in the profusion of Roman coins every where discovered in Europe, are content with none but those of superior fabrication and high preservation, worthy of the titles of *medals* and *medallions of large and smaller mo-*

dulus, fancifully conferred upon them in their class books. We possess none of what are usually called *medallions* of "*large brass*:"—those beautiful specimens of the die-sculptor's art are supposed to have been struck less with a view to circulation as coin, than as memorials of state events and families of note. The pieces found in India are chiefly of the lower denominations, the common currency of the eastern part of the empire, and if it were allowable to argue from such insufficient data, the predominance among our specimens of the copper coin of Ægyptian fabrication confirms what is known from history, of that country having been the principal channel of commerce between India and the Roman Europe. Robertson says that specie was one of the principal returns in trade for the spices, precious stones, silk, &c. of India: it is not improbable, therefore, that the coin of the empire circulated to a considerable extent in India; and that there existed no native currency at an early period among the Hindús, we have the authority of Pausanias, and the silence of other authors on the subject: this supposition is supported by the almost, nay, total absence of the remains of any ancient Indian coinage. The Indian coins of Kanouj and the *Dekhan*, described by Mr. Wilson in the As. Res. and the Indo-Grecian coins of Major Tod, are evidently *descendants* from the Bactrian coinage, from the types of which they gradually progress into purely Hindú models; but these are comparatively scarce, and must soon have given place to the coins of the Muhamedan conquerors. Coinage is certainly one of the improvements which has travelled and is still travelling eastward. Thus we see, at the present day, countries immediately to the east of us, Ava and China, nearly destitute of fabricated money of their own; into the former of which our silver and copper currency is but now by degrees beginning to penetrate, while the latter along the coast is supplied with dollars from America; and, within perhaps a century or so*, in its north-western provinces with coin struck by the neighbouring frontier states of Nipal, Lahore, &c. for their use. But this is a digression involving questions of deep research, foreign to my present object, and which I am by no means prepared to discuss.

The symbols on the Roman coins, unlike those of the Greeks, are generally explained at once by the inscriptions encircling them: thus SALVS REIPVB, or SALVS AVG, accompanies the type of a female feeding the serpent of the goddess of health, at an altar: CONCORDIA, ABUNDANTIA, PROSPERITAS, &c. are all marked by the cornucopia; the ca-

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* The Chinese provinces north of the Himalaya, Tibet, &c. were supplied with coin struck in the valley of Nipal.—*Dr. Bramley's Notes on Nipal Coinage.*

duceus expresses peace or commerce; the pontifical hat, the priesthood; military standards and warriors, glory and victory: a fort, or gateway, security, &c. The eagle generally denotes the consecration of an emperor, as the *thensa* or divine chariot is the emblem of that of an empress. All, or the greater part, of the types on the reverse of the coins of the emperors have reference therefore to some attribute or event of their reign; and when accompanied by the date of tribunate, consulate, imperial or pontifical elevation, &c. are so many imperishable testimonials of the truth of history. In not a few cases they have served to fill up blanks or to rectify doubtful events; and they have brought down to our sight not only the record of facts, but the very portraits of the monarchs, heroes, law-givers, and authors, whose deeds and words form the delight of our studies from our youth upward. It may be regretted, that the Roman coins did not directly exhibit the calendric date, especially after the entire reformation of the calendar under the first of the Cæsars; but with this sole exception what system of modern coinage, in the world, can stand a competition with the Roman or its prototype the Greek, the two earliest supposed to have been introduced among mankind? If as a contrast we look but one moment at the system of coinage prevalent in the nineteenth century throughout the extensive provinces of India, what will it impart of the history of our time to after-ages, when all other records shall have perished, or shall want the confirmation of public monuments, and the cherishing memory of a proud posterity? It will deceive them, as to the name and nation of the ruling power; as to the date, and as to the place of coinage! It will afford neither information, nor variety, nor beauty of design to gratify the curiosity of future antiquaries; the very excellence of its fabrication will be thought to have been lavished on an object unworthy of a great and enlightened nation! But this also is a digression, only excusable as it serves to enhance the value to us of the precious reliques of antiquity.

As the contents of our cabinet are to be regarded in the light of mere coin, a few remarks are necessary, to explain by what names they went and what value they represented; this part of the subject is generally disregarded by writers on medals, properly so called, who look to their *numismatic* value only as elucidatory of history and the arts; it has however received a very clear illustration in Pinkerton's Essay on Medals, from which we collect the following facts. The gold coin of Rome *(aureus)* varied gradually in weight from the Augustan æra to the close of the empire, though in a less degree than the coins of the other metals; it was, under the first emperors, 110 grains in weight, passing for 25 silver denarii and 100 sestertii : it declined to 80 grains in Gallienus' time : Aurelian attempted in vain to restore its weight to 100 grains. Besides the term *aureus*, it generally took a cognomen from the emperor, whose image it bore, as is still the case with the coin of many modern countries. Constantine introduced a new name and system of subdivision of the gold coin, but maintained his *solidus* of gold of the same weight as the *aureus*, or 80 grains ; it became current throughout Europe as the *Bezant* (from Byzantium), and gradually dwindled to less than half its size and value with the decline of the empire.

The principal silver coin of the republic was called *denarius :* it weighed 90 grains, and was worth, as its name implied, 10 copper *ases :* its subdivisions were the *quinarius (5 ases)*, and the *sestertius (half the third*, that is, $2\frac{1}{2}$ *ases)*. In the reign of Augustus the weight of both copper and silver coins had declined, and the *denarius* (then of 60 grs. weight) was made equivalent to 16 *as*. The *sestertius* thenceforward ceased to be a silver coin, and in lieu thereof, the handsome large brass medals, so prized by collectors, were first struck, weighing a Roman ounce. The silver *quinarius* (also called *victoriatus* from the common figure on its reverse) lasted to the time of the Philips. At that period the denarius having diminished to 40 grs. was called *minutus*, and a new piece called *argenteus philippeus* of 60 grs. or one-half heavier,was introduced as an equivalent for 24 *ases* of copper, or six brass *sestertii.* This again dwindled down to 40 grs. by the time of Gallienus, when all the inferior silver, as well as the large brass, disappeared entirely, and small silvered copper pieces *(denarii æris)*, weighing 60 grs. took the place of the sestertii, and passed current as tokens of 10 *ases* value; the silver *philippeus* itself being, as before, 60 *as*, or six of the plated denarii. Diocletian restored the *silver denarius* of 60 grs. and replaced the *denarius æris* by the *follis*, a new copper coin of $\frac{1}{2}$ an ounce, silvered or tinned : six of these as before were equal to the *denarius,* or to 60 copper *ases* of 60 grs. weight each.

Once more, the new *denarius* had declined to nearly 40 grs. by the time of Constantine, under whom its name was changed to *centenionalis*, so called because 100 pieces=1℔ of silver, and a new 70 grs. piece was instituted, having the title of *milliarensis*, from 1000 pieces being equal in value to one pound of gold. The copper *follis* remained of half an oz. in weight, but 24 now went to the *milliarensis :* Numerous fractional parts of the latter also were made : the ημισυ φολεος, or $\frac{1}{2}$; τεταρτον, or $\frac{1}{4}$; οβολον, or $\frac{1}{10}$; ασαριον, or $\frac{1}{20}$, (now of only 20 grains,) and the νουμιον, or $\frac{1}{40}$; from this last coin, the marks upon the copper pieces of the lower empire are supposed to be derived; thus the Greek numeral M. on a copper piece weighing ½ an ounce, shews it to be a *follis* or 40 νουμια : K stands for 20, I for 10, of the same unit, &c.

In describing the silver coin, I have unavoidably introduced as much notice of the copper coinage as is requisite for the purpose of recognizing, or naming, all that will come under review in the following catalogue. The *as.* was the *pysa*—the penny piece—of the Romans from first to last, merely declining in weight from one pound in the time of Servius Tullius, to half an ounce in that of Augustus, and to 20 grains in that of Constantine the Great.

The money of account was distinct from the coin, being estimated in *sestertii* and *sestertia;* the *sestertium* (*pondus*), or 2½ *centum denariorum* being equal to 100 *Sestertii*, or about £8 6 8 English money; but with this we have nothing to do at present, and it is high time to turn to the coins before us.

Gold Coins.

In the ASIATIC RESEARCHES, vol. III. is a notice of the discovery of a number of Roman coins, chiefly of gold, of the second century, by a peasant, in digging the remains of what appeared to be an old Hindú temple near Nelore, 100 miles west of Madras, in the year 1787. Many were melted up as old gold, but 30 were recovered by *Nawab Amir-ul Amra*, who allowed the Governor of Madras, Mr. A. Davidson, to make a selection of two from the number for himself. He chose an *Adrian* and a *Faustina*, of which drawings were sent to the Asiatic Society. "Some of the *Trajans* were in good preservation, and many of the coins could never have been in circulation, they were so fresh and beautiful." This printed record is all that now remains in our archives of the interesting discovery:—the coins were probably brought to India by the Christian or Jewish refugees, who migrated to Mysore in the third and fourth centuries of our æra.

Pl. VII. *fig.* 1, } DN ARCADIVS PF AVG. *Dominus noster Arcadius pius filius Augustus.* Front face of the
A. D. 392. } prince, juvenile, in helmet and armour: an equestrian device on the shield.

Reverse. NOVA SPES REIPVBLICÆ Θ. below, CONOB.

Type. Victory seated, half naked, inscribing five crosses or XX XXX on a shield; a star on the left.

Weight 70 grs. troy:—The *solidus* of Constantine and his successors.—*As. Soc.*

This coin does not agree with any engraved in Bandurius or in Vaillant: it is however described by the former vol. ii. 529, with the difference of β in lieu of Θ, marking it of the second instead of the ninth year of his reign. The signification of the five X's does not appear to be understood, nor to whom *nova spes* refers, unless it was struck by the emperor Theodosius, on consecrating his son as Augustus. Bandurius entitles his similar coin *rarissimus.*

Fig. 2. } DN ARCADIVS PF AVG. Head of a youthful prince
A. D. 389. } looking to the left, with chaplet and toga.
Reverse. CONCORDIA AVGGG *s* (*an.* 8.)
Type. Helmeted female sitting on the prow of a ship, with spear in the right hand and a shield in the left, inscribed V O T V MVLX
Weight 65 grs. *Solidus.*—

This coin is depicted in Bandurius, page 527, *an.* H. It is, as all those with mention of votes, esteemed a very rare coin. It was given to me by Mr. Walter Ewer.

Silver Coins.

Fig. 3. } ROMA Ӿ on the exergue, or below the image of a
B. C. 200. } head armed with a winged helmet; either of Pallas or of Dea Roma.
Reverse. On the exergue SGERII, an equestrian figure on the right, and traces of a pedestrian on the left. There is a hole through the coin: it is in the possession of Col. Wilson.

The Ӿ probably denotes that this coin is the ancient *denarius*, which bore the impress X, (meaning 10 ases.) Pinkerton supposes that the value of the *denarius* was changed to 16 ases about 175 years before Christ; if so, this coin must be of very ancient fabrication, and it may be the more valuable, because none of precisely similar appearance is to be met with in the books to which reference has been made.

In the earliest times of the Roman coinage, the silver *denarius*, *quinarius*, and *sestertius*, all bore alike on the obverse the winged head of Pallas with the simple word ROMA, and the marks of value X, V, or HS respectively: and on the reverse, the mounted *Dioscuri*, or Castor and Pollux. Perhaps the present indistinct device may be of this nature, although from the epigraph it seems rather to point to some victory over the Germans. Perhaps the latter, which was indistinct, may have been SPQR. I am not able now to refer to the coin to decide this point.

Fig. 4. } CÆSAR AVGVSTVS........ATRIÆ. The first part
B. C. 1. } of this inscription is barely visible, and a part of the coin is cut off. Well defined head of the emperor.
Reverse. ....L CÆSARES. The rest illegible.
Type. Two figures standing and supporting two shields, the one partly covering the other.

ROMAN COINS Pl I.

GOLD

SILVER

COPPER

J Prinsep del. et sculps

This coin is doubtless the same as one described by Mediobarbus (page 39) of the 14th year of Augustus. The full inscription would then be CÆSAR AVGVSTVS DIVI F PATER PATRIÆ. And on the reverse, below, or on the *exergue*, as it is called, "C et L CÆSARES (*Caius et Lucius*) AUGUSTI FILII COS DESIGNATI PRINCIPES JUVENTUTIS. *Type.* Duæ figuræ togatæ assistentes clypeis cum hastis puris."

Caius and Lucius, the sons of his daughter Julia, and Agrippa, were adopted by Augustus as his successors upon the birth of the latter (16 B. C.) ; were designated *principes juventutis* at twelve and thirteen years of age, and "*Consules post quinquennium,*" Caius in B. C. 5, Lucius in B. C. 1. The present coin probably belongs to the latter year. The two princes died within four years after.

Fig. 5. A. D. 6. } TI CÆSAR DIVI AVG F AVGVSTVS. Head of the emperor Tiberius in good preservation.

Reverse. PONTIF MAXIM.

Type. A figure seated, (either the emperor, as officiating priest, or *Dea Clementia* ;) a spear in the right hand, an olive branch in the left.

Weight 60 grs. The silver *denarius.—As. Soc.*

Tiberius Cæsar, the adopted son and successor of Augustus, was made *Pontifex Maximus* in the seventh year of his reign. Mediobarbus mentions but one silver coin corresponding with this in device ; it must therefore be scarce and valuable.

Fig. 6. A. D. 70. } ..ASIANVS AVG COS II. V. P. Head, a good deal worn.

Reverse. SALVS AVG.

Type. A female figure standing before an altar, offering food to a serpent.

There is no coin of VESPASIAN in Mediobarbus exactly resembling this in type, and bearing the same date, but the device is common enough.

Fig. 7. A. D. 236. } ..MAXIMVS CÆSAR GER. Head of the emperor distinct.

Reverse. Illegible, probably *Princeps Juventutis.*

Type. An armed youth, standing.

C. Jul. Ver. Maximus was nominated *Cæsar* and *Princeps Juventutis* at the age of 18, by his father Maximus : he took the title of *Germanicus* with his father during their campaign in Germany, on the following year, when they were both killed in their tents.

Copper and Brass Coins.

Fig. 1. A. D. 14. } ...AVGVST...Well executed head of the emperor.

Reverse. S C [*senatus consultu*] enclosed in a wreath of laurel.

A brass coin, weighing 118 grains, or ¼ oz. ; in value 1 as. None of the coins of Augustus enumerated in Mediobarbus precisely agree with this ; those struck by

Tiberius, in honor of his apeotheosis, resemble it most; but the wreath in them was of oak, the inscription DIVVS AVGVSTVS.

B. C. 40, } CÆSAR AVGVST PONT MAX TRIBVNIC POT.
A. D. 19. } Head of Augustus without the laurel.
Reverse. S.C. encircled by III. VIR·A·A·A·F·F·P. LVRIVS AGRIPPA.

This is one of the coins denominated *nummi monetales*, bearing the name of the mint-master of the time, *Lurius Agrippa.* There were three prefects or moneyers in the Roman *ærarium*, one for each of the precious metals; as explained by the inscription *Triviri Aeris Argenti Aurique Flandi Feriundi* curam habuere. They were chosen from the members of the senate, and the names of nearly fifty mint-masters of those ancient times have been faithfully preserved on the coins of Augustus alone. A similar coin is depicted in the *Edin. Encyc. Numism.* Pl. cccxx.

Fig. 2. } ....ESAR·DIVI·AVG·F·AVGVS...Head of Tiberius
A. D. 15. } Cæsar facing the left.
Reverse. ..BVN POTEST XVII. PONTIF MA...In area S.C.
Type. A female figure seated, holding in one hand a cup, and in the other the *hasta pura*, or blunt spear.
Weight 165 grs. Copper; much worn.

This is known to belong to Tiberius from bearing his title of *Divi Augusti filius.* It agrees with a coin described in Mediobarbus, 64.

A. D. 84.—Legend illegible, head recognizable as that of Vespasian.
Reverse. S C, below ROMA.
Type. A square frame,—the gate of a temple?

Fig. 4. } MP TRAIANO AVG. GER. DAC PM. Head of the
A. D. 107. } emperor.
Reverse. Optimo priNCIPI. Most of the inscription effaced.
Type. Emperor standing with sceptre in left hand; right hand outstretched to a suppliant figure at his feet. In area S C.
Weight 368 grains. Brass *sestertius*—H. H. Wilson. *Med.* 157.

Trajan assumed the title of Dacius upon the reduction of Dacia, and its formation into a Roman province, A. D. 106. The type probably refers to the reduction of an insurrection on the following year.

Fig. 5. } HADRIANVS AVG COS III...Well executed
A. D. 137. } head.
Type. Figure of Victory holding a branch; no legend. S C on the area.
Weight 465 grains. Brass *sestertius.*

Mediobarbus explains, that coins of the emperor Hadrian, bearing only S C on the reverse, belong to the year A.V.C. 890, or A. D. 137.

Fig. 6. } haDRIANVS...Head similar to the last.
A. D. 137. }

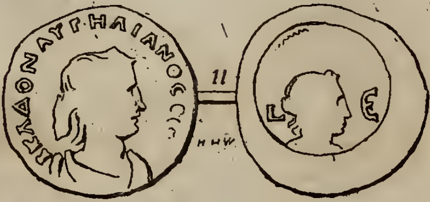
ROMAN COINS Pl. II.

COPPER


8


9


10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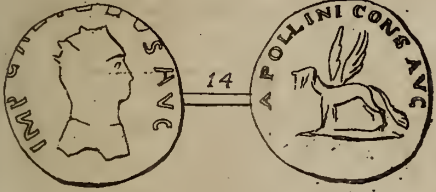
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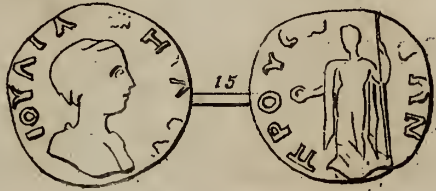
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EGYPTIAN


16


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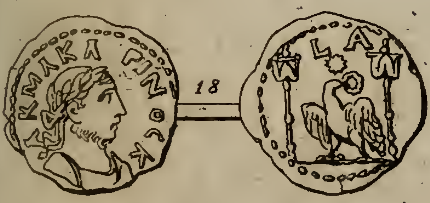
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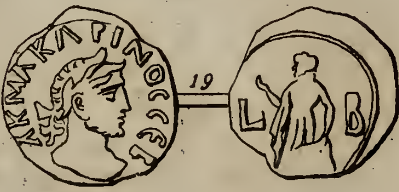
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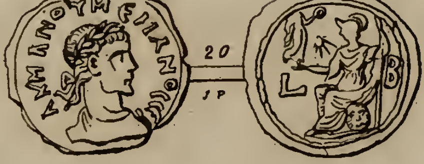
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J Prinsep del et sculps.

Type. Female standing, and holding a branch. S C in area.
Weight 174 grains. A copper *assarium.*

Pl. II. *fig.* 15. } ΙΟΥΛΙΑ ϲΗβΑϲτη. Head of Julia Augusta, the
A. D. 200. } wife of Septimius Severus.
Reverse. ΠΡΟΥϹ αϵ ΩΝ.
Type. A standing female figure, with spear and wreath.

Patinus (page 233) says, that of many cities of the name of Prusæ, the most probable one to strike a coin in honor of Julia was in Bithynia, near Mount Olympus: the coin is of brass and much worn.

A. D. 180.—A coin of one of the Antonines, by the appearance of the head, but the legend effaced. On the reverse, a trophy, S C. Copper.

Fig. 8. } IMP ALEXANDER PIVS AVG. Wreathed head
A. D. 226. } of emperor.
Reverse. PROVIDENTIA AVG; in area S C. Female figure holding an ear of corn over a pannier; l. h. a cornucopia.
Weight 250 grains. Brass *sestertius. Med.* 321.

Alexander was called Pius in this year, on the opening of the Alexandrian baths.

Fig. 10, } IMP ALEXANDER PIVS AVG. Head in good
A. D. 231. } preservation.
Reverse. PM TR PX COS III SP, . Half naked figure of the Sun, with r. h. elated: in the left a whip or *flagrum.*

This coin is described in *Med.* 324, and was struck after a victory in Persia.

Fig. 9. }
A. D. 243. } . . GORDIANVS PIUS AVG. Much worn.
Reverse. A triumphant car drawn by four horses.
Weight 130 grs. Copper *assarium. Med.* 340.

Fig. 14. } IMP GALLIENUS AVG. Only the lower part of
A. D. 263. } the letters visible.
Reverse. APOLLINI CONS. AVG. A griffin (*monstrum alatum, Med.*) Described also in Bandurius I. 158, as a silver coin.
Weight 60 grs. Copper, or billion, [plated copper.] *denarius æris,* or *sestertius.*

This is the first of that peculiar system of coinage of silvered copper, the value of which has been so much contested by antiquaries; they are easily recognised by the rounding of the edges of the letters, probably done to prevent the silver covering being cut by the die. Gallienus' coins of this year are peculiar for land and sea monsters, supposed to refer to the Decennalia, then celebrated with great magnificence.

Fig. 13. A. D. ? } ..CARCINIA T..KUA. ? Face imperfect and illegible legend. I...A. Female figure standing.

Fig. 3. A. D. 268. } IMP CLAVDIVS AVG. Emperor's head in radiated crown.

Reverse. VIRTVS AVG.

Type. A soldier standing on the prow of a vessel, holding a branch in the right hand; in the left, a spear.

Weight 55 grains. Copper, *denarius æris.*

Ditto. Another coin similar to the last, having on the reverse ÆQVITAS, with the figure of Justice holding a balance.

These coins were inserted in Plate I. under the impression that they belonged to Tiberius Claudius. It requires however but little knowledge of medals to perceive that they belong to Claudius Gothicus, who succeeded Gallienus.

Fig. 7. A. D. 268. } ..ICTORINUS PP AVG. Head with radiated crown.

Reverse. Illegible. Figure of Sol with r. h. outstretched.

Weight 35 grs. Copper.

This is a coin of *M. Aurel. Victorinus,* who was associated in the empire with *Posthumus Senior;* he killed the latter along with two other rivals, and reigned himself for six years.

Fig. 12. A. D. 270. } IMP C TET.....PF AVG. Radiated head.

Reverse. SALUS AVG. Female offering a cake to a serpent near an altar.

A coin of *C. Pesuvius Tetricus,* Præses of Gaul, under Aurelian, and nominated colleague in Italy with him.

Fig. 11. A. D. 275. } ΑΚΛ ΔΟΜ ΑΥΡΗΛΙΑΝΟC ....emperor's head.

Reverse. L E (*an.* 5) with the head probably of Jupiter or Apollo: but belonging to a die of inferior size.

An Egyptian coin of *Imp. Cæs. Luc. Domit. Aurelianus Aug.* described in *Bandurius* I. 387.

The coins of the Roman Emperors bearing Greek inscriptions are of two kinds: those of the Grecian cities, provinces, and colonies had generally the name or insignia of the town where they were fabricated on the reverse, without any date: those coined in Egypt (at Alexandria), had invariably the date or year of the reign, in alphabetic numerals, on the reverse, with various devices, but no legend or epigraph. Some of them have a letter Α or Δ below the type, supposed to designate the town or mint. It is necessary to bear in mind, that the numerals 1 2 3 4 5 6 7 8 9 10 11 20 30 40 50, &c. were represented in Greek by Α Β Γ Δ Ε Ϛ Ζ Η Θ Ι ΙΑ Κ Λ Μ Ν. The ancient form of the Greek lambda L is supposed to stand for λυκαβαντος, *anno* (*currente*): sometimes, and especially in coins of the *third* year, the word ΕΤΟΥϹ (*anno*) is used in lieu of it, and the ninth year seems to be invariably expressed by ΕΝΑΤΟΥ L (*nono anno*) instead of L Θ. I do not find any explanation of this circumstance, which is probably attributable to some superstition in Egypt respecting the mystical numbers 3 and 9.

Fig. 16. } ΑΚΜ ΑΥΡ ΠΡΟΒΟϹ ϹΕΒ *Imp. Cæs. Mar. Aur. Pro-*
A. D. 277. } *bus Augustus*, Head of the emperor rudely executed.
Reverse. LB, *an.* 2. An eagle bearing a laurel wreath.

Fig. 17. } Same inscription, and device; L Η, *anno* 8.
A. D. 283.

Probus was made Imperator of the East by the Emperor *Tacitus*, and recovered a part of Egypt and Persia which had revolted. The weight of these copper coins is 120 grains, or ¼ oz. They are therefore the ασσαριον or οβολος of the eastern empire.

Fig. 18. } Α Κ Μ ΑΚΑΡΙΝΟϹ Κ. *Imp. Cæs. Mar. Aur. Cari-*
A. D. 282. } *nus Cæs.*
Reverse... L Α, *anno* 1. An eagle holding a wreath between two military standards.

Fig. 19. } Same image and superscription of the Emp. Carinus.
A. D. 283.
Reverse... L Β, *anno* 2. Female holding in the right hand a flower; in the left her robe. *Band.* 538.

This is a brass coin; it was dug up in the neighbourhood of Mirzapoor.

Fig. 20. } Α Κ Μ Α ΝΟΥΜΕΡΙΑΝΟϹ ϹΕΒ *Imp. Cæs. Mar. Aur.*
A. D. 284. } *Numerianus Aug.*
Reverse... L Β, *anno* 2. An armed and helmeted female sitting on a shield: r. h. an image of victory; l. h. a spear.
Weight 140 grs. Copper.

Numerianus, younger brother of *Carinus*, accompanied his father *Carus* in the Persian war: on his death, he succeeded to the empire, and reigned for two years.

Pl. III. *fig.* 24. } ΑΚΓΟΥΑ ΔΙΟΚΛΗ.....*Imp. Cæs. Caius. Val.*
A. D. 285. } *Diocletianus Aug.*
L Β. *anno* 2. Female bearing a branch and a cornucopia; a star on the right.

A. D. 285.—Two similar coins of the same year, with Justice holding a balance.

Fig. 25. } ....ΔΙΟΚΛΠΤΙΑΝΟϹ ϹΕΒαστος.
A. D. 286. } L Γ, *anno* 3.: Female with wreath and cornucopia,
Fig. 26. } L Δ, *anno* 4. Female helmeted: r. h. a victory; l. h.
A. D. 287. } cornucopia. A shield on the ground. *Band.* II. 39.
Fig. 27.— L Δ, *anno* 4. Legend illegible; r. h. an eagle?

Fig. 28. A. D. 291. L Z, *anno* 7. Jupiter naked with a spear in the left hand, and thunder in the right; at his feet an eagle.

Fig. 29. A. D. 292. L H, *anno* 8. Jupiter seated with the same accompaniments; beneath A. *Band.* 39.

Fig. 30.—L H, *anno* 8. Same type as fig. 28. *Band* 39.

Fig. 31. A. D. 293. L ENATOY, *anno* 9. Female figure in tunic, holding a flower in the right hand; gathering her garment with the left: below Λ. *Band.* 39.

This coin was procured at Kanouj, by Mr. E. V. Irwin, C. S. and was presented to the Society by Captain Sanders, Engineers, 1832.

Fig. 32. A. D. 294. L I, *anno* 10. The eagle bearing a wreath.

Weight 120 grs. Copper. This device is not in Bandurius.

Fig. 34. A. D. 284. AKMA OVA MAΞIMIANOC CEB *Imp. Cæs. Mar. Aur. Maximianus Aug.*

L A, *anno* 1. Female holding an olive branch or flower, and a cornucopia. *Band.* 80.

Fig. 35.— L A, same device. Two cornucopiæ; star on the right.

Fig. 36. A. D. 285. L B, *anno* 2. Similar device; star on the left.

Fig. 37. A. D. 290. L S, *anno* 6. A winged female holding a flower wreath in the right hand, and a palm branch in the left.

L S, another in every respect similar.

L S, another belonging to J. P. *Band.* 81.

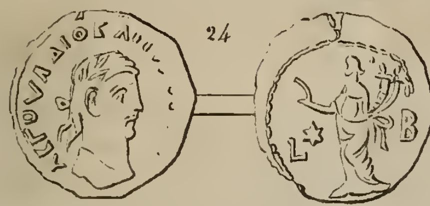
The above series of coins embraces ten years of Diocletian's, and six of his colleague Maximian's, reign. These two emperors called themselves the Jupiter and Hercules of the state, and frequently impressed the effigies of those gods upon their coins.

The fabrication of money, bearing Greek inscriptions in Egypt, ceased altogether in the twelfth year of the reign of Diocletian, A. D. 296, when Egypt was united to the rest of the empire by the defeat of the tyrant Achillæus; after which period, its coin bore the usual Latin legends. Our series reaches within two years of this date.

Pl. III. *Fig.* 33. This coin was procured at the ruins of *Manikyala*, in the *Panjáb*, by Lieut. Burnes and Dr. Gerard, in 1832.

From the L S, and the appearance of the device, I supposed it to be a Roman coin of Egyptian fabrication of the second or third century: but on a closer examination, I am inclined to think, that it is a Bactrian coin, similar to those which are described by Mr. Wilson, in his paper on Indian coins in the As. Res. XVII. Pl. II. fig. 25. Their device is a figure on horseback, with arm outstretched; the L S, forms part of the head and ear of the horse, and the arch of his neck are faintly visible on the coin, although not represented in the plate, for want of shading. The *bandelettes* of the head on the obverse also agree better with the coins of the Bactrian dynasty, as well as the size and weight of the coin.

ROMAN COINS Pl. III.

24


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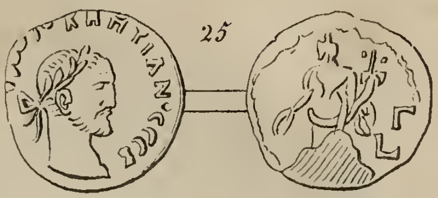

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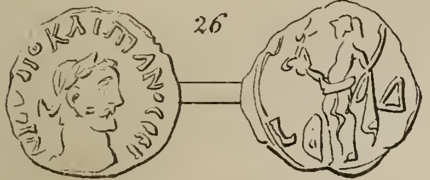

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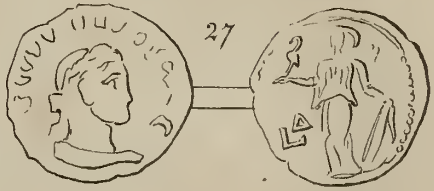

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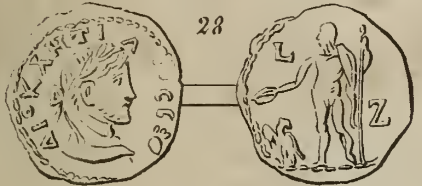

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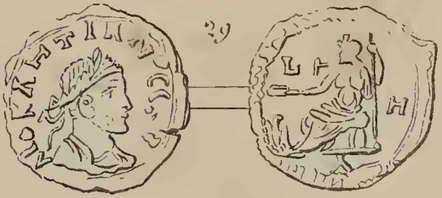

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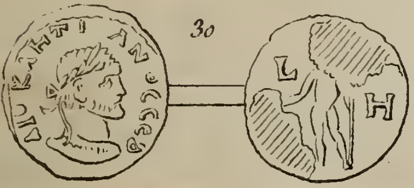

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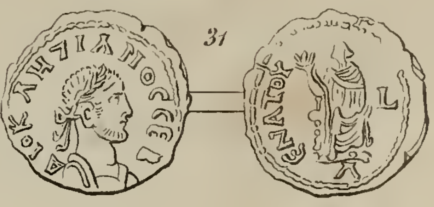

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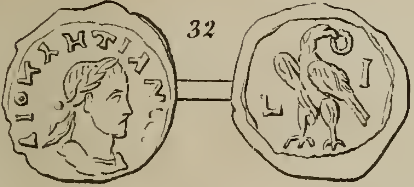

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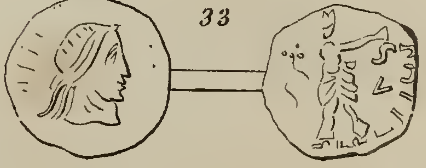

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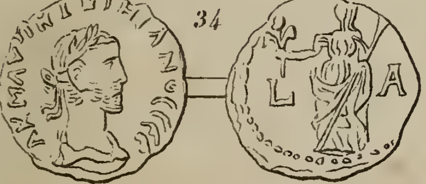

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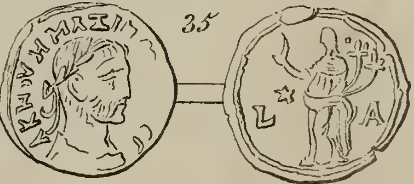

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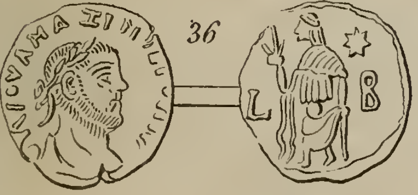

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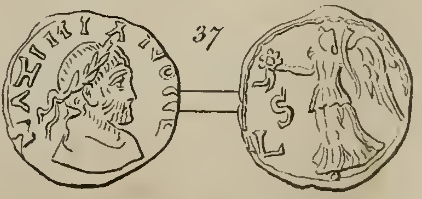

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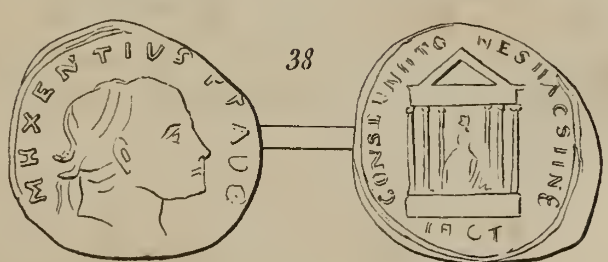

J. Prinsep del.

J. B. Tassin lith.

Fig. 38.
A. D. 309. MAXENTIVS PF AUG. Head much worn.
Reverse. CONSERVATORES VRBIS SVAE, beneath IACT.
Type. A statue of *Roma,* seated in a temple of 6 columns.
Weight 105 grs.—the *half follis* described in *Band.* II. 154.

Fig. 39.
A. D. 307, 312 CONSTANTINUS MAX AUG. Head with a wreath of jewels.
...... EXERCITUS *(gloria exercitus).*
Type. Two military standards with armed supporters; some letters below illegible.

Fig. 40.
A. D. 302. CONSTANTINUS AUG. Head of the Emperor.
Reverse. PROVIDENTIÆ AUGG. Below SMANTE.
Type. A gate or arch *(castrorum porta,* Band. 278) surmounted by two globes, and a star in the centre.

Ditto.—Another coin of similar inscription and type. Head laurelled.

Ditto.—CONSTANTINVS MAX AUG.
GLORIÆ X EXERCITVS. Military standard. SMANS.

This coin is reckoned rare by Bandurius, as it bears the Monogram of Christ.

Fig. 41.
A. D. 335. CONSTANTINVS AVG. Head with plain band.
Reverse. DN CONSTANTINI MAX AUG. Below SMNA. *Med.* 468.
Type. A wreath enclosing VOT XXX.
Weight 60 grs.

This coin must be a *denarius æris,* coined previous to the introduction of the large copper follis of 240 grs..

Fig. 42.
A. D. 330. CONSTANTINOPOLIS. A juvenile head (of Constantine junior ?)
Reverse. Legend wanting: Victory with outspread wings sitting on the prow of a ship, with spear and shield: below SMALR.
Weight 40 grs.

This piece differs in the epigraph from any enumerated in *Bandurius*: it is not certain whether *Constantine* himself struck any coins in honor of his new capital, or whether they originated with his successors. A. D. 330 is the date of the dedication of the new city.

A. D. 330.—VRBS ROMA. Juvenile head helmeted.
Reverse. Romulus and Remus suckled by a wolf: two stars above; below CONSΘ

Coins of the imperial city seem to have been struck at the same period with those of its rival Constantinople, to prevent jealousy between the two.

Fig. 43. A. D. 330. } ...VL CONSTANTIVS NOB C. *Flavius Julius Constantius... Nobilis Cæsar.* Head with plain band.

Reverse. GLORIÆ EXERCITVS. Two standards and martial supporters: below..CP..

Weight 50 grs.

Constantius was made Cæsar by his father Constantine the Great, in 323.

A. D. 330.—FL IVL CONSTANT NOB C

GLORIÆ EXERCITVS. Below, CMB. Standards. There are two or three coins of similar device.

It is difficult to say, whether the last two are coins of *Constantius*, or of his brother *Constans:* both having the same names FL. IVL. The coins of Constantine and his family are extremely numerous, and have nothing to mark their precise dates. Bandurius arranges them alphabetically, according to the legends on the reverse.

A. D. 337.—DN CONSTANTIVS PF AVG. Head with ornamental wreath.

Reverse. FEL TEMP REPAR....Below illegible.

Type. A captive thrown from his horse, is pierced by the spear of a Roman soldier.

The device of this small coin is very neatly executed.

Fig 44. A. D. 364. } DN VALENS P F AVG. Head with plain band.

Reverse. SECVRITAS REIPVBLICÆ indistinct. Victory stepping forward: on the face SP; below ASISCL.

This coin is described by Mediobarbus, 506. Valens was put in charge of the western empire by his brother Valentinianus in the year 364.

Fig. 45. A. D. 393. } ....DOSIVS PP..Head with star on the right.

Reverse. GLORIA ROMANORVM. Three figures standing, armed with spears. *Med.* 519.

Mediobarbus supposes the three figures to be the Emperor *Theodosius*, with *Arcadius* and *Honorius*, his sons, imploring the divine aid on their expedition to Italy: the coin is rare; it was found at *Mahabalipúram*, along with several others, bearing the same device, but of a smaller size. They belonged to Col. Mackenzie's cabinet.

Weight 30 grs.; the οβολον.

Fig. 46. A. D. 379,395 } THEO....Head of the Emperor Theodosius much worn.

Reverse. Illegible. Victory crowning the Emperor.

Fig. 47. A. D. 403. } ......VS PF AVG. Head of Arcadius?

VIRTVS.....The Prince receiving a crown of laurel from Victory.

ROMAN COINS Pl. IV.

Eastern Empire.

J Prinsep del

Fig. 49.
A. D. 394. } DN HONORI...*D. N. Honorius Aug.*

....ROMAN...*Gloriæ Romanorum.* Two figures armed, supporting a globe.

Weight 20 grs. the *νουμιον.*

This device, no doubt, represents the two brothers, but the type is not found in either of our authorities. A coin of *duæ figuræ,* is mentioned in Patin's catalogue of rare inferior coins.

Fig. 48.—A small coin referrible to the same period, but unintelligible. On the reverse four legs united, or a cross? From their weight these must be the *νουμια,* or smallest copper coins, whence the denominations of those which follow were derived, as explained in the introductory remarks.

Fig. 50.
A. D. 522. } ....INVS PF AVG Probably *D. N. Justinus Pius Felix Augustus.*

+
Reverse. *M* with a globe under the centre of the M. Copper
CON *follis,* of very inferior fabrication.

Weight 170 grains.

Fig. 51.
A. D. 585. } ....PF AVG. Front face apparently of *Mauricius,* with jewelled head-dress: holding in his left hand a globe and cross.

A
N M II The year is not very distinct; c under the M does
Reverse. N
O C II not occur in *Med.* 576, or *Band.* 666. The *follis.*

Weight 240 grains.

Fig. 52.
A. D. 970. } Head apparently of Christ, almost obliterated; inscription on the reverse, very rude and only partly legible...XRISTuS ... BAsIL ..

This is a coin of *Joannes Zimisces* (*Band.* 738), the full inscription being IηSuS XRISTuS bASILευS bASILEων.

Weight 140 grains.

Fig. 53.
A. D. 970. } Three-quarter front figure of Christ, with a glory round the head: much worn.

Reverse. An ornamental cross, with four globes in the quarters IC XC NI KA signifying *Ιησω Χριστω νικα,* which may be the origin of the Latin motto, *In hoc signo vinces.*

Weight 170 grs.

Joannes Zimisces, a monk who rose to the throne after the murder of his benefactor Nicephorus Foca, was the first who ventured with dissimulated piety to put the effigy of Christ upon his coin. They were thence called Σωτηρικοι. The modern Greeks erroneously ascribe them to Constantine the Great. It is a curious fact, that these, which are the most recent coins in the cabinet of the Asiatic Society, should be in the worst state of preservation.

Note.—Since writing the above, the Society has become possessed of 250 Roman coins, purchased from an Armenian; as they were not found on the continent of India itself, I do not feel called upon to include them in the present list, although they will be of great use in forming the germs of a future cabinet. Some of them are in high preservation; they comprise

2 of Augustus
2 Nero
1 Galba
6 Vespasianus
1 Titus
3 Domitianus
2 Nerva
2 Trajanus
6 Hadrianus
45 Antoninus Pius
16 Commodus Ant.
2 Maximinus
1 Septimius Severus
1 Sept. Geta
4 Alexander Pius
1 Gordianus
8 Philippus
6 Trajanus Decius
8 Gallienus
4 Claudius Gothicus
2 Aurelianus
8 Probus
32 Diocletianus
27 Maximianus
18 Constantinus
2 Constantinopolis
11 Constantius
2 Valens
2 of Greek Towns
1 Severa
1 Lucilla Augusta
4 Faustina
2 Mammæa

and 20 others, more or less illegible. Should any of them turn out to be new or rare, I shall take occasion to notice them hereafter.

III.—*Observations of the Transit of Mercury.* *By* James Prinsep, *Sec. Phys. Cl.*

On the 5th of May, the expected transit of Mercury over the sun's disc, a phenomenon which occurs twice in an interval of about 12 years, invited all lovers of astronomy to be prepared at their telescopes. Unfortunately, in Calcutta, the day proved cloudy just at the time when the ingress took place, and, as the sun set before the egress, little advantage could be taken of the event in correcting the longitude; much less in attempting to furnish data for the calculation of the parallax of the sun or of the planet. From half past four to a quarter past five p. m., there were intervals of sunshine sufficient to afford a transient view. Lieutenants Waugh and Rennie, Engineers, endeavoured with me to profit by these moments in taking the position of the planet on the sun's disc. We were permitted the use of a very fine 4-feet achromatic telescope, belonging to Lieut. Pemberton, of four inches aperture, mounted equatorially, and provided with a delicate wire micrometer. The power used was 60, and the darkened glass was varied to accommodate the light to the eye—the clouds were sometimes sufficient alone to act as a screen against the sun's rays.

For the time we were indebted to Mr. Gray, with whose astronomical clock our chronometer was compared before and after the observation; thus,

At 9 h. 10 m. A. M,				*m.*	*s.*
Chronometer slow of Ellicott's Clock,	—			15	46.2
Deduct error of Clock by Me. So. Time,	+			4	55.2
Chron. slow of Mean Time,				10	51.0
		m.	*s.*		
At 5 h. 45 m. P. M. Chron. slow,		15	50.0		
Clock fast, (daily rate 0.2 gaining),	+	4	55.2		
				10	54.8
Chron.'s loss in 8 h. 35 m.					3.8
Daily rate losing,					10.33

Hourly rate 0.43 s.

Correcting the times noted, therefore, the subjoined are the observations expressed in mean solar time. From the rapid motion of the sun, we found it quite impossible to measure the distance of Mercury from either the advancing or the following limb with the wire micrometer; the planet's distance, however, from the tangent of the sun's northern limb, or at right angles to his motion, was taken at three different times, during the series of observations. There is, however, more or less uncertainty in this mode of measurement, from the difficulty of bringing one of the wires of the micrometer to coincide with the sun's limb, as from the darkened eye-glass, the wire ceases to be visible as soon as it is off the disc; the divided object glass micrometer is in this respect preferable.

For the equatorial measurements, we had resort to the times of transit of the sun's two limbs and of the planet past the two wires of the micrometer; repeating the sights as frequently as the weather would permit, by moving the telescope a little in advance before each series of readings commenced. There was a small spot on the sun indistinctly defined towards the advancing limb, the transits of which were also noted: the time occupied by the planet's passage of a wire was about half a second, but as small reliance could be placed on the measurement of such a space, it has been preferred to insert the mean of the two readings, as the passage of his centre. His disc appeared as a clean circular spot, surrounded with a slightly enlightened ring; his diameter was as near as could be estimated, that of one of the micrometer wires.

The time occupied by the passage of the sun's disc across the wires decreased as the evening advanced, from the effect of the atmospheric refraction contracting his vertical diameter.

Transits of Mercury and of the limbs of the Sun, past the wires of an equatorial telescope in mean Solar Time, at Calcutta, Lat. 22° 36′ 21″ *Long.* 5*h.* 53*m.* 28*s.*

Number of the series.	Passage of ⊙'s advancing limb.	Passage of Spot on the sun.	Passage of ☿'s centre.	Passage of ⊙'s following limb.	Time of ⊙'s diameter passing the wires.	Interval from ☿ to ⊙'s second limb.
	H. M. S.	M. S.	M. S.	M. S.	M. S.	
1	4 30 44.3		31 59.5	32 57.6	2 13.3	0 58.1
2	33 54.4	34 10.3	35 09.0	36 07.8	2 13.4	2 58.8
3	46 40.8	46 57.2	47 51.3	48 54.2	2 13.4	1 02.9
	47 04.9	47 21 6	48 17.0	49 18.6	2 13.7	1 01.6
4	49 40.6	49 56.4	50 50.4	51 52.6	2 12.0	1 02.2
	50 05.3	50 20.6	51 15.2	52 17.6	2 12.3	1 02.4
5	52 36.5	52 52.5	53 45.5	54 48.3	2 11.8	1 02.8
	53 01.5	53 16.7	54 09.9	55 13.7	2 12.2	1 03.8
6	5 00 06.3	00 23.0	01 14.5	02 17.5	2 11.2	1 03.0
	00 33.7	00 49.3	01 40.5	02 45.6	2 11.9	1 05.1
7	03 38.0	03 54.3	04 44.7	05 50.3	2 12.3	1 05.6
	04 04.3	04 19 7	05 10.2	06 15.7	2 11.4	1 05.5
8	16 05.6		17 09.1	18 17.8	2 12.2	1 06.7
	16 33.8	16 59.4	17 36 6	18 45.8	2 12.0	1 09.2
Means	4 54 37.7		4 55 46.6	4 56 50.0	2 12 4	1 03.4
Time of ⊙'s passing meridian by Nautical Almanack,..					2 12.28	

Distance from Mercury's centre to the tangent of the northern limb of the sun, measured with a wire micrometer.

	Mean Solar Times.	Divisions of the Micrometer.	In space.
	h. m. s.		′ ″
At	4 40 00	509	5 55.4
	4 57 14	530	6 10.1
	5 07 24	568	6 36.6

The sun's horizontal diameter measured by the same micrometer, on the 7th May, 6 P. M. was 2727 divisions. By the Nautical Almanack for the same period, it was 1904.0 seconds, which makes the value of the divisions 1.432 per second.

There is too much discrepancy among the foregoing measurements to allow of their being individually useful; the utmost that can be expected from them is the determination of the position of Mercury on the sun's disc at one mean period. As I hope this will be undertaken by an astronomical friend, who will combine the results here published with his own observations at Madras, I shall leave the subject in his more able hands.

I have been favored with the following observations of the transit at other places:

At the Surveyor General's Office, Calcutta.—The mean time of Mercury's outer contact was observed at 2 h. 53 m. 24. 2 s., but the sight was not esteemed good, owing to the state of the weather.

At Chuprah.—Latitude 25° 43′ N. Longitude 5h 39m. E. Mr. Walter Ewer observed the internal ingress of Mercury at 2 h. 42 m. 18 s. mean time. "The telescope was a Troughton's three and a half feet achromatic, aperture two and three quarter inch, and power about 60. The time was taken by equal altitudes of the sun on the preceding day. The nearest approach was at about 6 h. 8 m., taken with a wire micrometer by Troughton; but the sun was so low, the refraction so great, and the motion of Mercury so slow, that this can only be considered an approximation. The precise latitude and longitude of the place are not yet determined."

At Barelly.—Latitude 28° 20′ 7″ N. Longitude, 5 h. 17 m. 20 s. E. The internal ingress was observed by Mr. H. S. Boulderson, at 2 h. 20 m. 58s. mean time Barelly. "This observation may be doubtful to two or three seconds, as the planet had just entered the disc of the sun when first seen."

IV.—*On the Habits of the Paludinæ.* By Lieut. T. Hutton, 37th N. I.

If it be not against existing rules and regulations, and the matter here furnished be deemed at all worthy a place in your interesting Journal, I propose doing myself the pleasure of sending you occasionally a few extracts from my "Notes on Natural History," accompanied by specimens of any thing that I may consider worthy of your acceptance.

On the 21st and 22nd of June, after a few heavy showers of rain, I ventured forth from my bungalow to a grove of mangoe trees hard by, in search of land-shells, or in fact any thing that might fall in my way; at the foot of many of the trees, the water was lying in pools, and wherever this was the case, I found a great many small shells, with the living animals in them, evidently just forcing a passage through the moistened earth, and crawling over its surface beneath the water in search of food. I gathered up several of them, and took them home, where they were placed in a tumbler for future examination.

In about an hour afterwards I returned to the same spot, in search of more, but by this time the water had all dried up, and with it had disappeared the shells also. From that time up to the 1st July, we had no more rain, and the weather became in consequence very sultry and oppressive; the heat once more put to flight the various insects, &c. which were just preparing to sally forth, and although I was a daily visitor at the mangoe grove, I made no addition to my museum.

On the 1st, 2nd, and 3rd days of July, the rain descended in torrents, so much so, that the plain all round my bungalow, for some hundreds of yards, was a sheet of water for several hours after.

This state of things gave new vigor to my spirits, for I knew, that when the water should have sufficiently subsided to allow of my going out, a rich harvest awaited me: and I was not disappointed, for my usual haunt the clump of mangoe trees, alone, furnished me with a good supply, not only of the above-mentioned shells, but also with two fine specimens of the wood scorpion and a fresh-water crab.

With regard to the shells, I perceive that in the 9th No. of the Gleanings in Science, Mr. Benson has made some observations on a small species of *Paludina*, found by him in localities somewhat similar to those observed by me; but as that gentleman seems uncertain of their abode and habits during the hot season, I shall here mention a few observations which I made on finding shells in the situation above described. At the roots of several trees, the water was lying in puddles, and thinking that this might have been occasioned by the droppings from the tree, I stooped down to see if there were any insects or land snails washed down with it, and I there saw, for the first time, the little *Paludinæ* crawling on the dead leaves, &c. beneath the surface of the water; several of these I took home and placed in a tumbler without any water, where they remained forgotten for a week or more, but on looking at them at the end of that time, they were all firmly closed and shut in by their little calcareous *opercula;* on putting them into water, however, they began to open and crawl about in apparently good health.

On an after-occasion I had the good fortune to observe them pushing aside the moistened earth, and coming forth from their retreats; but on the disappearance of the pools of water, not one of them was to be seen above ground; wishing therefore to ascertain what had become of them, I turned up the earth at the base of several trees, and invariably found the shells buried from an inch to two inches below the surface.

From this circumstance, I am strongly inclined to think, that during the prevalence of the hot-weather they remain beneath the surface of the earth in a state of torpor, at a sufficient depth to protect them from too great a degree of heat, and the immediate action of the sun upon them, until the refreshing moisture of the rains once more enables and induces them to come forth for the purpose of performing that part, in the great chain of animated nature, for which an all-wise Creator destined them.

Of these shells I have found two species, both in the same situations, and both having calcareous *opercula.*

The largest of the two appears to be identical with that found by Mr. Benson in a ditch at Banda, and the animals of both are similar to those of the other *Paludinæ.*

No. 1. Animal with the head proboscidiform; two *tentacula* long, tapering, and retractile; eyes at the exterior base of the *tentacula;* color of the animal pale, with a dirty tinge of white; head and *tentacula* mottled with greyish.

Shell. About 4½ lines long, with a pale olive-brown *epidermis;* whorls (apparently) 4; the spire very much eroded; aperture angular above *and below;* deeply umbilicated; *operculum* calcareous; shell conoid; whorls rounded.

No. 2. Animals similar to the foregoing; colour pale throughout, but darkest on the head.

Shell. About 4 lines long, with an olive-brown *epidermis:* whorls 4; spire eroded; aperture sub-ovate, angular above, rounded below; no *umbilicus; operculum* calcareous, and at the very edge of the shell, and incapable of being drawn within the aperture; shell conoid; whorls rounded.

In Lamarck's generic description of *Paludina,* he merely says, when speaking of the aperture, "*angular at the summit.*" If by this we are to understand, that it is *only* angular at *the summit,* and *not below,* then my species No. 1 is no longer a *Paludina,* being angular *both above* and *below;* it therefore remains to determine to what genus it is referrible, or whether it may not constitute a new one.

At all events, I am inclined to think, it cannot be classed with the *Paludinæ,* as all the shells of that genus in my possession (and I have six or seven species) are angular at the summit alone, agreeing with the generic description.

The circumstance of these shells burying themselves beneath the surface of the earth is by no means peculiar to them ; both the *Ampullariæ*, *Planorbes*, and *Paludinæ*, being found in similar situations during the heats of the dry season, as I should suppose Mr. Benson must have observed;—of this I have abundant proof before me in a hollow, which being now full of water, forms a tolerably large jhíl, in which all these species occur plentifully ; but a fortnight or three weeks ago this same hollow was as hard and dry as the walls of my bungalow, and yet by digging a very little way below the surface, I found both *Ampullariæ* and *Paludinæ**, which on being left in a tub of water for about a quarter of an hour, began to crawl about in great vigor.—At the bottom of the tub I placed a quantity of mud, about nine inches or a foot deep, and when after some days, the water by not being renewed, had all evaporated, the shells of both genera had disappeared, and were buried in the mud at the bottom. I allowed them to remain thus for a few days, until the mud became dry, and I could not disengage them from it, without digging them out, whem I again furnished them with water, which by moistening the earth enabled them to force a passage through it.

The ova of *Ampullariæ* occur very abundantly at this season, in the small jhíl near my house, being deposited in beautiful clusters among the long grass and weeds just above the water mark ; in some instances, I saw the animals in the act of depositing them. At first they are rather soft, and contain a gelatinous transparent substance, like the white of an egg, but thicker; in a few hours, they become brittle and covered with a calcareous shell, of a pure white. When fresh and moist, they are very heavy, but become remarkably light on drying. In shape they are sometimes round, sometimes oval, and resemble small caraway comfits stuck together in bunches.

If my present communication be deemed acceptable, I shall have pleasure in continuing from time to time to furnish you with a few lucubrations on similar subjects.

Mirzapore, 23rd July, 1832.

Note. We shall always be happy to receive Lieut. Hutton's communications, which are those of a zealous amateur in a field hitherto but little explored.

The doubt expressed by the author as to the first of his species may perhaps reasonably be extended to both, if the structure of the *operculum* be allowed to indicate the structure of the animal; and neither the one nor the other of these *Molluscæ* would belong to the genus *Paludina.*

---

* *Paludinæ* with corneous *operculum,* shell thin and pale-greenish ; animal with the head and *tentacula* spotted, orange and black.

In this interesting paper, both species are described as having a *calcareous operculum*, but the under-mentioned authorities describe the *operculum* of *Paludina* as *horny*.

> " Un opercule orbiculaire et *corné*"
> " Operculum orbiculare *corneum*"

are the expressions of De la Marck, and which would have been noticed by Dubois if incorrect. Dubois however contents himself by translating them "the operculum *horny* and orbicular." Mr. Guilding, in his notices of the Zoology of the Caribæan Islands, when speaking of the " *Paludina Anetorum*," says, " operculum *corneum* in dorso pedis." And some species found in Bengal have none other than a horny *operculum.*

Again;—the author describes his first shell as "*deeply umbilicated*," and the second, with "*no umbilicus.*" On this part of the subject Mr. Guilding represents the shell of the genus *Paludina* as " *sub-umbilicata*," a term well expressive of the rudimental *umbilicus* formed by a slight reflection of the columellar lip towards the body of the shell; De la Marck affords negative evidence by making no mention of any kind of *umbilicus;* and in this country it occurs but in the slight degree mentioned above. All concur in the rounding of the lower part of the aperture.

Upon the whole, therefore, these species do not appear entirely to agree with the characters of any known genera; but this is a point of too much importance to be determined in the absence of an exceedingly minute description, both of the animal and the shell, particularly of the anatomy of the former.

V.—*Proceedings of the Asiatic Society.*

Wednesday, 5th September, 1832.

The Rev. Dr. W. CAREY, senior member, in the chair.

Read the Proceedings of the last Meeting, and proceeded to the ballot, when SIR EDWARD RYAN was elected President of the Society; and

Mr. J. CALDER, Vice-President, in his room.

Dr. Langstaff, proposed at the last meeting, was elected a member.

Correspondence.

The Secretary communicated to the meeting an application from the executors of the will of the late Mr. Bruce, for the Society to forego their claim to any further share in the property of the testator in favor of his brother and sister.—*Resolved,* that the determination of the Society be suspended, until they are apprized of the amount of the residuary share to which they are entitled by the will.

The Secretary communicated to the meeting a letter from the Baron de Ferussac, with reports, prospectus, and proceedings of the Societé Anonyme of Paris, and proposing to the friends of Literature and Science in India to subscribe for six shares in this Society.—*Resolved,* that the letter and documents accompanying be referred to the Committee of Papers for their report at the next meeting of the Society.

The number of literary and scientific journals issued to the world in the nineteenth century, amounts according to the prospectus of the Bulletin to upwards of fifteen hundred; learned Societies have multiplied in an equal ratio; so that it would occupy a man's life to peruse the mass of information accumulated, even if he could collect together the numerous works containing it. The Baron de Ferussac would secure to France the privilege of assembling and concentrating in a focus this scattered knowledge: he is perhaps the only man ambitious, persevering, and laborious enough to put the feasibility of such a scheme to the proof; but the experience of eight years has shewn that he is equal to the task. His Monthly Bulletin Universel, in its eight parts, contains analyses of the contents of every published journal, and with the aid of copious annual indexes, forms a register of all that is done in literature and science, enabling the student of any department to become acquainted with every new fact and discovery, and the historian to trace the progress of each science, from a most perfect and compendious record.

But the scale of the work as hitherto conducted is found to be quite inadequate to embrace the mass of additional matter now offering itself for publication:—and the only mode of effectually keeping pace with the demands of knowledge, is to enlarge the scheme by raising further capital, or forming a kind of joint stock association among those who would otherwise patronize the work as subscribers; and of whom there are already 5000 enlisted.

The following is a general view of the scheme:

There are 500 shares, 450 regular and 50 supernumerary, valued at 1000 francs each: a share may be held jointly by any number of persons not exceeding four.

The holders will be entitled to such annual dividends as may be afforded by the profits of the concern.

The shares are to be transferable and heritable.

Every share-holder has the option of receiving the monthly numbers of the Bulletin to the value of 50 francs, per annum, per share, in lieu of a dividend to that extent, or any thing below it.

According to the prospectus published on the cover of our July No., 50 francs will cover the subscription to any single division of the work, except the geographical. The whole work of eight parts costs 300 francs per annum.

The Society to continue 25 years from the year 1828.

Of the 500 Shares, France has already subscribed for	150	
Original proprietors and coadjutors, ...	89	
		239
Foreign countries,..............................		51
		290

There are still 210 shares to be disposed of, and these have been assigned by the projector to the various literary bodies, who have not yet joined the association; thus six shares have been set aside for the members of the Societies at the several British establishments in India, and one share for the Governor General: the originator of the scheme calculates more on the moral support and concurrence of its friends, than on their expectation of pecuniary benefit; and certainly viewing it as a money transaction, unless some prospect is confidently held out of much higher annual dividends than 5 per cent., it is not clear wherein the advantage of investing capital in the concern would lie: the interest of the same sum, safely lodged in the securities of the country, would purchase an equal portion of the publications of the Societé Anonyme: and a subscription for the whole work would be equivalent to the interest of the six shares.

The Treasurer's Report submitted, showing a balance in favor of the Society of Rs. 10,892, 6. 7.

The Collector's Report submitted, shewing a balance of outstanding bills of 11,140, of which 3,856 may be realized.—*Resolved*, that the Subscribers in arrear be written to for payment.

Museum.

A number of articles of Tibetan manufacture, presented by Government.

A collection of shells and a dried fish, presented by Dr. Burlini.

A snake, called *Kaulau Ganney*, presented by Mr. George.

A metal box, containing eleven silver rings, and three coins, (two of the Mohammedan Kings of Bengal, and one of Assam,) dug up in clearing an estate in the Sunderbans, sent for inspection by Mr. Storm.

Fourteen specimens of Roman coins, procured in Persia, presented by Mr. Avdall.

Library.

Books from the Bookseller, laid on the table.

Rickard's India, Part 4th.

Gray's Indian Zoology, Part 8th.

Lyell's Principles of Geology, 2nd Vol.

Cabinet Cyclopedia,—Military Commanders; Italian Republics; and Porcelain and Glass.

Mr. H. T. Prinsep presented Molesworth's Mahratta Dictionary on the part of the Bombay Government.

Read a letter from Mr. Twining, presenting a copy of his Clinical Illustrations of the Diseases of Bengal.

Read a letter from J. Vaughan, Esq. Secretary of the Philadelphian Philosophical Society, dated 29th April, 1830, presenting,

1. Mr. C. L. Bonaparte's Observations on the Nomenclature of Wilson's Ornithology.
2. Danas' Outlines of the Mineralogy and Geology of Boston and its vicinity.
3. Secretary of Treasury's Report to Congress on the Commerce and Navigation of the United States for 1830.
4. Achlan's Flora Cantabrigiensis.
5. Vols. 4 and 6, and 1st New Series of the Transactions Americ. Phil. Soc.

And offering politely to supply any former numbers of the Transactions which may not have reached the Society.

Dr. Bowdich's Translation of the Mecanique Celeste,—*presented by the author*.

Meteorological Registers for May, June, and July, 1832,—*from the Surveyor General.*

A list of books, some of which it might be desirable to purchase, submitted by Mr. J. Tytler. Referred to the Committee of Papers.

Resolved, that the thanks of the Society be presented to the Donors of the above presents.

Literary.

A collection of papers on the language and literature of Madagascar, and specimens of Missionary Tracts, printed at Madagascar, were presented by Mr. Calder, on the part of Mr. C. Telfair, President of the Natural History Society of the Mauritius.

We hope hereafter to find room for the insertion of some of the curious legends of Madagascar, as translated faithfully by Mr. Baker, the contributor of the specimen of the poetry of that island printed in our number for March.

Remarks on the intercourse of the western nations of antiquity with India, by Mr. E. Stirling.

The papers connected with the abstract of the subsequent portion of the Kah-gyur were laid on the table; of which an analysis by the Secretary was presented at the last meeting; (printed in the present No.)

The thanks of the Society were voted for the above.

VI.—MISCELLANEOUS INTELLIGENCE.

1.—*Extract of a letter from Lieut. Alex. Burnes, dated Balkh,* 11*th June,* 1832.

"On leaving India, I had resolved to avoid the Town of Khúlm, in the territories of the Uzbek chief of Kúndúz, who placed Mr. Moorcroft's party under contribution to the amount of 25,000 rupees, but by the urgent advice of a most influential man at Kabúl we joined a party who were to pass that town, since they were supposed to have influence at Kúndúz. The result was, that we were forthwith put under surveillance, and reported to the chief, who summoned us to his presence. Leaving all my party behind me, as well as Dr. Gerard, I proceeded to Kúndúz, and personified the character of a poor Armenian, by profession a watchmaker, who was proceeding to Bokhara. Múrad Bég was deceived; but I must add, that I first came to a private understanding with his custom-house officers to keep me in countenance. You may imagine, I did not wait long at Kúndúz, but mounting my horse, rode 70 miles at one stretch, and 40 on the following day, to this city, where we are beyond the reach of all such désagrèmens. As I finish this, our caravan is just starting for Bokhara, which we shall reach in fourteen days.

Our journey across the Hindú Kúsh was most exciting: it is a fearful undertaking, but with a judicious choice of season presents no barrier to the passage of an army, if accompanied by a *horde* of pioneers. The great range of the Indian Caucasus, i. e. the prolongation of the Himalaya, has been placed erroneously in our maps to the north, instead of the south of Bamíán. None of the passes were higher than 12,000 feet, as water boiled on them at 192° and 193°, [Bar. 19.72 and 20.15 inches,] but some of the peaks cannot be under 20,000 feet. There are six passes between Kabúl and Khúlm. The formations of the three first differed widely from those farther north, and which are lower. South of Bamíán we had iron, blue mica slate, and quartz, and from the higher hills blocks of granite had been precipitated from above. North of Bamíán, at the pass of *Dundan Shikun,* or the tooth-breaker, the formation changed into ash-coloured limestone, and continued so till we left the mountains. Once across the mountains we wound among terrific defiles and dells, the different courses of the water. Some of these rose to a height of 2000 perpendicular feet over our heads, and were such as to hide the sun from our view. What a country for a geologist! The Hindú Kúsh is almost destitute of vegetation; but the asafœtida plant grows in great exuberance, and forms the principal pasture of the flocks, which browse over them.

We have now fairly debouched into the plains of Tartary, but we have no plateau or elevated land, as seems to have been imagined by some geographers to exist in these regions. Here water boils at 209½°=[Bar. 28.40 inches], and before we reach Peshawer, since we follow the Oxus, it must even rise. This climate is considered insalubrious, but it looks a very nice place, and produces the most delicious fruit: the apricots are as large as small apples, with the mellowest flavour.

You must not suppose, that we took the route of the Hindú Cúsh in our journey to this place, but followed the grand caravanseras. The Hindú Cúsh is but the name of one pass over these mountains, and though it is the highest of all the practicable passes and is only traversable for three months in the year, it is described as the best road. Twenty horsemen may go abreast on it, but the snow is eternal, and it is a three days journey without grass, wood, or supply. It must be very high, since men and animals all experience a difficulty of breathing. There appears to be a phenomenon of nature in this mountain, which deserves mention—I allude to snow-worms. They are described to be as large as a silk-worm before it begins its cocoon, and white and transparent; they die on being separated from the snow."

2.—*Lithontrity practised in Persia.*

The following notice of a method of breaking up a stone in the bladder is extracted from the *Khawás-ul-hejár*, an anonymous Persian translation of a treatise on the properties of minerals, composed in the Arabic language; the date of the work is not known, but it is accounted ancient. Were the spirit of the author to appear before the Académie at Paris, we know not whether it might not become a claimant for a share of the Monthyon prize of six thousand francs lately adjudged to M. Leroy, for his various lithontritic instruments. The passage occurs in describing the qualities of the diamond.

" One of its properties is to reduce urinary calculi to powder, and it is used in this way :—a diamond of the size of a grain is fastened firmly to a kind of probe of copper (میل *mil*, an instrument used for applying collyrium) with mastich or lac, which probe is then brought in contact with the calculus and rubbed upon it until the stone is broken to pieces, when it is voided with the urine."

3.—*Extract from a letter from Major Burney, Resident in Ava, to Mr. Swinton, dated Rangoon, 24th August,* 1832.

" I lately discovered in the 21st volume of the Burmese History, that the Cholera is no new disease in this country. In the year 1706, it raged in the city of Ava, and destroyed a great many of the inhabitants. The Burmese History, in which I find this account, is said to have been compiled before the Talain conquest of Ava in 1751, and the copy of the work which I possess is marked as having been transcribed in the year 1790. These are the words in the original. " On Thurs-" day, the 4th day of the waning moon of *Katshoun* (our April), in the Burmese " year 1068 (A. D. 1706), past six o'clock in the evening, the whole of the golden " city was seized with panic, and made a great uproar, shouting and beating with " sticks. And from this month of *Katshoun* the whole city of Ava suffered from " purging and vomiting, and a great many persons died of the *Kála-na*, or Kala " sickness." The above is a literal translation of the passage. The Burmese still call the Cholera *Kála-na,* which means sickness that comes occasionally. About four years ago this dreadful scourge appeared in this town of Rangoon and carried off 3,500 of its inhabitants.

4 —*Rain at Chirra Púnjí, registered by W. Cracroft, Esq.*

1832.	*inches.*		*inches.*		*inches.*
June 1 to 17	6.45	July 12	0.450	August 6	5.805
18	2.24	13	1.150	7	0.937
19	1.40	14	1.420	8	0.680
20	4.91	15	5.169	9	1.987
21	4.76	16	7.597	10	1.155
22	1.04	17	5.250	11	0.517
23	not meas.	18	5.860	12	0.0
24	1.04	19	3.390	13	0.0
25	2.39	20	0.701	14	0.060
26	2.22	21	not meas.	15	0.915
27	0.0	22	do.	16	1.150
28	0.0	23	2.490	17	0.407
29	1.85	24	not meas.	18	0.765
30	1.40	25	4.869	19	0.0
July 1	1.95	26	0.0	20	7.812
2	1.83	27	0.0	21	2.862
3	2.12	28	1.350	22	4.420
4	4.57	29	1.355	23	1.595
5	9.73	30	0.0	24	2.425
6	4.11	31	2.642	25	not meas.
7	1.33	August 1	not meas.	26	1.087
8	1.837	2	2.715	27	2.650
9	1.247	3	2.862	28	2.170
10	0.0	4	2.690	29	2.050
11	1.287	5	not meas.	30	0.405
				31	2.265

For 16 days of June,	28.58 inches.
In July,	73.724
In Aug.	52.386
Total rain	154.690

For the first 22 days, the measurements were taken by means of a glass bottle and funnel:—afterwards, by an accurately constructed tin pluviameter.

5.—*Method of ascertaining the Humidity of the Soil, from an Arabic work,—communicated by* Mulví Abdúl Mújid.

"I find in a book of Agriculture, that if any one wish to know the proximity or distance of water, he is to dig three or four cubits in the earth, then to take a pot of brass, or a pitcher of earth, and besmear the inside evenly with fat; let the pot have a wide mouth, and when the sun sets, let him take a quantity of white wool, combed and washed, and a stone of the size of an egg; wrap this wool round it like a ball, and moistening the side of the ball with melted wax, attach it to the bottom of the pot already smeared with grease, then throw it to the bottom of the hole that has been dug, *so that the wool will be dependent, and the wax will retain it, and it will be dependent to the place of the stone*:* then pile upon

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* This passage is unintelligible in the original: it means apparently that the pot shall be placed in an inverted position in the well, so that the stone enclosed in the cotton and attached to the bottom of the earthen vessel with wax, shall hang in an insulated position in the hollow space; any moisture rising from the ground would thus be deposited in minute drops upon the cotton.

it earth to the height of one or two cubits, and leave it during the whole night, and when it is morning, before the rising of the sun, scrape the earth from it, and lift up the vessel, and if the water is seen adhering to the vessel within, in many drops, near to each other, and the wool filled (with it), there is water in this place, and it is near; and if the drops be not collected (together), and not near each other, and the quantity of water in the wool be moderate, then the water is neither very far off nor very near; and if the drops be adherent and separated from each other, and there be little water in the wool, then the water is distant; and if there be seen no drops in the vessel, neither large nor small, and there be no water in the wool, then there is no water in the place, and it is useless to dig it. I find also in some copies of agricultural works upon this subject, that he who wishes to know this matter is to examine the ants' nests, and if he find the ants thick, black, and slow in their motions, let him consider, and as slow as are their motions, so near is water to them, and if the ants are quick in their motions, it is not near; and the water is 40 cubits from them; and the water in the first case is sweet and good, and in the second is heavy and salt: and this paragraph is for him who desires to find water, and we have explained this in detail in our book the *Akhbar-uzzamán*, and have only mentioned here what necessity requires as a hint on the subject, without any detail or explanation." T.

6. *Mirage in India.*

It is not generally known that the mirage, apparently first brought to the notice of modern Europeans by the French army in Egypt, is visible in the central parts of Híndústan. In Rajpútana it is necessarily of constant occurrence; but in the less arid plains to the eastward it is also to be seen. At Ghazípúr, between the European bazar and the stables of the Company's stud, there is a level, extending about a mile; from the east end of which may very often be seen, about half a degree under the western horizon, the appearance of a sheet of water about 1° in width and perhaps 10° in length from right to left, in which the sky, houses, trees, and animals are reflected as in a bright mirror. D. B.

7. *Hará Míná, or Green Basalt, used for coloring Stucco.*

The rock in which the caves of Ellora are excavated is stated by Captain Twemlow, Bombay Artillery, to be a basaltic trap, which from its green tinge, and its different stages from hardness to disintegration, is supposed by the natives to be full of *vegetable* matter in a greater or less advance to petrifaction. The crumbling rock affords a natural green color, which is ground up and employed by the natives in painting on wet chunam: it is called *hará míná*, or green enamel, probably because when exposed to heat it fuses into a dark bottle-green glass.

Chaptal, the chemist, introduced in France a method of making glass bottles with pulverulent basalt, either alone or mixed with sand and ashes. The above substance might doubtless be employed for the purpose, were there sufficient inducement to set up an establishment of the kind.

8. *On the Converging Beams of Light which are occasionally seen opposite to the Sun.*

"This phenomenon is always seen opposite to the sun and generally at the same time with the phenomenon of diverging beams, as if another sun, diametrically opposite to the real one, were below the horizon, and throwing out his divergent beams." In a phenomenon of this kind which I saw in 1824, the eastern portion of the horizon where it appeared was occupied with a black cloud, which seems to be necessary as a ground for rendering visible such feeble radiations.

"This phenomenon is entirely one of perspective. Let us suppose beams inclined to one another like the meridians of a globe to diverge from the sun, as these meridians diverge from the north pole of the globe, and let us suppose that planes pass through all these meridians, and through the line joining the observer and the sun, or their common intersection. An eye, therefore, placed in that line, or in the common intersection of all the fifteen planes, will see the fifteen beams converging to a point opposite to the sun, just as an eye in the axis of a globe would see all the fifteen meridians of the globe converge to its south pole."

Having observed in Sir David Brewster's treatise on optics (published last year in Lardner's Cyclopædia), the above repetition of his usual account of a beautiful appearance which frequently adorns our Indian evenings, and having always thought his explanation of it deficient in the clearness and truth which generally characterize his writings, I shall venture to suggest another mode of illustration:

The diverging beams which to us appear to *radiate* from the sun when obscured by broken masses of cloud are in fact, as a consequence of the sun's enormous distance, sensibly *parallel* to each other. It need hardly be remarked that in permeating the atmosphere they do not proceed in straight lines, but are more or less inflected towards the earth. This inflection being disregarded, they may be considered as a series of elongated parallel prisms, extending perhaps 50° to the north and south of the zenith, at the height of a few thousand feet. The beam which crosses the zenith will have to the spectator the same appearance as the sky seen from the centre of a long narrow street of lofty houses: at the zenith it will have its greatest breadth, and it will taper and appear to *descend* towards the sun and opposite point of the heavens, and the same will happen with all the other beams lying north and south of it; whence they will appear to *converge*.

I may remark, that the phenomenon is incomparably more vivid in this climate than in Britain, that it is frequently and most clearly seen when there is not a visible cloud except the few masses in the west which produce the necessary obstruction of the solar rays, and that the beams can be traced across the whole concave in alternate shades of the purest light and dark blue. D. B.

9. *Errors in Dr. Arnott's Physics, Second Volume.*

In the first volume of the Gleanings in Science I remarked on some mistakes which disfigure Dr. Arnott's excellent Elements of Physics; and the first part of the second volume of the latter work having recently reached me, I would beg to direct the author's attention to the following slight blemishes, which might, if uncorrected, affect its otherwise well sustained character:

The most serious mistake is in his theory of the camera lucida, at p. 304: the eye does *not* see the paper "*through*" the prism but *beyond its edge*, the plane in which lie the line of sight and the edge of the prism bisecting the pupil.

At p. 218 he states that if the insertion of the optic nerves were at *corresponding parts* of the eyes, a black spot would always be seen in the field of vision;—forgetting that when only one eye is open *no* black spot appears. *Why* no black spot in this case appears is as yet unexplained.

At p. 194 he represents as a *straight* line a ray of light passing *obliquely* through the centre of a lens.

At p. 157 he states that "the inhabitants of India, where the thermometer sometimes stands at 115° in the shade, have their blood no higher than 98°." Dr. John Davy from numerous experiments concluded, that blood heat in tropical countries is raised to 100° during the hot season.

At p. 102 he repeats his erroneous theory of the artificial formation of ice in India,—" by evaporation and a current of air;" while the former circumstance is unnecessary to the process, and the latter always fatal to it. Radiation is the principle. D. B.

10. *Silver Mines discovered in Cuba. By* Don Ramon de la Sagra, *Superintendent of the Botanic Garden at the Havannah.*

(From the " Anales de Ciencias, Agricultura, Comercia o Artes" of May, 1828.)

When towards the end of 1826, I began a course of lectures on mineralogy and geology, it was my object to induce attention to the mineral productions of the Island of Cuba, and they had the effect of procuring me numerous contributions of specimens from various districts. About the same time Don Jose de Escalante, an inhabitant of Villa Clara, being well acquainted with the mines of Peru and Mexico, employed himself in exploring and examining the minerals of that neighbourhood, and he succeeded in discovering, first, several veins of copper, and afterwards a mine of silver, which he has claimed (denunciado) in the usnal form. The specimens of minerals submitted by him, were sent to me for analysis by His Excellency the Intendent; and the following is the result; the silver being separated by amalgamation.

Iron,	67.84
Silver,	0.48
Silex and Alumina,	9.7
Loss in gases and water,	21.98
	100

The mineral is found in mass; of an earthy ferruginous appearance; friable on the surface, but compact within; of a grey metallic colour; texture granular, sometimes laminous; fracture irregular and rough, with a few bright specks; fluate of lime makes no impression; but the ore is easily scratched by rock crystal; yields a reddish powder,—not magnetic: its specific gravity is 2.25; easily dissolved by nitric and hydrochloric acid; and also by weak sulphuric acid, which disengages much hydrogen gas. When dissolved, prussian-blue may be precipitated abundantly with hydroferrocyanate of potash. Infusible with the blowpipe, which converts the ore into black scoria. Hence I class the mineral among the ochreous iron-stone, or the *Ochriger roth Eisenstein*, of the Germans.

According to Geological reports of the mines in Peru, most of the silver from that country is extracted from ore of iron clay. In Mexico also, there are mines worked in the province of Oajaon the ore of which has a similar appearance, being composed of grey iron with native silver disseminated in the mass, not perceptible to the eye. Humboldt remarks, that, both in Mexico and in Peru the masses of oxide of iron which contain silver are found in the upper part of the veins near the surface of the earth; which is a good sign as regards Senor Escalante's discovery.

According to the report of the discoverer, the mine occupies a great extent of ground on the slope of a hill; but he is ignorant of the width and depth of the vein. A mine which yields 7½ ounces of silver to the quintal of ore, if the ore be abundant and of easy access and separation, is a treasure worthy the attention of government and of enterprising individuals. Should the mass of mineral prove as considerable as Senor Escalante asserts, the mine of Villa Clara will be one of the most valuable in America, on account of the proportion of metal which it contains, and the very simple process required to extract it.

The researches of Don Fausto del Elhuyar, whose fame is so well established in the history of science and of the mining art, shew that the mean produce of all the mines of Mexico does not exceed 18 to 25 parts of silver in 10,000, which is equal to 3 or 4 ounces per quintal (100 lbs.) The calculations of Senor Garrés give less than 2 ounces per quintal for the mean produce of all America. The great vein of Guanajuato, the most valuable in the world, has yielded only an average return of 4 ounces per quintal. The proportion of 7½ ounces found in the ore from Villa Clara is therefore remarkable; but not less so is the great facility with which I obtained the metal, by a first experiment, without any guide to regulate the quantity of salt and the proportion of quicksilver, best suited to form the amalgam, which nevertheless was formed within a few hours after throwing in the mercury. It is also to be observed that no "*magistrat*" (precipitant?) was employed, which is usually indispensable.

A subsequent article by the same writer, dated January 1829, states that no other silver mine had been discovered, and that the workiug of that of Don Jose de Escalante had made little progress up to that date. G.

11. *Supposed Change of Climate of the Northern Parts of the Earth.*

Our readers are aware, that the opinion of the northern parts of our earth, having formerly possessed a much warmer climate than at present, has been adopted and supported by many naturalists and geologists. The proof of this fact is supposed to be found in the remains of vegetables and of animals, the inhabitants of warm countries, being now found in the rock formations of colder climates. Dr. Fleming, who was the first to shew the weak points of the much talked of speco-diluvian hypothesis of Dr. Buckland, has now taken up the subject of the remains of animals. His opinion is, that the discovery of the remains of a species in any rock formation is no ground for inferring, that the other species of that genus must have been also inhabitants of the same country. He considers, that unless *the same species* are found in our rocks, which at present inhabit warm countries, nothing certain can be concluded; as an instance how much analogy may mislead us in this question, he mentions, the genus *Equus*, the species of which are sufficiently separated in geographical distribution. In like manner he brings forward the elephant, the remains of which found in Siberia have been pronounced by Cuvier to be very probably those of an animal that inhabited a cold country. Analogy is certainly a powerful instrument in the search after truth, but it is to mistake its nature and use altogether, to apply it to the direct establishment of dogmas. It can only guide our enquiries; at most it may shed a ray of light upon our path, and enable us to distinguish and seize the particular truth we are in search of: but it would be to confound all science, to suppose that every analogy is a truth. Analogy cannot be made the foundation of a fact; but it may form sufficient grounds for enquiring if that fact be true or otherwise.

Dr. Fleming's paper is in answer to Mr. Conybeare, and taken with the former on Dr. Buckland's deluge, proves him to be an antagonist every way worthy of attention. Both the papers contain detections and refutations of that loose analogical inference, for reasoning it cannot be called, which is the bane of true science. H.

12. *Limestone Formation.*

Professor Sedgwick, in his communications to the Geological Society, of 1831, has shown, that the mountain limestone of the north of England consists essentially of two groups, the "great scar limestone" is the lower, having an average thickness of more than 500 feet, and containing orthocerata, trilobites, and ammonites. The younger group contains five beds of limestone, of which the highest or "12 fathom limestone" is associated with many strata of sandstone and shale, and 3 or 4 seams of workable coal. The whole of this calcareous system is overlaid by a complex group connected with the millstone grit, and interlaced with beds of shale, and one or two seams of coal. From his general conclusions we learn, that the carbonaceous formations become much more calcareous in their range to the north—that from the nature of the associated organic remains, coal has, in some places, been produced in deep seas, and in other places in shallow estuaries,—that changes in the mineral character of the contemporaneously formed strata are usually accompanied by changes in the species of the fossils, whether animal or vegetable—and lastly, that the valleys in the carboniferous chain, near the lines of section, are not fissures which have been deepened by erosion, but true valleys of denudation.

13. *Correction of a mistake in the notice on Marine Surveys.*

In page 333, line 4, where mentioning, that the sextant is used for taking the relative positions of points on shore, it was said that "the azimuth *compass* was resorted to only for laying down the true meridian." Every surveyor will see, that this must be an inaccuracy, as such determinations would ill accord with the exactitude obtained by the other parts of the operation. The sentence should have run thus;—"azimuths taken with the sextant between the limb of the setting or rising sun and some fixed object on the horizon, as an island or peak, afforded the means of determining the true meridian." Such we know to be the method practised by Captain Ross.

VII.—*Progress of European Science.*

MECHANICS.

1. *Steam Carriages.*

The introduction of steam carriages on the turnpike roads of England may now be considered as established: this grand improvement has broken its way through the difficulties opposed to it—in the nature of the machinery,—the varying resistances and levels of the roadway,--the prejudices of the public against its dangers and inconveniences, and the strenuous opposition of the stage-coach proprietors, and of the toll trustees, whose prohibitory increase of charge has been finally levelled by an Act of Parliament, if not passed, at least brought up by the chairman of the Select Committee appointed to inquire into the subject of steam carriages, and consequently not likely to be negatived.

This great achievement in mechanics has prevailed through two irresistible practical arguments: 1st, journeys from London to Bath and Southampton have been performed, and 2nd, a great saving of expence to travellers has been certified.

The following extract from the "Report" shews the progress already made:

"The first extensive trial of steam as an agent in draught on common roads, was that by Mr. GURNEY, in 1829, who travelled from London to Bath and back in his steam carriage. He states, that although a part of the machinery, which brings both the propelling wheels into action, when the full power of the engine is required, was broken at the outset, yet that on his return he performed the last 84 miles from Melksham to Crawford Bridge in 10 hours, including stoppages. Mr. Gurney has given to the committee very full details of the form and power of his engine, which will be found in his evidence. The committee have also examined Messrs. Summers and Ogle, Mr. Hancock and Mr. Stone, whose steam carriages have been in daily use for some months past on common roads. It is very satisfactory to find, that although the boilers of several engines described vary most materially in form, yet that each has been found fully to answer the expectation of its inventor; so well in fact have their experiments succeeded, that in each case, where the proprietors have ceased to use them, it has only been for the purpose of constructing more perfect carriages, in order to engage more extensively in the business.

When we consider that these trials have been made under the most unfavourable circumstances, at great expense, in total uncertainty, without any of those guides which experience has given to other branches of engineering,—that those engaged in making them are persons looking solely to their own interests, and not theorists, attempting the perfection of ingenious modes; when we find them convinced after long experience that they are now introducing such a mode of conveyance as shall tempt the public by its superior advantages from the use of the admirable lines of coaches which have been generally established, it surely cannot be contended that the introduction of steam carriages on common roads is merely an uncertain experiment unworthy of legislative attention.

Beside the carriages already described, Mr. Gurney has been informed, that from twenty to forty others are being built by different persons, all of which have been occasioned by his decided journey in 1829.

The committee have great pleasure in calling the attention of the house to the evidence of Mr. Farey. His opinions are the more valuable from his uniting, in so great a degree, scientific knowledge to a practical acquaintance with the subject under consideration. He states, that he "has no doubt whatever but that a steady perseverance in such trials will lead to the general adoption of steam carriages;" and again, "that what has been done proves to his satisfaction, the practicability of propelling stage coaches (by steam) on good common roads, in tolerably level parts of the country, without horses, at a speed of 8 or 10 miles per hour."

Much of course must remain to be done in improving their efficiency, yet Mr. Gurney states that he has kept up steadily the rate of 12 miles per hour; that the "extreme rate at which he has run is between 20 and 30 miles an hour."

Mr. Hancock "reckons that with his carriage he could keep up a speed of 10 miles per hour without injury to the machine."

Mr. Ogle states, "that his experimental carriage went from London to Southampton in some places at a velocity of from 30 to 35 miles an hour.

"That they have ascended a hill, rising 1 in 6, at 16½ miles an hour, and four miles of the London road, at the rate of 24½ miles per hour, loaded with people.

"That his engine is capable of carrying three tons weight in addition to its own."

Mr. Summers adds, "that they have travelled in the carriage at the rate of 15 miles per hour with 19 persons in the carriage up a hill 1 in 12.

"That he has continued for 4½ hours to travel at the rate of 30 miles per hour.

"That he has found no difficulty in travelling over the worst and most hilly roads."

Mr. James Stone states, "that 36 persons have been carried in one steam carriage. That the engine drew 5 times its own weight, nearly at the rate of from 5 to 6 miles per hour, partly up an inclination."

The several witnesses have estimated the probable saving of expense to the public from the substitution of steam-power for that of horses at from one half to two-thirds. Mr. Farey gives, as his opinion, "that steam coaches will very soon after their first establishment be run for one-third of the cost of the present stage coaches."

The advantages of steam-power are not confined to the greater velocity gained or to its greater cheapness than horse draught :—

"There is no danger of being run away with ; and that of being overturned is greatly diminished. It is difficult to control four such horses as can draw a heavy carriage ten miles an hour, in case they are frightened or choose to run away ; and for quick travelling they must be kept in that state of courage, that they are always inclined for running away, particularly down hills, and at sharp turns of the road. In steam, however, there is little corresponding danger, being perfectly controllable and capable of exerting its power in reverse in going down hills. Every witness examined has given the fullest evidence of the perfect control which the conductor has over the movement of the carriage. With the slightest exertion they can be stopped or turned, under circumstances where horses would be totally unmanageable."

The danger of explosion has been greatly reduced by adopting the tube form of boiler, and further benefit is expected from some ingenious modifications of Mr. Trevithick.

The questions of frightening the horses of other carriages, of inconvenience from smoke and steam, are also disposed of by the committee; but they are of too trivial a nature to need comment, and we know that steam carriages have passed over London bridge in the midst of vehicles of all denominations.

The mass of evidence taken before the committee is of a most valuable nature, but for this we must refer our readers to the printed report, or to the Mechanic's Magazine for 1831, selecting only a few notes therefrom.

Mr. Gurney's boilers are of cast-iron tube : he works them up to 100 lbs. on the square inch. On plain ground, one wheel, on hilly or slippery, two wheels are connected with the working crank : the facility of stopping by throwing the steam on the opposite side of the piston is so great, that if going 8 miles an hour, a carriage can be brought up within 6 or 7 yards : it can turn in a circle of 10 feet. When moving at a slower rate than 4 miles an hour, the expense of fuel is greater than that of horses. The evaporation of 9 gallons of water per hour is equivalent to one horse power : Mr. Gurney prefers coke as a fuel, and thinks smoke cannot be consumed without separation of the carbonic acid gas, by passing through lime or other means : considers explosions not always attributable to steam, but frequently to formation of explosive compounds of hydrogen and oxygen, as does Gay Lussac.

To provide for accidents from the guide falling asleep, he has contrived that the valves of the engine shall only remain in gear while he is awake and at his post. The moment he takes his foot off, the engine stops : the same contrivance prevents the carriage running down hill too rapidly, and there is no occasion for drags.

Mr. J. FAREY, engineer, thinks the carriage for conveyance should be upon the same wheels with the engine, to give firmer adherence to the road; approves of the ejection of the waste steam in a stream upwards through a contracted orifice at the bottom of the chimney (introduced by Mr. STEPHENSON on the rail-way engines), as it increases the draught, which from the necessity of a short flue cannot be maintained otherwise, without fans, blowers, or bellows. However Mr. SUMMERS and other engineers object to this plan, as the contracted orifice of the steam escape takes away proportionally from its power on the other side of the piston.

The vertical jet gives such an intensity of draught as was never procured before, and with the further advantage, that the rapidity of draught so produced increases whenever the engines work faster and discharge more steam. This may be considered a very important improvement, as is another described by Mr. R. TREVITHICK regarding the construction of boilers. This engineer has taken out a patent for an entirely new engine, wherein the fire-place, boiler, and condenser stand perpendicularly one within the other: they are formed of six wrought iron tubes. One charge of *distilled water* only is required; the steam being condensed and returned into the boiler by a force pump. To supply the waste by leakage a small apparatus is used, which effectually prevents any fluctuation in the height of water in the boiler, or the collection of sediment, and consequeut danger of the boiler becoming heated red-hot.

The boiler is not only less than any other but stronger, and if it were worked at the same pressure as the portable gas-holders, theory would give a saving of fuel, weight, and room over low pressure engines of sixteen to one.

Mr. DAVIES GILBERT explains the apparent anomaly, that with steam power increase of velocity does not enhance expence*.

It was last year determined by the society of civil engineers, that the expence of conveying carriages drawn by horses was at its minimum, when the rate of travelling equalled about three miles an hour; and that expence increased up to the practical limit of speed nearly as the velocity; while on the contrary, friction being a given quantity, as well as the force necessary for impelling a given weight up a given ascent, the power required for moving steam carriages on a rail-way remains theoretically independent of its speed, and practically increases a very little in consequence of resistances from the atmosphere, slight impacts against the wheels, inertia of the reciprocating piston, &c.

The expenditure of what may be called efficiency is as the actual force multiplied by the velocity, and the consumption of fuel in a given time will be in the same proportion: but the time of performing a given distance being inversely as the velocity, the expenditure of fuel in a given time will be constant for a given distance; and it is very nearly so in practice.

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* This is the case on land, where friction is constant, but on water the very reverse takes place; for the resistance to motion in fluids increases much more rapidly than the velocity: thus the same expenditure of steam (or coal) that will carry a steamer alone a certain distance, with a given velocity, will with a sacrifice of only $\frac{1}{12}$ of time, convey her with a large ship astern to the same distance. Vide GLEANINGS, III. 158.

Mr. James M'Adam acquaints us with the fact of the legislature having obliged the tires of all wheels to be free from projecting knobs or nails—a great improvement; he looks to great benefit to the roads from dispensing with horses : weigh bridges are now universally abolished, the effect of carts upon roads being mainly proportionate to the number of horses, according to which the toll is now levied.

Mr. John Macneill furnished a variety of very useful experimental tables of the pressure of various carriages upon an inch surface of road;—the weight necessary for their draught with different velocities and on different inclinations;—and he expence per mile for the same. The experiments of the second table were conducted under Mr. Telford, with a machine invented by his assistant Mr. Macneill for measuring the force of traction, or the labour of horses in drawing carriages. The following are the general results in a tabular form.

Results of experiments made with a stage-coach, weighing, exclusive of passengers, 18 cwt. *on the same piece of ground with different inclinations.*

Inclination.	Rate of travelling.	Force required.	Expence of drawing one ton per mile in a waggon at 2½ miles per hour.
			pence.
1 in 20	6 miles	268 lbs.	22.83
1 in 26	6 ,,	213	
1 in 30	6 ,,	165	18.55
1 in 40	6 ,,	160	16.79
1 in 600	6 ,,	111	12.66
horizontal			12.36
1 in 20	8 ,,	296	[Expence of drawing one ton per mile in a four-horse stage, at 10 miles per hour.]
1 in 26	8 ,,	219	
1 in 30	8 ,,	196	
1 in 40	8 ,,	166	
1 in 600	8 ,,	120	
			d.
1 in 20	10 ,,	318	50.47
1 in 26	10 ,,	225	
1 in 30	10 ,,	200	44.15
1 in 40	10 ,,	172	41.25
1 in 600	10 ,,	128	33.59
horizontal	10 ,,	?	32.93

The following are the same engineer's accurate measures of traction, or resistance, on different qualities of road, which are directly opposed to M'Adam's theory of road-making, as applied to cities, though not to country.

1.—On well-made pavement, the draught (of each horse?) in a waggon weighing about 21 cwt. is	33 lbs.
2.—On a broken stone surface or old flint road, ...	65
3.—On a gravel road, ...	147
4.—On a broken stone road upon a rough pavement foundation,	46
5.—On a broken stone surface upon a bottom of concrete, formed of Parker's cement and gravel, ...	46

No description is given of Mr. Macneill's dynanometer, but Mr. Telford speaks of it in great commendation.

Meteorological Register, kept at the Surveyor General's Office, Calcutta, for the Month of September, 1832.

	Minimum Temperature observed at sunrise.					Maximum Pressure observed at 9h. 50m.					Max. Temp. and Dryness observed at 2h. 40m.					Minimum Pressure observed at 4h. 0m.					Observations made at sunset.					Observations in Calcutta at 10½ P. M.						
Days of the Month.	Barometer reduced to 32°.	Temper. of the air.	Depres. of M. B. Ther.	Wind.	Aspect of the sky.	Barom. red. to 32°.	Temper. of the air.	Depres. of M. B. Ther.	Wind.	Aspect of the sky.	Barom. red. to 32°.	Temper. of the air.	Depres. of M. B. Ther.	Wind.	Aspect of the sky.	Barom. red. to 32°.	Temper. of the air.	Depres. of M. B. Ther.	Wind.	Aspect of the sky.	Barom. red. to 32°.	Temper. of the air.	Depres. of M. B. Ther.	Wind.	Aspect of the sky.	Barom. red. to 32°.	Temper. of the air.	Depres. of M. B. Ther.	Wind.	Aspect of the sky.	Rain Gauge, No. 1.	Rain Gauge, No. 2.
1	29,472	81,3	1,1	n. e.	cu.	,543	86,	5,5	n. e.	cus.	,465	87,7	7,8	n. e.	n.	,449	87,3	5,2	n. e.	cu.	,462	83,	1,8	n. e.	cl.	,578	84,3	3,9	s.	cu.	0,31	0,23
2	,522	81,5	2,8	do.	ci.	,579	85,5	5,6	e.	cu.	,498	88,	6,8	do.	cu.	,482	87,5	6,3	do.	do.	,500	83,	3,8	do.	cis.	,583	82,1	1,1	e.	cus.		
3	,551	79,3	1,4	do.	n.	,608	85,	4,8	n. e.	do.	,534	87,	6,3	s. e.	n.	,518	86,	6,3	s. e.	do.	,519	82,	3,8	do.	cl.	,638	81,2	2,8	do.	cl.	0,55	0,41
4	,609	80,7	3,5	n. w.	cu.	,679	84,5	4,8	s. e.	do.	,592	87,9	6,9	s.	cu.	,589	87,5	7,	s.	do.	,585	84,	4,8	s.	do.	,648	82,3	3,7	s.	do.		
5	,609	80,7	3,5	do.	do.	,682	87,	6,1	n. w.	do.	,579	91,3	10,6	cm.	do.	,579	87,7	7,2	s. w.	do.	,574	86,	5,8	s. w.	ci.	,662	84,1	4,7	do.	do.	0,91	0,74
6	,607	80,5	2,8	s. w.	ci.	,674	85,7	7,5	s. w.	do.	,557	89,5	8,8	s. w.	ci.	,551	88,	8,	cm.	cis.	,552	85,	4,8	cm.	cis.	,645	84,0	4,3	do.	cu.		
7	,578	81,5	2,8	cm.	cu.	,646	85,7	4,7	cm.	cis.	,550	86,	6,5	n.	cu.	,530	85,5	5,6	n.	cu.	,529	84,	2,8	n.	do.	,632	84,0	3,9	do.	do.		
8	,564	80,	2,3	s. w.	do.	,608	86,8	5,1	s. w.	cu.	,539	80,5	2,5	cm.	rn.	,508	80,	1,5	cm.	rn.	,508	80,7	1,2	cm.	do.	,577	82,6	4,1	s. w.	cis.	0,64	0,42
9	,525	80,	2,6	do.	cus.	,585	82,7	3,	do.	do.	,492	88,5	8,	s. w.	cu.	,491	84,	3,8	s. w.	cus.	,519	83,	3,8	s.	do.	,626	78,8	2,8	n. w.	cu.		
10	,589	78,	1,1	s.	rn.	,670	84,3	3,6	s.	do.	,605	83,5	4,8	do.	cis.	,598	83,3	4,6	do.	cis.	,599	81,7	2,	s. w.	cu.	,664	81,0	2,8	s.	cis.	0,10	0,07
11	,643	80,5	1,6	do.	cu.	,714	88,5	6,6	s. w.	do.	,627	89,3	8,3	s. e.	do.	,623	87,	5,5	s. e.	do.	,623	83,	2,8	s. e.	ci.	,688	81,6	2,6	do.	do.	0,35	0,19
12	,667	79,5	1,8	n. e.	rn.	,710	84,3	5,6	n. e.	ci.	,601	89,8	8,6	s.	cu.	,591	84,7	5,	s.	cus.	,593	83,	3,3	cm.	cl.	,685	83,2	4,0	s. w.	do.		
13	,632	80,	1,3	n.	cu.	,700	88,5	7,1	n.	cu.	,592	93,3	11,6	n. e.	do.	,574	91,7	11,5	n. w.	cu.	,585	87,	7,1	n. w.	ci.	,676	84,2	7,8	cm.	do.		
14	,610	79,7	1,5	do.	rn.	,685	88,3	8,3	do.	cl.	,592	93,	12,5	s. w.	ci.	,576	92,	11,2	do.	ci.	,579	88,5	7,3	do.	cl.	,670	87,2	6,0	do.	do.		
15	,646	82,	2,8	n. w.	cu.	,697	88,7	8,2	n. w.	cu.	,606	93,3	12,1	n. e.	cu.	,584	92,8	11,8	do.	cu.	,574	89,	8,3	do.	cu.	,667	89,0	6,7	w.	cl.		
16	,664	79,5	1,3	do.	cus.	,709	86,	5,5	do.	do.	,599	89,5	7,3	do.	do.	,585	89,	6,8	n. w.	do.	,582	86,	4,8	do.	do.	,679	80,0	1,1	s. w.	rn.		
17	,607	80,	1,8	s. w.	cu.	,647	85,5	6,	s. w.	do.	,543	83,5	3,5	s. e.	n.	,544	83,3	3,6	s. e.	cus.	,487	79,5	2,8	s. e.	n.	,639	82,0	4,4	s.	cus.		
18	,591	81,3	3,3	s. e.	do.	,645	85,5	6,3	s. e.	ci.	,546	85,7	5,	do.	do.	,556	81,7	3,	do.	n.	,572	80,5	3,3	do.	cus.	,675	81,1	3,1	s. w.	cl.		
19	,663	78,7	1,5	do.	rn.	,733	86,5	5,5	do.	cu.	,689	78,7	1,2	cm.	rn.	,690	78,5	1,	cm.	rn.	,666	78,7	1,	do.	cis.	,783	79,8	1,8	s. e.	rn.	0,10	0,07
20	,735	78,5	1,	n. e.	cus.	,805	84,	3,8	n. e,	do.	,720	87,7	6,	s. e.	cu.	,723	79,	2,8	do.	do.	,707	79,5	1,3	cm.	rn.	,799	81,1	2,4	e.	cus.	0,68	0,50
21	,746	78,5	1,3	cm.	cis.	,789	86,5	5,8	s. e.	do.	,681	83,5	3,6	e.	cis.	,661	82,5	3,3	s. e.	cus.	,664	81,	2,8	s. e.	cu.	,741	79,3	2,6	w.	cl.	0,39	0,28
22	,747	76,	0,8	s. e.	rn.	,775	80,3	3,1	do.	cis.	,673	81,3	3,4	s. e.	do.	,659	81,	2,8	do.	cis.	,655	79,7	2,5	do.	cis.	.736	78,8	2,8	s.	do.		
23	,710	76,5	1,1	s.	cy.	,763	81,5	3,3	do.	do.	,706	78,5	2,8	s.	rn.	,694	79,	2,8	s.	cus.	,694	79,	1,8	s.	do.	,801	78,3	2,2	do.	cu.		
24						,845	77,	1,3	s.	rn.	,743	77,7	1,2	s. e.	cis.	,723	78,3	1,4	s. e.	cis.	.739	79,	1,3	cm.	ci.	,777	78,0	2,1	do.	cl.	0,67	0,51
25	,713	78,	1,3	s. e.	rn.	,770	80,	2,5	s. e.	cus.	,646	84,0	4,8	do.	cu.	,652	83,	4,3	s.	ci.	,632	81,	2,8	s.	do.	,723	79,1	2,0	s. e.	do.	0,13	0,10
26	,678	78,3	2,1	do.	cus.	,732	86,	4,3	e.	cu.	,655	88,5	8,5	do.	do.	,638	86,5	6,	s. e.	cu.	,642	84,	4,3	cm.	cus.	,754	81,1	2,9	e.	do.		
27	,727	78,	1,8	n. e.	do.	,795	82,7	3,2	n. e.	ci.	,701	86,6	6,4	n. w.	do.	,704	82,	3,8	s. w.	cus.	,698	79,5	2,3	do.	do.	,809	79,7	3,7	cm.	do.	0,15	0,11
28	,782	77,	1,3	s. e.	rn.	,865	85,	6,1	s. e.	cu.	,794	84,5	5,	s. e.	cis.	,764	82,5	3,6	s. e.	cis.	,754	81,	2,8	s. e.	cis.	,851	79,8	2,6	s.	do.		
29	,839	77,5	1,3	s.	cu.	,893	84,7	6,2	s.	do.	,778	89,5	9,3	n. w.	cus.	,773	89,3	8,3	n.	cu.	,776	87,	3,8	n.	cu.	,839	82,3	3,5	do.	do.		
30	,811	79,	0,8	w.	cl.	,850	82,0	1,8	w.	do.	,726	89,5	7,6	s.	cu.	,723	88,	6.3	s. w.	do.	,743	84,0	2,8	s. w.	cu.	,825	85,0	4,0	s. w.	cu.	0,04	0,03
Mean,	29,650	79,3	1,9			,713	84,8	5,0			,620	86,6	6,6			,611	84,0	5,3			,610	82,7	3,5			,702	81,5	3,4			4,88	3,63

Abbreviations. In the column "wind," small letters have been used instead of capitals; *cm.* means *calm.* In the column "aspect of the sky," *cy.* is *cloudy*; *cl. clear*; *rn. rain*; *ci. cirrus*; *cu. cumulus*; *cs. cirro-stratus*; *cus. cumulo-stratus*; *cc. cirro-cumulus*; *n. nimbus.*

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I.—*Analysis of the Vishnu Purána. By* H. H. Wilson, *Sec. As. Soc.*

The *Vishnu Purána,* as may be inferred from its appellation, is eminently *Vaishnava,* and considers VISHN'U one with the Supreme Being, PARAMA BRAHMA, and PARAMA'TMA'.

It is supposed to be related by PARÁSARA, the grandson of VASISHT'HA, to his disciple MAITREYA, and dispenses with the usual machinery of *Suta* and the *Rishis:* it is said in the first chapter, indeed, in the form of a prophetic enunciation by VASISHT'HA, that PARÁSARA is the author of the *Sanhitá* and the *Puránas.*

In other chapters, however, it is again asserted, that DWAIPÁYANA VYÁSA is the author of all the *Puránas,* and to reconcile these two statements recourse is had to a statement in the 3rd chapter of the 3rd section. It is said, that there is a VYÁSA or VEDA VYÁSA in every *Dwápar Yuga* of the *Vaivaswat Manwantara;* of this *Manwantara* we are now in the 28th *Kali:* accordingly, 28 *Dwápar Yugas* have elapsed, and 28 *Veda Vyásas* have existed; the last is KRISHNA DWAIPAYANA, or the person usually designated as VYÁSA. PARÁSARA was the 26th VYÁSA, and this *Purána* is consequently the work of a preceding *Maháyuga,* or aggregate of four ages. The *Agni Purána* states PARÁSARA to be the author of the *Vishnu Purána.* In the classification adopted by itself, (book 3rd, chapter 6,) it is placed the third; after the *Brahma* and *Padma.*

This *Purána* is divided into six *Ansas,* books or sections, each being sub-divided into a varying number of *Adhyáyas* or chapters: it does not follow the order prescribed by the usual definition of a *Purána,* but deviates less widely than most of these compositions: according to the *Agni Purána,* it contains 25,000 *slokas.* A commentary on this *Purána* exists, but of no great value, except as explanatory of some of the philosophical passages.

The first book opens with the dialogue between Maitreya and Parásara, as already noticed. Parásara states himself to be the son of Sakti, the son of Vasisht'ha. Buchanan, from the *B'hágavat*, makes him the son of Upamanyu and grandson of Sakti, but the *Maháb'hárat* confirms the authority of the *Purána.* " The son of Sakti (Parásara) next arrived there with his disciples." The passage of the *B'hágavat* on which Buchanan's statement rests, has not been found; the Bengali manuscripts generally read *Saktri* instead of *Sakti.*

Buchanan has also noticed the incompatibility of Parásara's genealogy with his being, as it is stated, cotemporary with Santanu king of *Hastinapur*, that prince being the 44th in descent from Atri, who is cotemporary with Vasisht'ha, who again is but three generations anterior to Parásara; he supposes therefore, that many generations in the line of Vasisht'ha must have been omitted. It is not necessary, however, to attempt to reconcile these incongruities, for the coetaneous existence of Atri and Vasisht'ha is less chronological than mythological, or, perhaps, as they are both enumerated amongst the stars of the great bear, astronomical; it extends throughout the *Manwantara:* their immediate successors, who hold a sacred character, enjoy a like longevity, and are similarly cotemporary at any period with their ancestry and posterity: if we consider them as mere mortals, we must suppose, that Parásara preceded the great war by three generations, Krishna Dwaipáyana, his son, being the father of Dhritaráshtra, Pandu and Vidura by the widow of Vichitraviriya. Vyása was however cotemporary with his grandson and their descendants, agreeably to the above system of saintly immortality. Mr. Bentley places Parásara about 575 B. C. (Hindú astronomy), Buchanan about 1300 B. C. (Genealogies of the Hindús), and Wilford 1391 (A. R. ix. 87.)

The first chapters of the first book of the *Vishnu Purána* contain an account of the creation, ascribing it to the association of Vishnu with Pradhána and Purusha, matter and spirit, or the female and male, or passive and active energies. During the intervals of creation, Vishnu exists independant of all connexion or attributes, and is beyond the comprehension of human faculties. When disposed to create the universe, the elements, properties, and senses generated by the two sensible combinations of the deity are collected into an egg floating on the water, in which Vishnu again, as Brahmá, is concealed, and from which he issues to separate, and arrange the constituent portions of the world: the system is therefore perfectly conformable to that anciently entertained as explained in the opening of Menu, substituting Vishnu for Brahma.

The third chapter contains the usual divisions of time, from the twinkling of an eye to the period of a *Kalpa;* the fourth, an account of the *Varáha Avatára*, whence the *Varáha Kalpa*, or actual great period, derives its appellation. In the 5th chapter we have the series of creations, effected by Vishnu, amounting to nine, followed by a more detailed account of the order in which the several classes of beings sprang into existence, extending through the 6th and 7th chapters.

The seventh chapter brings us to the creation of the chief characters of the *Swayambhuva Manwantara*, the account of whose family is in part at least obviously an allegory. *Swayambhuva*, the son of the self-existent, is married to Satarupá, (the hundred or many-formed, the great mother;) their children are two sons, Priyavrata (the lover of devotion), and Uttánapáda (where we are at fault), and two daughters, Prasuti (child-bearing) and Akuti*, a name not admitting an obvious allegorical etymology. It may be observed, that the *B'hágavat* adds a third daughter, Devahuti (invocation of the gods), married to Kerdama (soil or sin); Akuti was married to Ruchi (light), a *Prajapati*, but not included in the usual enumeration of those sons of Brahma, unless he be the same with Marichi; their offspring were Yajna (sacrifice), and Dakshiná (donation), who, though brother and sister, were married and begot the twelve divinities called *Yámas*, a class whose character and office are not known. Prasuti was married to the *Prajapati* Daksha (ability or power); they had twenty-four daughters, all emblematical, Sraddhá, (faith,) Lakshmi, (prosperity,) Dhriti, (fortitude,) Tushti, (content,) Pushti, (satiety,) Medhá, (apprehension,) Kriy'a, (action, &c.); thirteen were married to Dherma, (equity;) of the other eleven nine were married to the nine *Rishis*, Swáhá (oblation) was wedded to fire, and the collective Pitris or progenitors had *Sráddhá*, the funeral sacrifice, for their spouse: their posterity are all of the same significant character, as their appellations satisfactorily indicate. The *Puránas*, in general, follow this account of the first race of created beings, with some modifications and additions: the *B'hágavat*, as we shall hereafter see, has supplied the most copious accessions, and has introduced into the series

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* However another reading often occurs, usually considered, it is true, an error of the copyist, but possibly the right reading; Ahu'ti, invocation of the gods, prayer, or sacrifice.

a degree of perplexity and inconsistency that are quite foreign to the simplicity of the *Vishnu Purána*, in which we may therefore conceive the primitive notion is most faithfully represented.

The churning of the ocean for the recovery of *Sri* and *Amrita* or ambrosia, lost to the gods in consequence of the anger of *Durvásas* with *Indra*, is narrated in the ninth chapter, but more concisely than usual. The posterity of the *Rishis* by the daughters of Daksha follow, and we have then a long episode relating to Dhruva, the second son of Uttánapáda, who, for his devotion to Vishnu, was elevated to the dignity of the polar star.

The descendants of Dhruva are traced in the 13th chapter to the 6th Menu Chákshusha, and from him by Uru, Anga, and Vena to Prithu, from whom the earth was named *Príthivi :* the fourth descent from Prithu, consisted of the ten Práchetasas, and their son was Daksha the *Prajápati* in a new birth : this is the father of the 60 daughters, of whom 27 were the constellations, the lunar mansions, or wives of the moon, and thirteen the wives of Kasyapa, by whom the gods and demons, men and animals, were produced. The remaining chapters of this section contain the accounts in detail of the origin of these races, from the daughters of Daksha married to Kasyapa. The original refers these in the 21st chapter to the *Swárochisha Manwantara*, but this is irreconcilable with the descent of Daksha, as before mentioned from *Chákshusha Menu*, and as again stated in the third book. This section of the *Purána* terminates with the division of the universe under its respective regents, and praises of Vishnu as the Supreme Being.

The second book contains the usual account of the division of the earth into *Dwipas*, and the formation of the seven *Pátálas*, and *Naraka*, with the situation and course of the planets and the description of their several cars : that of the sun is very fully and curiously detailed : the last chapters give a legendary account of *Bharata*, the object of which is to inculcate the supremacy of Vishnu, and the unreality of worldly existence, agreeably to the doctrines of the *Vedánta* philosophy.

The third book of the *Vishnu Purána* should have formed, agreeably to the systematic classification of the contents of a *Purána*, its fourth, treating of the reigns of the different *Menus* and their descendants : the detail however is little more than a bare enumeration of names, the appellation of the *Menu*, the Indra, or king of the gods, the *Ganas* or classes of *Devas*, the seven *Rishis*, and the sons of the *Menu*, and who are all distinct in each *Manwantara*. Those of the first, sixth, and seventh periods are of the most note. In the intermediate ones little of interest occurs, and less in those that are to come. We may therefore here insert the names of the persons of these three *Manwantaras.*

Menu.	*Swayamb'huva.*	*Chákshusha.*	*Vaivaswat.*
Indra.		*Manojava.*	*Purandhara.*
Devatas.		*Adyas.*	*Adityas.*
		Prasutas.	*Vasus.*
		Bhavyas.	*Rudras, &c.*
		Prithugas.	
		Mahanubhavas, &c.	
Rishis.	*Marichi.*	*Sumedhi.*	*Vasisht'ha.*
	Angiras.	*Viraja.*	*Kasyapa.*
	Atri.	*Havishmat.*	*Atri.*
	Pulastya.	*Uttáma.*	*Jamadagni.*
	Pulaha.	*Madhu.*	*Gautama.*
	Kratu.	*Atenaman.*	*Viswamitra.*
	Vasisht'ha.	*Sahishna.*	*Bharadhwája.*
Sons.	*Priyavrata.*	*Uru.*	*Ikshwáku.*
	Uttanapada.	*Puru.*	*Nab'hága.*
		Satadru.	*Dhrishta.*
		Tapaswi.	*Saryáti.*
		Satyavati.	*Narishyanta.*
		Suchi.	*Bhágadheya.*
		Agnishthoma.	*Karusha.*
		Sadyumna.	*Prishadhra.*
		Abhimanyu.	*Vasumat.*
		Atiratra.	

In this manner the persons of the remaining seven *Manwantaras* are prophetically detailed.

In the next chapter of the third section occurs the enumeration of the 28 *Veda Vyásas* already alluded to. In the *Dwápar* age of every *Maháyug*, or aggregate of four *Yugas*, a *Muni* or sage appears, who makes a new arrangement of these works, and is therefore called *Vyása* or *Veda Vyása.* The *Vyása* of the present period is Krishna Dwaipáyana, the son of Parásara, and the twenty-eighth of the series, and who, according to this authority, and the sectarial notions it advocates, is a minor descent or incarnation of Vishnu himself.

The origin of the *Vedas* and *Puránas* is treated of in the next chapter of this section, with many curious details. The *Veda,* it is said, was originally a ritual, containing ample instructions for the five great sacrifices, or oblations to fire, at the full and change of the moon, and in every fourth month, the offering of animals, and libation with the juice of the acid Asclepias; these five being doubled as *Prakriti* and

Vikriti, or simple and modified, became ten, and these were the objects of the *Vedas*.

The mode in which *Vyása* is described as arranging the *Veda*, implies its prior existence in separate portions, as he called to his assistance four persons, severally acquainted with them, or *Paila* for the *Rik*, *Vaisampáyana* for the *Yajur*, *Jaimíni* for the *Sáma*, and *Sumanta* for the *Atharvan*. The description is not very clear, but it should seem that he made a kind of digest of the whole collectively, which he again separated according to the purport of the different passages; the *Rik*, containing the *Richas*, or prayers used with oblations by the *Hotri*, or officiating priest; the *Yajur*, comprising the formulæ of the rite repeated by the *Adhwaryu;* the *Sáma*, composed of the hymns chanted by the *Udgátá;* and the *Atharvan* comprehending prayers and rites suitable for princes or the military order, repeated or conducted by the *Brahmans* on their behalf.

The *Vishnu Purána* then describes the different *Sanhitás*, or collections of the prayers and formulæ of each *Veda*, and their respective authors. The *Rig* was divided into two *Sanhitás*, by PAILA, who taught one to INDRAPRAMATI and the other to VASHKALA; each of these and their disciples made further subdivisions. The *Yajur* was divided into 27 *Sákhás* by VAISAMPÁYANA, besides the other great portion of it obtained from the sun, by YAJNAWALKYA, which subsequently branched into fifteen divisions. The *Sáma* and *Atharvan* are in a like manner extensively subdivided. The whole of these details are curious, and indicate a period long forgotten, when the *Vedas* were extensively studied: the names derived from the subdivisions, as *Taittiri*, *Vaji*, &c. still designate tribes of *Brahmans* in some parts of India, but few of any of the separate *Sanhitás* are procurable. Mr. Colebrooke has made use of these sections of the *Vishnu Purána* in his account of the *Vedas*. (A. R. Vol. viii.)

The origin of the *Puránas* is here also ascribed indirectly to various individuals. *Vyása* is said to have compiled the *Purána Sanhítá*, but he gave it to SUTA or LOMAHERSHANA, who had six disciples, SUMATI, AGNIVERCHCHÁ, MAITREYA, SINSAPÁYANA, KASYAPA, and SÁVARNI; and to them SUTA delivered six *Sanhitás*. Three of the disciples, SINSAPÁYANA, KASYAPA, and SÁVARNI, composed *Sanhitás*, also called *Mula Sanhítá*, and ROMAHERSHANA compiled another. The *Vishnu Purána*, again, it may be inferred is a subsequent compilation, as it is said to contain the substance of these four works. A list of the *Puránas* is then given as usual, omitting the *Váyu* from the series.

The remainder of the section is occupied with the detail of the duties of the different tribes and orders, and terminates with an absurd legend called the *Yama Gitá*, the scope of which is to shew, that the spirits of those who have faith in Vishnu, are not to be approached by the messengers of the infernal monarch; it must be admitted, however, that compared with the other *Puránas*, the *Vishnu Purána* does not very frequently offend with legendary insipidities of this description.

The fourth section contains the genealogies of the royal families, commencing with the lines of the sun and moon, and terminating with the kings of the *Kalí* age, until a modern period. This section has furnished the greater part of the materials with which Sir William Jones, Mr. Bentley, and Colonel Wilford, attempted to adjust the historical chronology of the *Hindús;* the latter (A. R. Vol. ix.) gives the *Vishnu Purána* as one of his authorities; the first cites a list furnished by his *Pundit*, but it is the same thing with one or two inaccuracies; as an example of these may be stated what he asserts of the four *Kanwa* princes, that they reigned 345 years, whence Sir William Jones observes, that the generations of men and reigns of kings are extended beyond the course of nature even in the present age (A. R. ii. 143.)

Adverting to the same circumstance, Mr. Bentley refers (vol. v. page 324,) the extravagant elongation of the reigns of these princes, to a deliberate attempt to fill up a chasm occasioned by placing the descendants of Janamejaya at too early a period, and cites this as one of the innumerable absurdities of the modern *Hindús.*

Colonel Wilford again observes, these *Kanwas* are said to have reigned 345 years, which is still more extravagant. (Vol. ix. page 110.)

It would scarcely be supposed, that these assertions are all founded on error. In the early stage of Sir William Jones's enquiries, his trusting to his Pandit's authority, may be excused; but it seems very doubtful whether Mr. Bentley or Colonel Wilford took the pains to verify that statement. At any rate, in four manuscripts of the *Vishnu Purána*, two in the *Devanagari* and two in the Bengalee character, instead of 345 years, the term of the united reigns of the four *Kanwa* princes is stated to be 45 years, a period neither extravagant nor absurd, nor beyond the course of nature.

The ancient dynasties of kings anterior to the *Kali* age, within the bounds of which they should no doubt be brought, can scarcely be adjusted with much consistency or satisfaction; at the same time this is a consideration rather favourable to their authenticity, as had they been the result of a systematic fabrication, they would easily have been adapted to some fixed periods, and to each other. That many inaccuracies and some falsifications have crept into these genealogies may be readily admitted; but there is no good reason to dispute the actual existence of the principal individuals commemorated, nor the general course of their ancestry or descendants. That their memory was preserved by some means anterior to the *Puránas* is established by the *Vishnu Purána.* Reference is made in it repeatedly to former traditions, and old verses are cited as illustrative of the history or character of a number of the princes of whom mention is made. (Sections 8, 10, 11, 12, 13, 19, &c.)

The 11th and following chapters of this book, to the 15th, contain a detailed account of the descendants of YADU. A curious story is interwoven into the portion that relates to KRISHNA, of his being falsely accused of having stolen a marvellous gem, the possession of which secured wealth and prosperity to its possessor, if virtuous. It was given to SATRAJIT, the cotemporary, very inconsistently it must be confessed, of KRISHNA, and his sixth ancestor, and a member of the YÁDAVA family. Apprehending KRISHNA's requiring the gem, SATRAJIT gave it to his brother, who was killed in the forest by a lion. KRISHNA hunting killed the lion and found the jewel; he returned it to SATRAJIT, who gave him in requital his daughter in marriage: this led to further family dissensions, in which KRISHNA was accused by his own brother of having under-handedly appropriated the gem to himself: he, at last, however, cleared himself in an assembly of the *Yádavas*, and the jewel became the undisputed property of his relative AKRURA. In these transactions, the character of KRISHNA, although heightened with marvels, is of a very earthly complexion; and as to BALARÁMA, it is said of him by KRISHNA, that he is unfit to be master of the jewel, because he drinks wine, and is addicted to sensual pleasures. With respect to the gem, its properties of procuring plenty to the country of its possessor, and of bringing down rain when needed, ally it to the marvellous stone, for the acquisition of which, the *Tartar* tribes not unfrequently had recourse to hostilities.

In detailing the lists of *Magad'ha* kings, the *Vishnu Purána* states, that from the birth of PARIKSHIT to the coronation of NANDA, 1015 years elapsed. NANDA preceded CHANDRAGUPTA 100 years, and CHANDRAGUPTA, as identified with SANDROKOPTUS, ascended the throne 315 B. C. PARIKSHIT was the grandson of ARJUNA, consequently the war of the *Maháb'hárat* occurred 1430 years before the Christian era. Wilford reduces this by 60 years, and places the conclusion of the great war 1370 B. C., the difference is not very material, and either date may present an approximation to the truth.

From Chandragupta to the accession of the Andhra princes, three dynasties occupy an interval of 294 years: the Andhras therefore commenced their rule about 20 years before Christ, which will agree well enough with the account of the power of the Andræ, as given by Pliny, about the end of the first century of our era. According to the *Purána*, there were 30 princes, who reigned 456 years, which brings them to A. D. 436. Colonel Wilford has endeavoured to extend them, however, to the seventh century, identifying the last or *Pulomarshi* with the Pouloumien of the Chinese Annals, who died in 648, according to De Guignes. (As. Res. ix. 87.) If this is correct, the Andhra dynasty must be imperfectly given. The commencement being corroborated by Pliny, is apparently accurate, but we want two centuries at the termination. Wilford proposes to supply part of the deficiency, which is less in his statement, by inserting seven princes, whom he calls genuine Andhras, before the Andhrabhrityas; but there is no warrant for this, and the number is inadequate to the interval required. There is however evident confusion here in our authority, the text and comment state expressly that the dynasty is composed of 30 princes, and yet even with the repetition of the name *Satakerni* five times, although it is probably intended in most cases as a title, we have but 27 names. Wilford's list, indeed, contains but 25 names. It is likely, therefore, that some of the names have been lost; and if we can suppose the dynasty to have comprised nearer 40 than 30 princes, we may extend the time of Puliman, so as to be the same with that of Pouloumien.

There is another identification in this list with the Chinese history, which may be even more readily adjusted than the preceding. The annals of China record that in 408 ambassadors arrived from Yuegnai, king of *Kiapilí* in India, the *Kapíla* of the *Bauddhas*, to which possibly the authority of the Magadha prince as Lord paramount extended. The name of the prince is clearly Yajna, and we have a Yajna Sri the 24th of the Andhra kings. Agreebly to the commencement of the race 20 years B. C. and the average of reigns authorised by the text, 15 years and five months, Yajna Sri reigned about 330, or only 78 years earlier than he appears in the Chinese accounts. If indeed, as is allowable, we consider him to be the 27th prince, being the third before the last, then the agreement is almost precise; as he will have reigned from 375 to 390, and we have only to suppose his reign one of those above the average amount, to bring him to the year 408; these identifications, however, whether made out precisely or not, bear favourable testimony to the accuracy of the *Hindu* lists, as to the existence of the individuals about the time specified: we can scarcely expect a close concurrence in the annals of different nations, at best imperfectly known to each other.

The succession of races which follows the Andhras is evidently confused and imperfect; seven distinct dynasties are detailed, extending through 1390 years, and two others through a period of 406 years: 47 princes of different tribes succeed them, to whom less than four centuries cannot be ascribed, the whole throwing the last of the Andhras back 2190 years, and computing that 4055 years of the *Kali* age had elapsed: the last periods, grafted probably, as Colonel Wilford has supposed, on the coetaneous existence of different dynasties at undefined intervals, are in all likelihood calculated to fill up the years expired of the *Kali* age, and so furnish a clue to the date of this *Purána:* if 4055 years of *Kali* had passed when the work was compiled, it was written 870 years ago, or in the year 954.

The notices that follow would present an interesting picture of the political distribution of India at the date at which it may be supposed the author wrote, if the passages were less obscure: as it is, considerable uncertainty pervades the description. It appears from it that the *Kshetriya* rule was very generally abolished, and that individuals of various castes, from *Brahmans* to *Pulindas* (mountaineers or foresters) reigned in *Magad'ha* or Behar, at Allahabad, at *Mathurá*, *Kántipurí*, *Kásipuri* or *Kanyapuri*, probably Benares or Kanouj, and in *Anugangam* or *Gangetic* Hindoostan. The *Guptas*, a term indicating a *Sudra* family, reigned over part of *Magad'ha*, and *Devarakshita*, an individual so named, over the maritime provinces of *Kalinga*, &c. the *Guhas* in another part of *Kalinga*, the *Manidhanas* in the *Naimisha*, *Naishada*, and *Kalatoya* countries, or the districts to the east of Benares and Bengal. *Sudras* and cowherds ruled in *Surat*, in *Mewar*, along the *Nermada* and at Ougein; and *Mlechchhas* possessed the country along the *Indus*, along the *Chandrab'hága*, or in the *Punjáb*, *Dárvika*, and *Cashmír:* this last statement is corroborative of the accuracy of the detail, as well as of the date assigned to the composition, as although in the middle of the tenth century, the Ghaznivide princes had not occupied *Cashmír*, yet they had extended their influence along the *Indus*, and into the upper parts of the *Punjáb*.

The fifth book is appropriated to the history of Krishna, and is possibly a graft of more recent date than the original. Although the story is told in the usual strain, yet there is this peculiarity, that Krishna is never considered as one and the same with Hari; he is only an *Ansávatara* or an incarnate portion of Vishnu; not a very distinguished one either, being only one of Vishnu's hairs (B. v. chapter 1.) plucked off by himself at the prayers of the gods, to become incarnate in the conception of *Devaki,* to be born for the purpose of alleviating the distresses of the earth.

The subsequent occurrences are related conformably to the tenor of the *B'hágavat*, and very differently, therefore, from that of the *Bhárat;* the war with Jarasandha particularly, and the adventures of Kála Yavana: it also includes what may be supposed to typify some hostile struggles between the followers of Siva and Vishnu, in the personal conflict between Krishna, and the former, as taking part respectively with Aniruddha and Banasura.

From the 34th chapter of this section, we learn that there have been spurious Krishnas amongst the *Hindus*, and Paundraka, the king of Benares, is described as usurping the title of *Vásudeva:* he is encountered by the legitimate possessor of the name, defeated and slain: his son continues the war with the aid of Sankara or the Saivas, and it should appear at first with some success, so as to endanger *Dwáraká*, the capital of Krishna: the allies however are repelled, and the holy city *Kasí* burnt by the relentless discus of the victor; the legend seems to delineate, though darkly, actual occurrences.

This book terminates with the destruction of the *Yádavas*; Krishna's being shot through mistake by a forester, and his ascent to heaven.

The last book of the *Vishnu Purána*, after describing the divisions of time into *Kalpas*, &c. expatiates on the various pangs that flesh is heir to, and directs mankind to the only remedy for them, faith in Vishnu as the Supreme.

The general character of the *Vishnu Purána* will be readily conceived from this sketch of its contents: it is a sectarial work, but of a much more sober character than such works generally possess, and appropriates to legend and panegyric, a comparatively insignificant portion of its contents: the geographical and astronomical systems to be found in it, are of the usually absurd complexion, but they are more succinctly and perspicuously described than perhaps in any other *Puránas:* the same may be said of the genealogies, and the fourth book, may be regarded as a valuable epitome of the ancient history of the *Hindús.*

The date of the compilation, it has already been observed, may be inferred to be as low as the middle of the tenth century: there are no other grounds for specifying the date, but the *Purána* is clearly subsequent to the development of the whole body of Hindú literature: the *Vedas* and their divisions are particularised, the names of all the *Puránas* are given as usual, and reference is repeatedly made to the *Itihása* and *Dherma Sástras*. In the fourth section of the third book also PARÁSARA says, Who but NÁRÁYANA can be the author of the *Mahábhárat?* It is consequently posterior to that work, in common it is most probable with all the *Puránas*. Notwithstanding this recent origin, however, the *Vishnu Purána* is a valuable compilation, particularly in its being obviously and avowedly derived from more ancient materials.

II.—*On the Standard Weights of England and India.*

The Westminster Review, No. 31, contains an able article on the imperfections of the system of measures and weights adopted by the legislature in England, upon the report of the parliamentary commission in 1825.

The reviewer justly remarks, that the fear of innovation seems to have curbed the free exercise of judgment by the commissioners, so that in fact, after all their deliberations, they did little more than settle the discrepancies of various standards to the thousandth part of a grain, and lop off four and a half grains from the avoirdupois pound! In most other respects the country is left in as much confusion as before, with two kinds of lineal measure;—two kinds of superficial measure;—three kinds of cubic measure;—and not only two kinds of weight, but these so exquisitely varied, that the larger pound has the smaller ounce!

In lieu of so perplexing and anomalous a state of things, the reviewer proposes to substitute a system founded on a simple and a rational basis: viz.—that some fixed length, a foot for instance, shall be taken as the unit of lineal measure; that the square of this shall become the unit of superficial measure; and the cube, the unit of solid measure. We do not propose at present to advert to his arguments on the inconveniences of our numerous linear and square measures,—but on the subject of weights, we will endeavour to show the kind of system which he represents as capable of formation out of materials at hand, with only such little modifications as would not practically be felt in the ordinary affairs of commerce.

He first premises as a maxim of utility, that the current coin of the country should be closely connected with the weights; accordingly,—the pound of standard silver being coined into 66 shillings in England, it is evident that 11 crown pieces weigh 10 oz. troy, leaving a very simple ratio for the conversion of one into the other: the crown (436.36 grs.) is also nearly equal in weight to the avoirdupois ounce (437½ grs,) and might be substituted for it practically without much inconvenience: moreover, 1000 crowns are exactly equal in weight to a cubic foot of distilled water at the temperature of 15° cent. (59° Fahr.) (436363 grs.)

From these data, it becomes a very easy problem to frame a system of weights, measures, and coin connected together in simple ratios, uniting all the benefits of decimal numeration, and still maintaining tolerable accordance with the weights now in use. To give a general idea of the combination proposed, without entering into its details, we present the following scheme alongside of the existing system.

Proposed Crown Weights.	*Weight in crown grs.*	*Weight in troy grs.*	*Remarks.*
One crown grain, . .	1	0.91	one troy grain = 1.1 crown grain.
20 gr. = 1 scruple,	20	18.18	
3 sc. = 1 dram, . .	60	54.54	
8 dr. = 1 oz. (or cr.)	480	436.36	(the avoir.oz.now is 437.5 tr. gr. or 481.25 cr. gr.)
16 oz. = 1 pound, .	7680	9681.82	(ditto ditto, lbs. 7000 ,, or 7700 ,,)
100 lb. = c. lb.	768000	698182	(the cwt. av. wgs. now 784000 or 862400 ,,)
500 lb. = 1 qr. ton,			tr. gr. cr. gr.
2000 lb. = 1 ton, .		13963636	(the ton weighs now 15680000 or 17248000)

Measures of Capacity.

1 oz. = 1 cubic digit (or 0.1^3 foot) = the proposed liquid ounce.
1000 oz. = 1 cubic foot of distilled water, at 59° Farht. or 15° cent.
10 oz. marked x = ½ pint.
20 oz. marked xx = 1 pint.
40 oz. marked xxxx = 1 quart.
160 oz. = ONE GALLON (the present imperial gallon = 10lb. av. or 10 cr. lb. + 200 c.g)
8000 oz. = 500 lbs. = 1 hogshead = 50 gallons = 8 cubic feet = cube of 2 feet.
1000 lbs. = 1 pipe = 100 gallons = 16 ditto.
2000 lbs. = 1 ton or TUN = 200 gallons = 32 ditto.

It must be confessed, that the higher numbers in this scheme both of liquid and solid weights are too much at variance to obtain easily a footing in commerce, and in many respects as good a system might have been framed with the preservation of one only of the pounds and the present troy grain.

The most fortunate hit in the scheme of the reviewer is in the fortuitous circumstance of 1000 crown-pieces, of our present coin, counterbalancing precisely a cubic foot of pure water at 59°. A fact worth carrying in the memory, at any rate, for although five shilling pieces are but rarely seen in currency now-a-days, it may be convenient for those who experimentalize upon water in regard to evaporation, rain, discharge of pipes, and the like, to know that they carry a *decimal divisor* of the *liquid foot* in their pocket. But the crown piece of our coinage is already allied to the pound troy, as the coin must always be by the very provision that the "pound troy shall be coined into so many shillings or aliquot parts." The pound troy then is actually the standard unit of weight and coinage, and however plausible a scheme may be brought forward, unless it adheres to some such fixed point of very general prevalence, it may be looked upon as merely speculative, and not likely to gain admittance among practical men.

The troy pound is coined exactly into sixty-six shillings. The troy ounce therefore weighs 5s. 6d. without any fraction. The weights of every other coin, and the value of all the other systems of weights used in commerce, such as the avoirdupois, the liquid measure, &c. are expressed in terms of the troy grain, which is nothing but a subdivision of the *troy pound unit*, so that although a multiplicity of standards has been made up for preservation and comparison, this alone is entitled to the name of STANDARD. It was to simplify the connection of the avoirdupois weight in relation to the latter that it was changed from 7004½ to 7000 grains; the latter number however is almost as irrational as the former, and it would have been far better to have expunged the anomalous avoirdupois weight altogether; or, if it were thought absolutely necessary to preserve a heavy weight, a *pakka wazn* as the natives of India would call it, it might have been made one-third heavier than the troy pound, or 7680 grs. :— this would have been divisible by 16 into an ounce identical with the troy ounce, and when multiplied by 100, for the *hundred weight,* would have given a weight (of 7680000 grs.) nearly equal to the present clumsy cwt. of 112 av. tbs. or 7840000 grs. and equally applicable to all the wholesale operations of commerce, without necessitating any change of the customs charged on the gross weight, or even affecting the price-current of most commodities in the market.

But it is useless at this time, and at this distance from the scene of its operation, to comment upon a system now irrevocably adopted. It must ever be regretted, that a scheme of such national importance did not chance to fall under review under the ministry so eminent in science as the present Lord Chancellor of England.

The subject was brought to our notice principally by a measure now in agitation before the Government of British India, for the adoption of some law respecting the weights and measures of this country, in which at present so great a confusion prevails that it is almost impossible to say what is the recognized standard in either, even at the presidency itself.

The Indian system, when the English first became acquainted with it, combined all the advantages of a direct connection between the coin and the unit of weight*. They were in fact the same thing, until the regulation taking force from the 1st January, 1819, changed the standard purity of the coin by an addition of copper, without altering its value in pure contents of silver. This measure increased the weight of the rupee by an awkward fraction of $\frac{12250}{176666}$ parts, and rendered all subsequent conversions of weight into money a matter of intricate calculation ; for the old rupee was still retained as the unit of weight under the title of *sicca weight*, in contradistinction to the newly introduced *sicca rupee :* and it was allowed still to regulate the weight of the bazar maund, which was forty seer of eighty siccas each.

Subsequent changes in the upper provinces and in the other presidencies have had similar effects of introducing new weights, and although the object aimed at by the home Government has been all along that of equalizing the whole, yet, for want of a common basis to proceed upon, and of due combination in carrying their measures into effect, nothing more has been attained than mere approximations, as perplexing to the admirer of uniformity as the original system itself. It would lead us into lengthy observations to explain the steps taken at each place, to bring about an accordance of the several rupees to that ordered by the Court to be made the standard of India ; and as our object is to shew how all may become even now amalgamated into one system, connected directly with the standard of England, it will suffice to state, what our materials are at the present moment :

Appellation.	*Weight in troy grains.*
Calcutta sicca rupee,......	191.916 gold mohur, 204.710
———— sicca weight, ...	179,666
Lucknow rupee, in weight, ...	172.101 (value in Standard 180.705)
Furukhabad rupee, used as a weight up the country, where the old weight has disappeared,.........	180.234
Sonat Rupce, (nominal,)	183.644
Madras and Sagur rupee and weight, ...	180.000 (Madras mohur 180)
Bombay Rupee, in weight, (since ordered to be made 180 as at Madras,)..	179.000 but in Standard value 179.642

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* The genuine Indian *weights* were the *jo* or barleycorn, the *rati, masa,* and *tola :* 7½ jo = 1 rati : 8 ratis=1 mása=17.708 grs. 12 mása=1 tola=2125 grs. but these are now become obsolete, and are only known to jewellers, or beyond the provinces under British rule.

Bazar maund at Calcutta, ...	82 lbs. 2 oz. 2.055 dr. avoirdupois.	
———— at Benares, ...	82 lbs. 6 oz. 5.9	
Salt maund of 82 siccas to the seer, ..	84 lbs. 203. 15.7 drs.	
Factory maund, ...	74 lbs. 10 oz. 10.666	
Madras candy of 20 maunds, ...	500 lbs.	the md. = 24 lbs. 2 oz.
Bombay ditto of 20 ditto, ...	560 lbs.	28 lbs.

The Calcutta or pakka maund is also used at the latter place, and in bullion is received at the Madras and Bombay mints by the pound *troy*, as it is in England: in purchases of native produce, bazar weights are used, which vary in almost every different district: in transactions with the Company's commercial agents, the factory maund is employed; in salt purchases a maund of 82 siccas to the seer; opium is sold in packages of 133 to 140 lbs. to suit the Chinese *pikal* weight; while again for exportation to Europe, English cwts. or lbs. must be entered in the invoice, so that in one merchant's godown there are generally not less than three species of weights, and it is matter of experience, that continual mistakes will occur in their use, unless, as is seldom the case, they are marked in very legible characters, intelligible not only to Europeans, but also to the native weighmen.

It was not long since a case occurred in which the weights of a commercial establishment were found to be in error eight or ten per cent.: it may be very fairly supposed, that this proceeded from the confusion of the weights of different systems, although it must be acknowledged, that a skilful *podar* would very soon perceive differences of such large amount, and if he were inclined to take fraudulent advantage of them, could do so without much risk of discovery. It has been at times source of complaint, that the receipt and delivery weighments at the custom-house are at variance; in short, if it be desired to clear away all suspicions of wilful or accidental error, and to simplify to the utmost the transactions of commerce, it can only be done by adopting one system of weight; abolishing all others by common consent, and establishing means of adjustment and verification accessible to all parties.

We shall now offer a few hints on the system which appears most eligible from its simplicity, its connection with existing things, and its ready adjustment to the standard system of Great Britain; our reason for doing so, through these pages, in the first instance, rather than in a direct appeal to the proper authorities, where we have every reason to know they would meet with proper consideration is, that the question is one of universal interest, and, where the convenience of the public is concerned, the more such a measure is canvassed, the more likely will it be to have its faults and objections pointed out, and improvements, either radical or collateral, suggested.

1. At first view, it is obvious, that the Calcutta sicca *weight*, so called, (179.666 grs.) and the several rupees (or weights) of the upper provinces, and of the Madras and Bombay presidencies, though not identical (varying from 180.7 to 179 grs.) may be made to coincide, without the slightest effect upon commercial proceedings and a number of small perplexing difficulties may thus be avoided.

2. The advantage of assuming in even numbers 180 grains for the sicca weight of all India would be equally obvious in dealings with England, both in coin and in goods ; for the bazar maund, being 40 seers of 80 siccas each, would be equal to 576000 grains, or precisely 100 of the standard troy pound of Great Britain. The difference from its present weight would be a little short of ten sicca weight, or two *chitaks*, a quantity far too small to be influential ; and if a number of weights were at once adjusted on such a system, they might be dispersed throughout the country, and introduced at once, without disturbing the public mind by any talk of innovation. The seer weight would be exactly equal to $2\frac{1}{2}$ pounds ; the pound troy would equal 32 sicca weight ; $2\frac{2}{3}$ *British Indian rupees* would weigh 1 oz. ; and 1 rupee would weigh $7\frac{1}{2}$ dwt.

With regard to the connection of the maund with the avoirdupois weight, of course a simple relation could not be formed : in practice it would remain nearly *in statu quo ;* in theory it will be at any more simply connected than at present in the ratio of $82\frac{2}{7}$ to $82\frac{3312}{70000}$, or 82 lbs. 2 oz. 2.055 drs. ; the maund would represent $82\frac{1}{4}$ lbs. aver. within a trifling fraction.

3. Should it be necessary to retain the Calcutta sicca rupee, which has, at present, by law, the weight of 191.916 grs. troy, this fraction might with great convenience be made at once 192 grs. or exactly $\frac{1}{15}$ in excess of the proposed sicca weight, so that the up-country rupee would be precisely equal to 15 annas, instead of having a small fractional difference as at present. Thirty sicca rupees would then weigh 1 lb. troy, and, if the standard were the same, would be equivalent in value to 66 shillings, the rupee being $= 2\frac{2}{10}$ shillings.

Regarding the difference of standard alluded to, we would fain say a few words, although the subject may prove too technical for general readers to follow. The Indian standard of silver contains $\frac{1}{12}$ of alloy : English standard silver has contained by law ever since the time of William the Conqueror 18 dwts. in the pound, or $\frac{18}{240}$, being $\frac{1}{120}$th *purer* than that of India. Until the last year, however, on account of an error in the ancient Parliamentary standard plates of England, the coin of both countries has been coined $1\frac{1}{4}$ dwts. too fine, so that in reality our Indian coin has been only $\frac{3}{4}$ dwts. worse, or almost equal to the English legal standard. Now, that the error has been corrected at home, and has been brought to the notice of the proper officers here, with a view to the introduction of a similar correction, would it not be far simpler to equalize the two standards at once by raising our purity $\frac{3}{4}$ dwt., instead of lowering it $1\frac{1}{4}$, and making it differ from almost every coin on the globe? The Spanish, the Portuguese, the Mexican, and the North American dollar; the French franc, the German and Swiss, (since the confederation,) and the Italian coins, all contain $\frac{1}{10}$ alloy, and were it advisable to deviate from the English standard at all, it might be better to adopt that simple and almost universal system: but now that England has determined to supply her colonies with her own currency in silver coin, it may be perhaps better that the rupee of her Indian possessions should conform thereto as nearly as possible,—and if so, the present opportunity of equalizing the standard should not be allowed to pass by. There is another argument in favor of the measure, namely, that the proposed improvement in quality is nearly balanced by the proposed reduction in weight of our up-country rupee from 180.234 to 180.0 grains, so that there would be no appreciable difference in commercial or revenue transactions.

It may be urged against the alterations suggested, that they will render useless the splendid standard weights sent out to the several mints of India, by the Honorable Court of Directors, for the express purpose of adjusting the weights of the country: but such is not the case, for these magnificent standards comprize complete sets of troy weights, avoirdupois weights, and bazar weights, and it is the first of these only which can be regarded as the true standard of comparison whereby the other two are to be verified. The Bazar weights may by means of the troy standards be made to conform to the proposed system with the greater facility, because there will be no fractional discrepancies.

We read some time since in the *Government Gazette*, a notice of the verification of the standards alluded to, which was made by order of the Court upon their arrival in India; it gives a high idea of their great exactitude, and of the superior excellence of the superb balances by which these results were obtained: they were sent out by the Honorable Court in the year 1829, and are deposited in the new mint. Assuming the 1 lb. troy as unit, the errors of the following weights were respectively:

On the single troy grain,...... — 0.0019 grain.
the sixty pound troy, ... — 1.90
the one pound avoirdupois, — 0.04
the fifty-six pound ditto, .. + 0.71
the sicca weight, ... + 0.003
the maund, ... + 0.2

A brief description of the principles of the construction of these balances, and of the improvements introduced by Mr. Bate, was given in the GLEANINGS, vol. iii. p. 220.*

Since the examination above alluded to, the standard measures of capacity have also been verified, and have been found equally creditable to Mr. Bate, their maker. They are brass cylindrical vessels, covered with flat glass discs pierced through the centre with a small aperture, so that the quantity of distilled water contained in them may be ascertained with perfect accuracy : ivory handles are attached to them, to prevent an undue influence on the temperature of the metal from the contact of the hand. With due allowance for the temperature of the water used in the experiments, the trifling errors of capacity, expressed in weight of water, were as follows :

Names of measure.	Weight avoirdupois.		Temperature.	Calculated excess in grs.	Observed excess in grs.	Error of capacity in grs. of water.
	lb.	oz.	°			
Gallon, ..	10	0	77.4	95.97	93.4	+ 2.57
Half gallon	5	0	77.3	47.59	47.8	— 0.21
Quart, ...	2	8	77.3	23.78	26.3	— 2.52
Pint, ...	1	4	77.2	11.80	8.0	+ 3.80
Half pint,	0	10	77.0	5.80	6.2	— 0.40
Qr. pint, ..	0	5	76.9	2.87	2.7	+ 0.17

The only material error is in the pint measure, where it is equal to 0.015 cub. inch or about three drops; in all the others but the quart the difference is much within what would be caused by a single degree of temperature higher or lower, and consequently within the limits of experimental error. We hope soon to see the liberal intentions of the home government in supplying these splendid instruments of comparison, followed up by a gradual review and reform of the existing multifarious system of weights and measures in their Indian possessions.

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* It is recorded in the *Ayeen Akbery*, that the great Akber caused the royal standard weights of his empire to be made of polished agate, from the barley-corn up to the 140 *tank* weight (about 1 lb. troy). His example is worthy of imitation everywhere, but more especially in a country where metals are so liable to injury from damp, and acrid perspiration. The new standard weights, although doubly gilded, already exhibit incipient specks of oxidation.

III.—*Remarks on a late Paper in the Asiatic Journal on the Gypsum of the Himalaya. By the Rev.* R. Everest.

In the July No. of the Asiatic Journal, there is some information given us on the gypsum of the Himalaya, for which the thanks of all lovers of geology are due to the writer (Capt. Cautley). But as it is accompanied by a theory of the formation of gypsum in general, which seems to have been hastily adopted, and which a more mature consideration of the subject would probably induce him to reject, I shall make no apology for pointing out what I believe to be his error, lest others should be misled by his authority.

Having stated a doubt among geologists respecting the gypsum of the Alps, viz. whether it is primitive or transition, he proceeds to describe the gypsum of the Himalaya, and having done so, thus expresses his opinion as to its origin.

> " A question of considerable interest arises from the appearance and position of the above-mentioned deposits, which, as mentioned in a former part of this paper from their position under rocks of the primary and secondary classes acquire an *appearance of antiquity*, not borne out by the general history of the mineral; viz. that the gypsum throughout the globe is simply an *infiltration* analogous to the tufa, and calcareous deposits; and depending on causes chemically similar; the sulphuric acid being the active generator instead of the carbonic. *If in the proximity of sulphur an excess of oxygen would produce sulphuric acid, a difficulty is removed, and the contact with lime-rock, or carbonate of lime would, it may be supposed, produce its sulphate or gypsum; and I cannot perceive the improbability of such a process having been, or being still in force;* or that nature's laboratory might not have been as active in the dissemination of gypsum, as it is in the present day, of the calcareous tufa."—vide p. 293. And again, p. 295. " If therefore, where carbonate of lime, sulphur, and water are abundant, the chemical change above-mentioned is allowed, or is supposed from analogy, to be a probable consequence, gypsum can no longer be entitled to a place in either primary, transition, or secondary classes; but must be considered as an adventitious formation common to all ages, and produced by causes analogous to the present rapid formation of calcareous tufa. Among our primary and transition rocks, none can be assimilated to the stalactitic carbonate of lime; among our secondary or latest class of general rocks, there is none like the gypsum, that is to say, *we know of none actually forming at this day.* Causes that led to the formations of such abundance of gypsum formerly may, from unassignable reasons, no longer exist; and those which produce the tufaceous carbonates, then at rest, may now be in full vigor."

Did the writer, when he thus proposes as original the opinion of the formation of sulphuric acid from the proximity of sulphur and water, forget that it is the common solution of one of the most common phœnomena in geology, I had almost said, in nature; and never doubted? In almost every bed of clay, where sulphuret of iron and calcareous matter are present, and the bed is so loose as to allow of infiltration, the sulphuret is decomposing and the sulphate of lime forming? Did he not know that the same solution was commonly given and received for the presence of the abundant sulphuric and sulphurous acids, which both rise in vapours from the craters of volcanos and impregnate the mineral waters near them; viz. that they were produced by the decomposition of sulphur and sulphuretted hydrogen. Has he never heard, for instance, of the phænomena of the "Solfatara" near Vesuvius, and the manner in which they are accounted for? Lastly, when he asserted that "we know of no gypsum actually forming at this day," had he forgotten that gypsum, as well as the tufaceous carbonate, is actually forming at present? In proof of this, I will refer him no further than to a popular treatise of the day, Lyell's Geology, (vol. I.) Under the head gypsum springs, he may see a notice of that at Baden near Vienna; and a little farther back he will find an account of the baths of San Filippo, where three copious springs deposit calcareous carbonate, with gypsum and sulphate of magnesia.

Having accounted for the formation of gypsum, and thus rendered it probable that some gypsum beds are deposited by infiltration, i. e. by the insinuation of the mineral in solution into cracks and fissures, he comes to the general conclusion that all gypsum is produced by infiltration. That gypsum is analogous to calcareous deposits, is certainly true, but if he had recollected the manner in which calcareous deposits took place, he would have seen that great part of them could not be said to be caused by infiltration. Thus, when a spring containing carbonate of lime in solution issues to the surface, most of its mineral is carried to a neighbouring river; by the river to a lake, or to the sea. We have instances of calcareous beds now forming at the bottom of lakes, and, though we can have no direct evidence of what is going on at the bottom of the sea, we have good reason to believe, that the same process is taking place there. Now the same reasoning holds with respect to sulphate of lime. It is carried down to lakes and seas, and must be precipitated, owing to the evaporation which is continually taking place. If we examine the deposits of carbonate of lime and gypsum, which together constitute great part of our later strata, we find that they tally with the above supposition; viz. that they are precisely such as would have been deposited at the bottom of the lakes or shallow seas. The different remains found in them, the shells, the aquatic vegetables, the amphibious reptiles, the fishes, the mammalia, all point to the same result. Take, for instance, the

Paris basin, as it is called. Here we have gypsum interstratified with beds of sand, marl, and carbonate of lime; now what reason have we to suppose that the gypsum was deposited by infiltration any more than the carbonate of lime, or indeed than the sand and marl; for they too may be held in suspension by springs, as the others may be held in solution. Do not the remains found in each prove that they are all of the same era? The writer talks of the absence of vegetable remains in gypsum. Did he never hear of any in the gypsum near Paris? Moreover, if we *must* suppose the process of infiltration to have taken place for the gypsum, and for that alone, we must also suppose that the place it now occupies was once a hollow. That is, in the country round Paris a subterraneous cavity existed, a few feet in depth, but occupying an area of many miles in extent, covered by a roof composed of loose beds of sand and gravel. The writer may have seen, in examining mines, the great difficulty of driving a tunnel through soft strata, wide enough even for a man to creep through, and the artificial supports it must receive. What could have supported the cavity, we just now supposed, before the infiltration was completed? I forbear from extending these arguments to the gypsum of the earlier secondary formations, but they are equally applicable to them. The writer states that all geologists are agreed as to many beds of gypsum being secondary. One would have thought that circumstance might have made him hesitate before propounding his theory, and conclude, they had some good reasons for doing so. As I have never examined the gypsum of the Alps, I cannot enter into that part of the question; there are one or two other points, however, which I cannot pass over, as they seem like a revival of the obsolete doctrines of Werner. The writer esteems it almost matter of certainty, that the origin of all gypsums is contemporaneous, from the "exact resemblance both in texture and crystallization that they all bear, whether Alpine, or those varieties found with the secondary rocks: a similarity that does not exist in any of the limestones formed at different periods." To refer him no further than the same chapter of the same book, I have already quoted (Lyell), we find there that a rock is now depositing in Italy from a spring, "which cannot be distinguished, in hand specimens, either in grain, colour, or composition from statuary marble." I have myself seen on the continent of Europe a secondary limestone, not distinguishable in texture and crystallization from the primitive marbles which are usually found in beds in mica-slate. Many other instances might be cited to the same effect. Nor is the writer more fortunate in two other assertions he has made, viz. that "quartz veins are the type of transition," and that primary rocks " are never found reposing on the newer formations."

That identity of mineral structure proves formations to be contemporaneous, and that the order of superposition is invariable, were doctrines laid down by Werner, and for a long time received as axioms in geology. But of late years, a further insight into the phænomena of existing volcanos, and a more extended research over the surface of the globe, have brought both these propositions into doubt, and tended to confirm a belief that natural causes at present in operation are adequate to produce all the appearances that are presented to us. I cannot quote an example of quartz veins in secondary rocks from memory, and at this distance in the country having few books to refer to, I must be content with Jamieson's Mineralogy. It is there stated, under the head quartz, that quartz veins are found in secondary rocks as well as in transition. But I could name a locality, in the north of Europe, of granite overlying a transition limestone, and I can refer to Humboldt, as quoted by Daubeny, (on volcanos, p. 350,) for the following as an ascending series : No. 1, granite ; 2, Alpine limestone ; 3, granite. To the same chapter of the same work I would refer for a description of the porphyry of South America, not distinguishable from the transition porphyry of Europe, which as well as sienite, gradually approximates to trachyte, and passes into it ; so that Humboldt considers there is no natural line of separation between the transition and modern volcanic formations of America. What then becomes of the doctrine of contemporaneous origin ? It may be matter of convenience to preserve the classification of primary, transition, secondary, and tertiary rocks, for want of a better or as indicative of certain organic remains. But it is prejudicial to the cause of truth to ascribe to the opinion more importance than it deserves ; especially in a country as yet almost unstudied, where the disciples of it *must* go forth predetermined to find analogies to the European formations, and to overlook discrepancies.

It may appear presumptuous in me to hazard an opinion respecting a rock which I have never seen, but one or two circumstances mentioned by the writer lead me to believe, that the gypsum beds described by him in the Himalaya are not posterior to the formations with which they are connected. The first of these is, that they are interstratified with a reddish argillaceous schist. Now although it may be conceived to be possible that liquid sulphate of lime might have been forcibly thrust between two layers of rock of a different nature, as we see is frequently the case with lava, trap, and granite ; there is nothing in the history of gypsum which leads us to believe it would happen. It is but rarely found in veins, and never is, I believe, the sole substance that fills a vein. My second reason is, that he describes it as passing into the limestone with which it is connected. Now, it is usually inferred, that rocks in juxta-position, which approximate and gradually pass into each other, are contemporaneous, or at least next in succession to each other. The passage of one into the other at least proves, that the one, if not semi-fluid, was loose, earthy, and unconsolidated, so as to admit of being penetrated by the other, at the time of their junction.

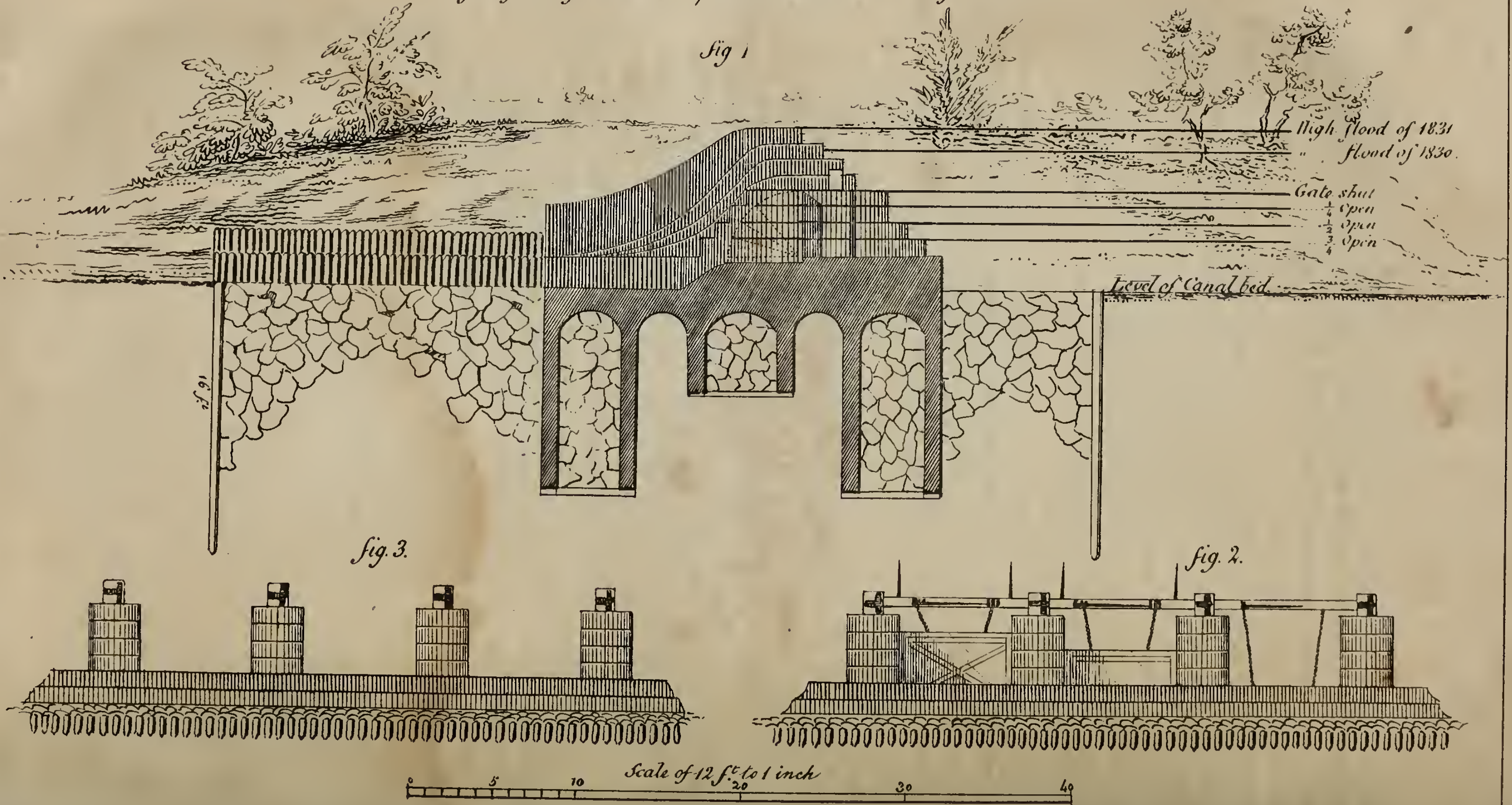
IV.—*Description of the Regulating Dam-Sluices of the Doab Canal.*

To provide a clear and open water-way during floods, unimpeded by the superstructure, which is generally attendant on sluice gates, and to facilitate their removal on sudden freshes, the following construction has been adopted at the dams over the large mountain torrents that cross the Doab canal in the country north of Sahárunpúr. Although merely a modification of the old self-regulating gate, it may be perhaps worth noticing, as I am not aware that an arrangement similar in detail has either been put in practice before in works of this nature, or that gates depending on lower pivots for their movements, have ever been alluded to in any books treating of canal works.

It may be necessary to mention, that the mountain torrents which cross the lines of the Doab canal, in their northern extremities, only flow during the rainy months, when continued falls of rain in the lower mountain range, and on the belt of forest that skirts them to the south, give rise to very sudden and rapid drainage, which being effected on the line of these rivers, or as they are provincially termed *rows*, cross the canal at right angles, and pass off by a series of sluice openings, fixed in masonry dams across their channels. On these occasions the volume of water is not more to be guarded against than the quantity of floating logs, large forest trees, roots, grass, &c. that the water collects in its course, for all of which a passage is as absolutely necessary as for the water itself. As the canal supply of water depends entirely on these masonry dams, and the facility of regulating the sluices in them, so that they may remain closed and be opened upon the occurrence of sudden freshes, is of absolute necessity, the main point, to be attended to, is to provide openings sufficiently large for the escape of the greatest quantity of water that the channel will carry, yet of such a size that the opening and shutting of the whole line can be effected in the shortest possible

SKETCH of GATES

for regulating Dam Sluices as practised on the Muskurra & Nogaon Rivers



Calcutta J.B. Tassin lith.

time, and with the least possible labor; at the same time avoiding the application of superstructure in the shape of a fixed road-way and lifting gates; in short, to throw the whole dam as open as possible, and to relieve it from any obstructions that may interfere with the free passage of the floating timber, &c. It will appear evident, that, the best sort of dam in a position of this nature would be a simple flooring of masonry, with flanks of the same material; the bund or bank for retaining the water being constructed of earth, gabions, &c. which although it would be annually washed away during the rains, would be repaired at a trifling expense, and the space of masonry between the flanks would provide an escape sufficiently ample, and at the same time perfectly free and unimpeded by any interruptions from piers, &c. in its width. This species of dam would best suit a situation, where the heavy freshes only rise once during the year, and springs of sufficient abundance occur below the works to keep the southern line of canal supplied with water; but in the present case, the destruction of these bunds or dams, and the loss of the head supply from the mountain streams, would leave the canal nearly dry, as there are but a few scanty springs in the southern limits. To meet this difficulty the following form of sluice has been introduced in the dams over the Rogaon and the Muskára rivers, on the Doab canal works; and as the experience of two rainy seasons has proved its efficacy, and shewn a facility of working, which was in a measure unexpected, I cannot do better than enter into a short description, accompanying it by a sketch, which will also exhibit the high-water mark of the floods that have occurred within the last two seasons.

Fig. 1—Represents a tranverse section through the centre opening of the Muskára dam. The gate being closed, the flank revetment is shewn at the back. The horizontal lines explain the different levels at which the canal supply may be regulated. The two upper lines shew the high-water marks of floods in the rains of 1830 and 1831. The former of 8 feet 9 inches, and the latter of 10 feet, from the flooring of the dam.

Fig. 2—Shews an elevation of three openings of the dam, with the sluice gates at different angles, the windlasses and chains fixed, &c.

Fig. 3—Shews three similar openings, with the gates dropped, and the windlasses, chains, &c. removed, as happens in the height of the rains, when the rivers are subjected to continual floods. The gates moreover act as self-regulators on certain occasions, especially on the approach of the flood water from the hills, which is generally sndden, although its approach is perfectly well known to the inhabitants of this part of the country.

The gates are made to fit the grooves in the masonry as closely as possible, so as not to fall by their own weight, but to depend on the increased pressure of the rise of water for their removal in these sudden floods: the arrangement on these occasions is simple, the catches fixed to the bit-heads are removed from the ratchet wheels at the end of the windlasses, and the handspikes being removed also, a rise of a few inches in the water throws the whole dam open at once—a method that is usually practised in the cold-weather floods, and when the rise of the water is not very great. In the height of the rains, the logs of wood and rubbish borne in the waters makes this out of the question ; fig. 3 being the state of the sluices at that period.

August 18, 1832, *Northern Doab.* B.

V.—*Note on the Jabalpúr Fossil Bones. By* James Prinsep, *Sec., &c.*

[Read at the Meeting of the Physical Class, 3rd October.]

In consequence of a hint from Dr. Hugh Falconer, that he had heard of the discovery of some fossil bones at Jabalpúr, I inserted a notice in the June number of the Journal, soliciting information on the subject from some of my correspondents on the Nerbadâ.

I am happy to say, that my appeal has not been ineffectual, and that the subject has been taken up with zeal by Doctor G. G. Spilsbury, Civil Surgeon at Jabalpúr. That gentleman has sent me by dâk three specimens of the fossil bones for presentation to the Society, promising a further supply when the season shall enable him to visit the spot, and offering to conduct any extended investigations which the Physical Class may point out as desirable to elucidate the subject. Doctor Spilsbury informs me, that the fossil remains were discovered by Captain Sleeman two years ago. They are not mentioned by Capt. Franklin in his survey of that part of the country, printed in the 1st pt. *Trans. Phys. Cl.* neither by Dr. Voysey, nor Captain Coulthard: Captain Sleeman is therefore entitled to the sole credit of having brought the interesting fact to light, and we may hope from his official situation that he will zealously take measures for making a particular examination of the spot, so as to extract if possible some fragments of bone in better preservation, and enable us to ascertain to what animals they belong, and to what epoch of the world's history they may be referred.

Dr. Spilsbury describes the locality as being about 1½ miles N. E. of the residency at Jabalpúr, on the northern side of a broken range of limestone hills, capped with a horizontal layer of trap, rising from the valley of the Nerbadá, about 150 feet to the east of the small rising ground, where the petrified tree was discovered, which is in the museum.

The three specimens sent are in too mutilated a condition to enable us to pronounce what they may be, but the osseous structure of the two first is very apparent.

They differ materially from the fragments of Himalayan fossil bone brought down by Mr. Royle in January, inasmuch as the latter contained its natural quantity of animal matter unaltered, whereas all of these now before us are thoroughly mineralized,—that is, the whole of the animal substance has in them been replaced by earthy matter, which proves to be of different quality in each; the following are the results of a hasty chemical examination of them.

No. 1.—In this specimen, the osseous part has become quite friable and white, as if it had been burnt, while the membranous fibre has been replaced by crystals of carbonate of lime of a delicate greenish hue: I separated a small portion of these crystals with care, and analysed them by solution in muriatic acid, in a glass measure over mercury: the carbonic acid disengaged was equivalent to 82.5 per cent. of carbonate of lime; the remainder was phosphate, which had adhered to the crystals. The white part treated in a similar way gave,

Carbonate of lime,..	14.0
Phosphate of lime dissolved with ditto and precipitated by ammonia,..	85.5
Needle-form silicious fibres evidently deposited by infiltration,..........	0.5
	100.0

There was no trace of animal matter.

No. 2.—The appearance of this bone is more compact than the first: the membranous texture has in some places taken a fine peuce color, and in others a green tinge: treated as before, or rather calculating the carbonate from the *weight* of gas expelled; and the phosphate from the amount dissolved by the acid, in excess of the carbonate, its composition was,

Carbonate of lime,......	16.0
Phosphate of lime, ...	71.0
Skeleton of silex more complete than the first; color jasper red, ...	13.0
	100.0

No. 3.—This specimen has become almost entirely silicified; it scratches glass; does not effervesce with acids, and only yields one per cent. to boiling nitric acid: it is unaltered before the blow-pipe.

Before Mr. Royle went home, he gave me a fragment of porous calcareous stone, found by him somewhere on the banks of the Jamna, which he imagined to be fossil bone: I did not then minutely examine it, but I am now happy to confirm his opinion, and only regret, that I have not the locality to pursue the inquiry further: the animal matter of this specimen, No. 4, is gone, and is replaced only by loose dirt: the composition of the osseous part is,

Carbonate of lime,......................	18.0
Phosphate of lime,......................	80.0
Brown ochreous residue,.............	2.0
	100.0

The ammon. precipitate of phosphate was digested in sulphuric acid, and converted into sulphate : the filtered solution was then proved to contain phosphoric acid by its behaviour with muriate of magnesia and ammonia. The analysis was not carried farther than to the demonstration of the presence of he phosphates generally, and their amount in round numbers.

The Ava fossil bones were found to be mineralized also, and to have lost their animal matter, but they differ again from either the Himalayan or the Jabalpúr fossils in regard to the mineralizing substance, and are of two distinct kinds.

4. The first, a dark brown heavy substance, is impregnated with iron clay, yielding on analysis,

Carbonate of lime, ...	25.	100.
Phosphate of lime dissolved in nitric acid, ...	34.	
Silex and oxide of iron, &c.--not dissolved. ..	41.	

5. The second or earthy bone from Ava proved to be wholly converted into carbonate of lime, colored merely with a little clay-iron of a dirty greyish brown.

VI.—*List of Articles of Materia Medica, obtained in the Bazars of the Western and Northern Provinces of India.* By J. F. Royle, *Esq. late Superintendent of the Botanic Garden, Sehárunpúr.*

The following table was by no means drawn up with a view to publication; thinking it however eminently fitted to assist naturalists in India in pursuing their investigations of the natural products of the country, we obtained the author's permission to make use of it as it is. In the 11th volume of the Asiatic Researches will be found a catalogue of a similar nature, drawn up by Dr. Fleming and Professor Carey, of such articles of Materia Medica, drugs, minerals, and plants as were procurable in the bazars of Bengal, with notes of the uses and qualities of many of them. The present table contains very numerous articles foreign to that list, and to these provinces altogether; and besides the advantage of the progress of botanical knowledge since that time, the plants of many of the drugs not cognizable by their external appearance have been procured and cultivated by Dr. Royle in the Sahárunpúr Garden, to ascertain their real nature, and to compare them with the description given in the works of Aristotle, Dioscorides, Pliny, Avicenna, and the ancient Arabic authors. These remarks relate more particularly to the voluminous catalogue of plants, &c. taken home by Dr. Royle, which we hope ere this has been put into the publisher's hands; but the present epitome of such substances as were procurable in the open bazars is entitled to the greater confidence, from having been corrected by those more ample tables. Where uncertainty prevails about any article, it has been left in blank to be filled up hereafter with a pen ; and we shall take care to advise our readers when we obtain any information for the completion of the list. Meantime, we can but recommend to others to make similar catalogues in Central, Southern, and Eastern India, so as to form an appendix to the one before us.

The alphabetical order followed by Dr. Royle is, it will be seen, that of the Arabic language, because the names in the first column are mostly those which occur in the Arabic medical works. This can be attended with inconvenience only to the very few in India who may be ignorant of the Persian alphabet; whereas, on the other hand, it affords facility in recognizing the native names, and in referring to native works: besides which, those who are acquainted with the oriental name (and such acquaintance is implied in a catalogue giving English synonymes) can more readily seek for it under the Persian initial than under the English, which may vary *ad libitum* according to the system, fancy, or ignorance of the writer.

The numbers in the first column refer to the specimens in Doctor Royle's cabinet: the second column contains the Arabic names: the third gives synonymes, generally Hindústaní: the fourth shews the part of the plant sold or used as a drug: then follow the Botanical name and the place whence procured, the latter depends frequently upon the declaration of the venders, and is consequently vague, as in the case of "India," where the particular place cannot be defined. In some instances a locality is given as being *mashhúr*, or noted for supplying a good quality of what may otherwise be common to many other parts of the country ;—where "gardens" are mentioned, either the Sehárunpúr, or the Calcutta Botanic Garden is intended.

Reference.	Name under which Article is described in Catalogue. (*a*)	Hindustani or other synonyme.	Part used.	Botanical name.	Whence obtained.
1	Aarghís,	Zírishk, *p.*	bark,	Berberis *chitra,*	Hills.
2	Abrún,	(house leek,)	plant,	Labiatæ, n. o.	Delhi.
3	Abúkhalsa,	Ratanjot,	root,	Buglossum ?	Múltan.
4	Abukánis,	(sow bread,)	do.	Cyclamen,	Turkey.
5	Abhul,	Húbèr,	fruit,	Juniperus,	Amritsér.
6	Utaruj,	Bijaora nimbu,	peel,	Citrus,	Gardens.
7	*Atís,*	Butis,	root,	Aconitum *atees,*	Hills.
8	Asal,	Pharas,	seed,	Tamarix,	India.
9	*Aslak,*	Sambhálú,	fruit,	Vitex trifolia,	Do.

(*a*) Indian names in the first column are printed in italics, to distinguish them from the rest, which are Arabic.

Reference.	Name under which Article is described in Catalogue.	Hindustani or other synonyme.	Part used.	Botanical name.	Whence obtained.
10	Ijás,	Alú Bokhara,	fruit,	Prunus Bokhariensis,	Kabul.
11	Ujmúd ?	Ajwain,	seed,	Ligusticum *ujwain* et diffusum, umbellifera,	India. Khadir.
12	Ahriz,	Kusumphúl,	do.	Carthamus tinctorius,	India.
13	Akhírus,	Kal-gihún,	do.	Coix Indica,	Hills and Khadir.
14	Adá, adrak,	(Green ginger),	root,	Zingiber officinalis,	Ind. Hills,
15	Azárakí,	Kouchla,	seed,	Strychnos, nux vomica,	India.
16	Izkhir,	Mirchiagand,(bél,)	root,	Andropogon,	Do.
17	*Ànjár,*	Badám kohí,	seed,	Prunus chúlú,	Hills.
18	*Arlú,*	Tah-baranga,	root,	Bignonia Indica,	India.
19	A'as,	Mendí ?	fruit,	Myrtus communis,	Kashmír.
20	Asarún,	Taggar,		substitute for *Asarum Eur.*	Hills.
21	Ustukhudús,	Dharu,	plant,	Prunella (substitute for Lavandula strichos),	Kabúl.
22	Asgandeh,	Nagaorì,	root,	Physalis flexuosa,	India.
23	*Isqíl,* unsul,	Kandrí,	root,	Scilla Indica, (squill,)	Do.
24	Usturkhár,	Unt-katára,	plant,	Fagonia Mysoriensis ? Echinops sphærocephalus,	Delhi. Firth.
25	Ushneh,	Chalchalíra,	do.	Lichen Islandicus, L.from hills substituted,	Hills.
26	Aftimún,	Akás-bél,	do.	Cuscuta Europæa,(reflexa, subs.)	Kabúl.
27	Afranjeh,	Aflunjeh,	seed,	Urtica,	Do. and Delhi.
28	Afsantín,	Satàrú,	do.	Artemisia absinthium,	Kabúl.
			plant,	——— Indica,	Amritsér.
29	Afímídún,		root,		Delhi or Surat.
30	Afíus,	Afius *g.*	plant,		Do.
31	Akakia,		ext. fr.	Acacia vera,	Arabia viâ Delhi.
32	*Akás bel,*		plant,	Cuscuta reflexa,	India.
33	Akit makit,	Kal-karenja,	seed,	Cæsalpinia Bonducella,	Do.
34	Akrora,		root,	Cyperaceæ ?	Delhi.
35	Akr-ul-bahr,		wd.and bk.		Púrab.
36	Iklíl-ul-jabal,		flower-buds of one of the Myrtaceæ (subst. for rosemary)		Surat.
37	Iklíl-ul-malek,	parang,	fruit,	(leguminosæ,)	Kabúl.
38	Alu saràsún,	(alu sún ?)	plant,		Surat.
39	Amárítun,		do.		Do.
40	Amdaryan,	Amdarban,	berry,		Arabia.
41	*Amár bél,*		do.		Amritsér.
42	*Amras,*		concretion found in old mango-wood,		Delhi.
43	*Amsúkh,*		seed and berry,		Surat.
44	Um-ghílan,	Kekar,	fruit,	Mimosa Arabica,	India.
45	*Amal béd,*		Acid twigs,		Delhi.
46	Amlaj,	Aonla,	fruit,	Phyllanthus emblica, Emblica myrobalans,	India.
47	Ambaj,	Am,	do.	Mangifera indica,	Do.
48	Amchúr,	unripe,	do.	Dried do.	
49	Anteleh,	Nirbisi,	root.	Caltha *nirbisí,*	Amritsér.
50	AnjibárRumí,	Bistort,	do.		Kabúl.
51	Anjudán,		seed.	Ferula asafœtida,	Arabia.

Reference.	Name under which Article is described in Catalogue.	Hindustani or other synonyme.	Part used.	Botanical name.	Whence obtained.
52	Anjudán 2nd,		seed,		Surat.
53	Anjureh,	Utangan,	seed,	Urtica,	Kabúl.
54	———— 2nd,	Nettle seed,	seed,	Urtica,	Marwar.
55	*Andhaúli,*		wood,		Dehlí.
56	Anèsún,		seed,	applied to Apricon petro-selima,	Room. Kabúl.
57	Awáfínús,		seed and plant,		Surat.
58	*Anga,*	Chirchira,	seed,	Achyranthes argentea,	India.
59	Ahlîlaj,	Bijwareh,	fruit,	Terminula Chebula,	Do.
60	—— asfar,	Har-zard,	fruit,	Ditto,	Do.
61	—— aswad,	Ditto séah,	fruit,	Ditto,	Do.
62	—— aswad júa,	jawí haré,	fruit,	Ditto,	Do.
63	I′maranútáli,		berry,		Surat viâ Dehli.
64	*Babchí,*		seed,		Púrab.
65	Babúna, *p.*	Chamomile,	flower,	Anthemis *nobilis,*	India.
66	Bad-áward,		berry,	Hedysarum Alhagi ?	Surat.
67	Badranjboyeh,	Billé-lotan,	plant,	Ocymum ?	Púrab.
68	Badrúj,	Jangla túlsí,	seed,	Ocymum,	Furakhabad.
69	Bádinjan,	Baigan, Egg plant,	do.	Solanum *melangena,*	India.
70	Badyan khatai,	Star-anise,	do.	Ilicium usitatum,	China.
71	Billa-i-kand,		root.		Kabúl.
72	Bardast,	Abnús, ebony,	wood,	Diospyros,	India.
73	Báqila,	Seu-channa, bean,	seed,	Faba vulgaris,	Do.
74	Báqila-misri,		do.	Nelumbium speciosum,	Do.
75	*Balangú,* túkhm,		do.	Draconphalum Roylenum,	Kanour. Rewarí.
76	*Bansa,*		leaf,	Justicia adhatida,	India.
77	*Bijisar,*		wood,		Dakhan.
78	*Bidarí kund,*	Sarál-chíp,	root,	Hedysarum tuberosum,	Púrab.
79	*Bídhára,*		do.		Gangake Khadir.
80	*Barkak,*		berry,	A scandent plant,	Surat.
81	Barg-Tibet,	Hulas Kashmírí,	root,	Rhododendron campanulatum,	Kashmír.
82	Barm dandí,		plant,	Centaurea,	India.
83	Birin jásif,		berry,	Artemisia,	Najíbabad.
84	Biranj kabulí,	Bae birang,	seed,	Embelia *ribes,*	Do.
85	Baryaleh,	Kharántí,	berry,	Sida cordifolia,	India.
86	Bazr katuna,	Asafghúl,	seed,	Plantago *isafghola,*	Gardens.
87	Buz ghunj,		galls,	Pistacia vera,	Kabúl.
88	Basbáseh,	Gawantrí, mai,	galls,	Myristica moschata,'	Púrab.
89	Bastiaj,	khilal-i-mekka,	seed,	—— composita,	Dehlí.
90	Basfáij,		root,	Polypodium vulgare,	Kabúl.
91	*Bis khapra,*		do.	Trianthema pentandria,	India.
92	*Bís mar,*		wood,		Dehli.
93	Battikh Hindi,	Tarbúz,	seed,	Cucurbita citrullus,	India.
94	Baklat-ul-hamka,	Kúlfa, lonia,	do.	Portulacca oleacea,	Do.
95	Baqam,	Patlang,	wood,	Cæsalpinia Sappan,	Do.
96	Bakúmbar,	Kúmbha,	flower,	Carèya arborea,	Do.
97	Baládur,	Bhiláwar,	seed,	Semecarpus anacardium,	Do.

Reference.	Name under which Article is described in Catalogue.	Hindustani or other synonyme.	Part used.	Botanical name.	Whence obtained.
98	Balsán,	Balm of Gilead tree,	wood,	Balsamodendron Gileadense,	Surat.
99	Bazrul banj,	Ban ?	seed,	Quercus *ban*,	Do.
100	Balelaj,	Bahera,	fruit,	Terminalia bellerica,	India.
101	Banj,	Ajwain khorasani,	seed,	Hyosciamus niger,	Dehlí.
102	Bandál,		fruit,	Momordica, hep. echinatus,	India.
103	Bundaq,	Fúndak,	seed,	Corylus lacosa,	Hills.
104	Bunduk Hindí,	Ritha, Soap nut,	fruit,	Sapindus detergens ?	Deyra.
105	Banafsaj,	Banafshel,	flower,	Viola serpens,	Kashmír.
106	Ban Karela,		fruit,	Cucurbitaceæ,	Below hills.
107	Bozidán,		root,		Surat.
108	Boi-mádarán,		fruit,	—— [composition ?]	Delhi, Surat.
109	Boí,		do.	Amaranthus tomarosus,	Delhí.
110	*Bhá-rangí,*		bark,		Almora.
111	*Bhaíphalí,*		berry,	(leguminosæ,)	Delhí.
112	———2nd,		do.		Do.
113	Bahman, súrkh,		root,		Kabúl.
114	——— suféd,		do.		Surat.
115	Bíj-band,		seed,		Delhí.
116	*Bèl,*	Belgírí,	fruit,	Ægle marmelos,	India.
117	*Baengan,*	Jangli kathail,	do.	Solanum,	Dehlí.
118	Besh,		root,		Guzerat.
119	*Bhambel,*	Kasuri *n.*	bark,	Euonymus tingens,	Hills.
120	Padil,	Parúl ?	fruit,	Bignonia suaveolens,	India.
121	Pakhán-bed,		root,	Saxifraga ligulata,	Hills.
122	*Panrí,*		root,		Surat.
123	*Papíta,*	(St. Ignatius bean,)	seed,	Strychnos Ignatia,	Púrab.
124	*Patol-pattar,*		extract,		Dehlí.
125	Pars-i-oshan,	mobarika,	plant,	Adiantum,	Hills.
126	Pusht-barni,	Chit-kabra,	root,	Hedysarum Alopecuroides,	India.
127	Palás papreh,	Dhak-papra,	seed,	Butea frondosa,	Do.
128	*Pañwár,*		do.	Cassia tora ? obtusifolia,	Do.
129	*Pilaíkanda,*		root,		Dehlí.
130	*Phalwa,*			Bassia butyracea,	Almora.
131	*Pokhar múl,*	Baghar mul,	root,		Guzerut.
132	*Palu,* ,	Keril,	fruit,	Capparis aphylla,	Hansi.
133	*Petha,*	Kúmra,	seed,	Cucurbita pepo,	India.
134	*Tal-mokhana,*	Isgandhanagori,	do.	Barleria longifolia,	Do.
135	Tirayaman,		root,	Anatis ?	Kabúl.
136	Turbad,	Nasch,	do.	Convolvulus Turpethum,	India.
137	Tashmazaj,	Cháksú,	seed,	Cassia acacalis,	Deyra.
138	Turmis,		do.	Lupinus albus,	Egypt.
139	Tamr,	Chuhara,	fruit,	Phœnix dactylifera,	Arabia.
140	Tamr-Hindi,	Imlí,	seed,	Tamarindus Indica,	India.
141	Tamtiríh,	Túng ?	seed,	Rhus parviflorus,	India.
142	Taroi siah,		do.	Luffa,	Do.
143	—— ghia,		do.	——- acutangula,	Do.
144	—— karwi,		do.	——- pentandra,	Do.

Reference.	Name under which Article is described in Catalogue.	Hindustani or other synonyme.	Part used.	Botanical name.	Whence obtained.
145	Túdri suféd,		seed,	Cheiranthus,	Gardens.
146	—— surkh,		do.	Malva	India.
147	—— zard,		do	——— ?	Kabúl.
148	—— gulgún,		do.	——— ?	Surat.
149	Tej-bal,		wood,	Xanthoxylum aromaticum,	Hills.
150	Tín,	Anjír,	fruit,	Ficus Carica ?	Kabúl.
151	*Tent,*	Keril,	do.	Capparis aphylla,	Kurnal.
152	Samrat-ul-asl,	Chhotí maí,	galls,	of Tamarix dioica,	India.
153	—— ut-tarfá,	Burí mai,	do.	———— Indica,	Do.
154	*Jámphal,*	Safri-ám,	seed,	Psidium pyriferum ?	Surat.
155	Jáwars,	Bájra,	do.	Panicum spicatum,	India.
156	*Jámghás,*		root,	———— polypodium,	Surat.
157	Jadwár,	Nirbisi,	do.	Calthæa, (kyllingia),	Amritsér.
158	Jirjir,	Tireh tezak, *p.* Tirmira,	seed,	Moricandia *tira,*	India.
159	—— 2nd kind,		do.		Surat.
160	Jazar,	Gájar,	do.	Daucus Carota,	India.
161	Júlnár,	Gul-anar,	flower,	Punica granatum,	Do.
162	Jal ním,		plant,		Dehli.
163	——— 2nd,		do.		Do.
164	Jintiána,	Pakhán béd,	root,	Gentiana ?	Kabúl.
165	——— 2nd,		do.		Surat.
166	Jawansa,		plant,	Hedysarum Alhagi,	India.
167	Jouz,	Akhrot,	fruit,	Juglans regia,	Hills.
168	Jouz-us-sarv,	Sarú, Saras,	do.	Cupressus sempervirens,	India.
169	Jouz-ul-katát,		do.	Solanum	Arabia.
170	Jouz-ul-kai,	Maënphal,	do.	Posoqueria dumetosa,	India.
171	Jouz-boa,	Jai-phal,	seed,	Myristica moschata,	Púrab.
172	——2nd,	(Nutmeg,)	do.	———— ?	Do.
173	Jouz-rúmí,		fruit,		Surat.
174	—— mâsil,	Dhatúra,	seed,	Datura *metel,*	India.
175	—— aswad,	Kala dhatúra,	do.	——— fatuosa,	Do.
176	Jounchí,		plant,		Dehlí.
177	———— 2nd,		berry,		Do.
178	*Jia pota,*	Putranjiva,	fruit,	Nageia *putranjiva,*	India.
179	*Cháb,*		berry	of gaj-pípal,	Najibabad.
180	*Chándni,*		seed,	[an convolvuli ?]	Dehlí.
181	Chái, cha,	(Tea,)	leaf,	Thea viridis,	China.
182	*Chirya kand,*		root,		Kashmír.
183	Chalápa,	(Jalap,)	do.	Convolvulus *jalapa,*	Dehlí.
184	Chilghoza,	Nuoza,	seed,	Pinus *neoza,*	Amritsér.
185	*Chámpa,*		do.	Michelia Champaca,	Hills.
186	*Chób chíni,*		root,	Smilax Chinæ,	Púrab.
187	*Chúk,*		do.		Amritsér.
188	*Chonch,*	Pát,	seed,	Corchorus olitorius,	India.
189	Hásha,		plant,	(given for thyme,)	Surat.
190	Háshish,	Husn-i-yúsf, *p.*	seed,		Marwar.
191	Hab-ul-bán,	Bakain,	fruit,	Melia sempervirens,	Surat.
192	Hab-ul-balsán,	Túkhm balsa,	seed,	Carpobalsamum	Arabia.

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193	Habut-ul-khazrá,	(green seed,)	seed,	Pistacia terebinthus,	Kabúl.
194	Hab-uz-zulam,		do.		Arabia.
195	—— simneh,	Piyal ke bíj, Chiraunjí,	do.	Buchanania latifolia,	Najíbabad.
196	—— ghár,	(laurel berries),	fruit,	Laurus nobilis,	Arabia.
197	—— qúlt,	Kulthí,	seed,	Dolichos	Hills.
198	—— Qilkil,	Kúlkúl, Karávi,	do.	Cardiospermum Halicacabum,	India.
199	—— mahlab,	Gyuní,	do.	Rhus ?	Almora.
200	—— nil,	Kaldona,	do.	Spomæa cærulea,	India.
201	Hurf,	Hálim,	do.	Lapidium sativum,	Do.
202	Hurmal,	Isband,	do.	Corchorus capsularis,	Do.
203	Hasak,	Gokrú dakhaní,	do.	Pedalium murex,	Hatras.
204	——	Gokrú,	do.	Tribulus lanuginosus,	India.
205	Huzuz hindí,	Rasot,	extract,	Berberis Asiatica,	Nagarkoth.
206	—— mekkí,		gum,		Surat.
207	Hulbeh,	Methí,	seed,	Trigonella Fœnum-græcum,	India.
208	Halimos,		wood,		Surat.
209	Hammáz barrí,	Epalkí, Chuka,	seed,	Rumex undulatus,	Saháranpúr.
210	Hamáma,	(αμωμον),	leaf,		Surat.
211	Ditto,	Ditto,	do.		Kabúl.
212	Himmas abíaz,	Chana Kabulí,	seed,	Cícer—,	India.
213	Himmas ahmar,	Lal chana,	do.	Cicer arietenum,	Do.
214	Hinná,	Mehndí,	leaf,	Lawsonia inermis,	Do.
215	Hénteh,	Gehún,	seed,	Triticum hybernum, æstivum,	Do.
216	Hanzal,	Bislambha,	root, seed,	Cucumis colocynthis,	Do.
217	Khúb-bazí,	Chandera,	fruit,	Malva rotundifolia,	Sahárunpúr.
218	Khúbeh,	Khúbkalán,	seed,	Sinapis pusilla ?	Marwar.
219	Khardal,	Raí,	do.	Sinapis nigra ?	India.
220	Khurnúb,	(*Carobs* fruit),	fruit,	Ceratonia siliqua,	Syria.
221	——Shamí, ——Nabatí,		do.	Cassia	Arabia.
222	Khiroa,	Arandi, Réndí,	seed,	Ricinus communis,	Farkhabad.
223	Khas,	Kahú,	do.	Lactuca sativa,	India.
224	*Khas,*	Panní, Bena,	root,	Andropogon muricatum,	Do.
225	Khas-khásh-abíaz,	Post,	seed,	Papaver somniferum,	Do.
226	—— aswad,	Pazára,	do.	Ditto, red variety,	Do.
227	Khusyat-us-sâlab,	Salab-misri,	root,	[Orchideæ,]	Kabúl.
228	————	——	do.	variety,	Sahárunpúr.
229	————	——	do.	———,	Púrab.
230	Khitmí,	Gúlkhyrú,	seed,	Althæa rosea,	India, Gardens.
231	Khiláf,	Bed múshk,	do.	Salix Ægyptiaca,	Kashmír.
232	Khandrus Mekkí,	Barí-joar,	do.	Zea *mays,*	India.
233	Kholinján,	Kolínjar,	root,	Alpinia Galanga,	Púrab.
234	Khiár-shambar,	Amaltás,	fruit,	Cassia fistula,	India.
235	*Khaeri,*	Todri saféd,	seed,	Cheiranthus *cheirí,*	Kabúl.
236	Dar chíní,		berry,	Laurus cinnamomum,	Púrab.
237	Dar shíshaan,	Kaiphul,	do.	Myrica sapida,	Hills.
238	Dar filfil,	Pipal,	fruit,	Piper longum,	India.
239	*Dalim,*	Darmí, Dhármi, Anár,	seed,	Punica granatum,	Hills.

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240	Dar hald,	Ambi haldí,	root,	Berberis Asiatica,	Hills.
241	Dánaj abrúj,		seed,		Súrat.
242	Dukhn,	China, Kangní,	do.	Panicum miliaceum,	India.
243	Dardáb,	Kachri, send,	fruit,	Cucumi,	Do.
244	Daránaj-Arabi,	Atís?	root,	Doronicum pardalanthes,	Arabia.
245	Dam-ul-akhwain,	(post),	bark,	(gum?)	Surat.
246	Dand,	Jamál gota,	seed,	Croton tiglium,	Púrab.
247	*Dopaharya,*		do.	Pentapetes Phœnicea,	India.
248	*Dúdhi,*		plant,	Euphorbia hirta,	Do.
249	——— 2nd,		do.	Euphorbia,	Delhí.
250	——— ki jar,		root,	Euph. hirtæ radix,	India.
251	*Dhai,*		flower,	Grislea tomentosa,	Do.
252	*Dhanattar,*	Asphota?	seed,	Clitoria ternatea,	Do.
253	Deodar,		wood,	Pinus Deodara,	Hills.
254	Zareh,	Jawár,	seed,	Sorghum vulgare,	India.
255	Raziánaj,	Souf,	do.	(substitute given,)	Do.
256	Rásan,		leaf,	Salvadora *jal,*	Shamlí.
257	*Rámpatri,*		rind,		Dakhan.
258	Ráwand,		root,	Rheum Emodi,	Hills.
259	—— khatri,	Ráwand chiní,	do.	——— palmatum,	China.
260	*Ratanjot,*		plant,	Lithospermum vestitum,	Delhí.
261	——— 2nd,		do.	[Vorragineæ,]	Do.
262	Riwásan,	Jael,	seed,	Æschynomene *sesban,*	India.
263	Rúmán,	Anár,		Pomegranate fruit seed,	
264	Zabíb múnaqqa,	Kismis,	fruit,	Vitis vinifera, (raisins,)	Kabúl.
265	—— ul-jabal,		seed,	Delphinium ?	Surat.
266	Zaráwand tawil,	Isarmúl,	root,	Aristolochia longa,	Kashmír.
267	——— múdehraj,		do.	——————— rotunda,	Do.
268	Zarnab,	Birhmi,	leaf,	Taxus variatus,	Hills.
269	Zaranbád,	Kachúr,	root,	Curcuma *zeranbel?*	Do.
270	Zafrán,	Kesar, (saffron,)	stigma,	Crocus Cashmerianum,	Kashmír.
271	Zanjabil,	Sonth,	root,	Zingiber officinalis,	Hills.
272	Zúfá-yábis,		plant,	(given for hyssop,)	Kabúl.
273	Sáj,	Sagwán,	seed & l.	Tectona grandis,	India.
274	Sádaj Hindí,	Tez-pát,	leaf,	Laurus cassia,	Hills.
275	Sál,	Sál,	do.	Shorea robusta,	Deyradún.
276	Sálsa, (úshbeh)	(salsaparilla)	root,		Surat.
277	*Ságú dana,*	(sago)	plant,		Calcutta.
278	*Sáng,*		fruit,	Mimosa	Hansi.
279	Sifistán,	Laisora,	do.	Cordia myxa,	India.
280	Satáwar,	Satráwal,	root,	Asparagus ascendens,	Najíbabad.
281	——— safèd,		do.		Delhí.
282	*Satpúra,*	Búrans,	bark,	Rhododendron arboreum,	foot of Hills.
283	*Sati,*	Kapúr-kachar,	root,	Globba *ordhnoul,*	Deyra.
284	Sazáb,	Sadás,	seed, br.	Ruta graveolens,	Surat.
285	—— kohí,		do.	—— parviflora ?	Hills.
286	Sadá sohágin,		seed, fr.	Hibiscus Phœniceus ?	Delhí.
287	Sadei,		plant,	—— composita,	India.
288	*Sarphonka,*		do.	Galega	Do.

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289	Sarshaf,	Sarson,	seed,	Sinapis dichotoma,	India.
290	*Sarwárí,*	Chúa,	seed,	Celosia argentea,	India.
291	Säd,	Motha,	root,	Cyperus rotundus ?	Guzerat.
292	—— 2nd,	———	do.	——— ditto,	Delhi.
293	Safarjal, (hab)	Bihí-dana,	seed,	Pyrus cydonia,	Kashmír.
294	Silq,	Chokandar,	do.	Beta vulgaris,	Gardens.
295	Salikheh,	Taj,	bark,	Laurus cassia,	Najibabad.
296	Súmmáq, H.	Kangní,	seed,	Panicum Italicum,	India.
297	———		do.	Rhus *toong,*	Hills.
298	———	(v. Arzan)	do.	Rhus coriaria,	Kabúl.
299	Simsim, semam,	Til,	do.	Sesamum orientale,	India.
300	Semúndar phal,		fruit,	Barringtonia acutangula,	Do.
301	—— sokh,		seed,		Khadír.
302	*Samar kokla,*		galls,		Púrab.
303	*San,*	Mesta pát,	fruit,	Hibiscus cannabinus,	India.
304	Sana,		leaf,	Cassia senna,	Agra.
305	Sumbul-ut-tíb,	Jatamansi,	root,	Valeriana *jatamansi,*	Hills.
306	*Sans-rúí,*		plant,	Portulacca,	Delhí.
307	*Sankhahúlí,*		do.	Evolvulus,	India.
308	*Singhára,*		seed,	Trapa bispinosa,	Do.
309	Súranján shírín,		root,	Colchicum *autumnale,*	Surat.
310	——— talkh,		do.		Kabúl.
311	Sús,	Múl-hatí,	do.	Glycyrrhiza globa,	Multán.
312	Rab-us-sús,		extract,	Liquorice,	Arabia.
313	———— 2nd,		do.	———	Kabúl.
314	Sosan,	I'rsa,	root,	Iris,	Do.
315	*Sahajna,*		seed,	Hyperanthera morunga,	India.
316	Sisáliyun,		do.	Sesali ?	Surat.
317	Shákhul,	Arhar,	do.	Cytisus cajan,	India.
318	——— 2nd,	Tor,	do.	——— bicolor,	Do.
319	Sháneh dushtí,	Kanghí,	fruit,	Sida indica populifolia,	Do.
320	Sháh balút,		seed,	substitute for Acorus,	Hills.
321	Sháh taraj,	Pil papra,	plant,	Fumaria parviflora,	India.
322	Shah hasfar,	Ryhán, Tulsi,	seed,	Ocymum *pilosum ?*	Jungles.
323	Shabit,	Soya,	do.	Anethum *soya,*	India cult.
324	Shabibí,	Urad ke jar,	root,	Phaseolus max. radiatus,	Surat.
325	Shabbú,		seed,	(not the seed of Polyanthus),	Delhí.
326	Shabú nah,	Arlú,	do.	Bignonia Indica,	India.
327	Sharbatí,		do.	Ocymum	Lucknow.
328	*Sharífa,*		do.	Annona squamosa,	India.
329	Shaqáqal,		root,	Eryngium campestra ?	Kabúl.
330	Shukaá,	Bádáward, *p.*	bark,	Cratagus oxyacantha, a substitute given,	Surat.
331	*Shukakai,*		fruit,	Cassia ?	Purab.
332	——— 2nd,		do.	Mimosa,	Dakhan.
333	Shakar-i-tíghál,		manna,	found on Anzerút,	Kabúl.
334	Shaljam,	Salgram,	seed,	Brassica rapa,	India.

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335	Shoukhrán,		plant,	Conium maculatum, substitute given,	Surat.
336	Shonghan,		plant,	Valeriana,	Hills.
337	Shouníz,	Kalounjí,	seed,	Nigella Indica,	Paniput.
338	Shír-khisht,		manna,	Frascinus ———,	Kabúl.
339	Shitaraj,	Chíta,	root,	Plumbago zeylanica,	India.
340	Sibr,	Elwa,	extract,	Aloe perfoliata,	Guzerat.
341	Sátar,		leaf,	Origanum vulgare,	Persia.
342	—— 2nd,			——— Smyrnæum,	Arabia.
343	Sanúbar saghár,		seed,	Pinus neoza,	Amritsér.
344	Sandal abiaz,	S. sufeid,	wood,	Santalum album, Syrium myrtifolium,	Dakhan.
345	—— ahmar,	Rakat-chandan,	do.	Pterocarpus santalinus,	Púrab.
346	Tálisfar,		leaf,	Rhododend. aromaticum,	Kabúl.
347	Tarásís,		root,		Surat.
348	Tarfá,	Jhao,	berry,	Tamarix Indica,	India.
349	Akarkarha,	Karkara,	root,	Anthemis Pyrethrum,	Calcutta.
350	Adas,	Masúr,	seed,	Ervum hirsutum,	India.
351	Arúk,	Jàwa haldí,	root,	Curcuma	Bengal.
352	Arúk-ul-safr,	Amba haldí,	do.	———	Do.
353	———,	Paharí haldi,	do.	———	Hills.
354	———,	Púrabí do,	do.	———	Bengal.
355	———,	Magla do,	do.	———	Do.
356	Ushbeh,	Maghrabia,	berry,	Smilax,	Arabia.
357	Ushshar,	Ak. madar,	root,	Asclepias gigantea,	India.
358	Afs,	Majú,	galls,	Quercus infectoria,	Púrab.
359	Enab,		fruit,	Zizyphus ———,	Kashmír.
360	Enab-ul-sálab,	Bhambholan,	do.	Solanum nigrum,	Najibabad.
361	U'd,	Ud Hindí,	wood,	Aloexylon Agallochum,	Hatras.
362	—— 2nd,		do.		Surat.
363	—— kimarí,		do.		China.
364	Gharíqún,		plant,	Boletus igniarius,	Kabúl.
365	Gháfis,		do.		Surat.
366	Gul-gháfis,		flower,	Delphinium,	Do.
367	————————		do.	Eupatorium canna binum,	Arabia.
368	Ghubaera,	Sanjad, *p.*	fruit,	Glinus lotoides, Zizyphus *giom*,	Surat.
369	*Ghotaghia,*	Osareh rewand,	extract,	Stalagmitis Gambogia,	Do.
370	Fághereh,		seed,	Xanthoxylum, Fagara piperata,	Najíbabad.
371	Fáwánia,		root,	Pæonia corallina,	Arabia.
372	Fujl,	Múlí,	seed,	Rappanus sativus,	India.
373	Farásiún,		do.	Manulea ?	Surat.
374	——— 2nd,		berry,	Anthericum Indicum,	India.
375	Faranj mishk,		seed,	Ocymum	Arabia.
376	——— 2nd,		do.	———	Bazar.
377	Faranj,	Mushk Ramtulsi,	leaf,		Kabúl

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378	Fustuk,	Pista,	seed,	Pistacia vera,	Kabúl.
379	———	post birun-i-pista,	envelopes of seed,	do.	Do.
380	———	gul pista, Phul pista ka,	galls,	Excrescences formed by insects.	
381	Fatrasaliún,		seed,	Apium petroselinum,	Kabúl.
382	Filfil abiaz,	White pepper,	fruit,	Piper nigrum,	Dakhan.
383	—— aswad,	Seah mirch,	do.	Ditto,	Do.
384	—— moyeh,	Pipala múl,	root,	Piper longum,	Púrab.
385	Fodnaj barrí,		plant,	Dracocephalum Royleanum,	Delhí.
386	Fúfal,	Súpyarí,	seed,	Arecha catechu,	Púrab.
387	——— 2nd,	S. chikní,	do.		Dakhan.
388	—— gul fufal,		gum,	apparently an exudation on Areca catechu,	Púrab.
389	Fúveh,	Manjíth,	root,	Rubia manjistha,	Amritsér.
390	Qaqilleh saghár,	Chotí elachi,	fruit,	Elettaria cardamomum,	Malabar.
391	———kebár,	Barí do.	do.	Amomum racemosum,	Púrab.
392	Qissáh,	Kakrí,	seed,	Cucumis utilissimus,	India.
393	Qasad,	Khíra,	do.	——— sativus,	Do.
394	Qirdmána,		do.	Umbellifera,	Kabúl.
395	——— 2nd,		do.	Ditto,	Surat.
396	Qirásia,	Alu balu,	fruit,	Prunus cerasus,	Kabúl.
397	Qarsáua,	Shoka ibrahim,			
398	Qarä,	Kadú,	seed,	Lagenaria vulgaris,	India.
399	Qirfeh,		bark,	Lauras *Cassia ?*	Furukabad.
400	Qaranful,	Laoung,	flower,	Caryophyllus arom.	Púrab.
401	Qúst shírín,	Kuth,	wood,	Costus,	Amritsér.
402	——— 2nd,		do.		Kashmir.
403	—— talkh,		do.		Amritsér.
404	Qasb-ul-zarírelı,	Cheretta,	plant,	Swertia cheretta,	Dakhan.
405	Qutun, (hab-ul)	Binola, cotton,	seed,	Gossipium herbaceum,	India.
406	Qúlan,	Columba,	root,		Surat.
407	Qinnab,	Bhang,	plant,	Cannabis sativa,	India.
408	Qanbíl,	Kambela,	Strigose pubescence of fruit,	Rottlera tinctoria,	Deyra Dun.
409	Qanturyún,		plant,	Polycarpon arymbosum,	Kabúl.
410	*Kát,*	Katha,	extract,	Mimosa catechu,	Deyra Dun.
411	*Kajuphal,*		seed,	Anacardium occidentale,	Dakhan.
412	*Kákrásingí,*		galls,	excrescence, Rhus,	Hills.
413	Káknaj,		fruit,	Atropa physalodes,	Kabúl.
414	*Kála bichwa,*		root,	[polypodi ?]	Lucknow.
415	*Kála kúth,*		do.	Calthœa ?	Amritsér.
416	*Káli zírí,*		seed,	Serratula anthelmintica,	Hills.
417	Kámráj,		berry,		Purab.
418	Kabábeh,	Kabáb chíní,	fruit,	Piper cubeba,	Palí, Calcutta.
419	Kábbar,		bark,	Capparis spinosa,	Kabúl.
420	Katán,	Alsí Tísí,	seed,	Linum usitatissimum,	India.
421	*Katai-búzung,*	Kathaela,	fruit,	Solanum Indicum,	Do.
422	——— *khurd,*	Kathasla,	do.	——— Jacquini,	Do.
423	*Katol,*		root,		Delhí.
424	*Kathal,*	Kental,	seed,	Artocarpus integrifolia,	Gardens.

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425	Kuras,		seed,	Allium porrum,	Delhí.
426	Karafs,		do.	Opium graveolens,	Room.
427	Karafs bekh,		root,	Ditto,	Kabúl.
428	*Kirm daneh,*		gum,	Lac,	Bokhara.
429	*Kirmali,*		seed,		Delhí (hills).
430	Kurúvia,	Carraway,	do.	Carum Carui, (substitute from Kabúl,)	Europe.
431	Kura,		berry,	Echites	Kheríbass.
432	Karú,		root,	Gentiana	Hills.
433	—— 2nd,		do.	Pæderota	Do.
434	Kúzbureh,	Dhanya,	seed,	Coriandrum sativum,	India.
435	*Kissar ke jar,*		root,	Ancissus ?	Sahárunpúr.
436	*Kasoundha,*		leaf,	Cassia Sophona,	India.
437	*Kaserú,*		root,	Cyperus tuberosus,	Delhí.
438	Kasht bar kasht,	Maror phalí,	fruit,	Helicteres ?	Kherí.
439	*Kishangona,*		plant,	Cyperus	Delhi.
440	Kashús,	Akás bel ke bij,	seed,	Cuscuta	Kabúl.
441	*Kahora,*		root,	Momordica muricata,	India.
442	—— *Ban kakora,*		do.	The former bears fruit, the latter not,	Do.
443	*Kalesar,*		fruit,	Cucurbitaceæ,	Delhí.
444	Kamázriús,		leaf,	Teucrium chamadrys,	Surat.
445	Kamún,	Zíra síah,	seed,	Cuminum Cyminum,	Kashmír.
446	——— safeid,	—— safeid,	do.	[umbelliferæ,]	
447	Kundus,	Nak-chinkhní,	plant,	Artemisia sternutatoria,	India.
448	——— 2nd,		root,	An Kuth ?	Hills.
449	*Kankol,*	Langoth,	fruit,		Delhí.
450	*Kankol mirch,*		do.		Dakhan.
451	*Kanoucha,* [v. marv,]	Kaoneh,	seed,	Dolichos pruriens,	India.
452	*Khatú,*		plant,	Justicia	Delhí.
453	*Khirní,*		seed,	Mimusops kauki,	India.
454	*Kaelh,*	Kath-bél,	fruit,	Feronia elephanta,	Do.
455	*Gaj pipal,*		do.	Pothos scandens,	Hills.
456	*Gangeran,*		bark,	Grewia hirsuta,	Kherí, Delhí.
457	*Gagán dhúl,*		plant,	[fungi,]	Dooab.
458	*Gul-machkan*		flower,	Pterospermum ?	Hills.
459	*Giloh,*		berry,	Menispermum cordatum,	India.
460	—— Sath giloh,		fecula of ditto,		Do.
461	*Gihunle,*		seed,		Amritsér.
462	*Gudachla,*		plant,		Delhí.
463	*Ghumohi* safeid,		seed,	Abrus precatorius,	India.
464	—— surkh,		do.	Do.	Do.
465	*Gilar patri,*	Goitre leaf,	leaf,		
466	*Latorí,*		plant,		
467	Lihyat-ut-tés,		extract,	an Cytus Hyporistus,	Delhí.
468	Lesán-us-saur,	Gao zaban,	root,		Do.
469	————————	Sankaholi,	plant,	Onosma bractiata,	Kabúl.
470	Lesán-ul-saur, (gul,)		flower,	Boragineæ,	Ghilan.

Reference.	Name under which Article is described in Catalogue.	Hindustani or other synonyme.	Part used.	Botanical name.	Whence obtained.
471	Lisán-ul-haml,	Bártang,	seed,		Kabúl.
472	—— al-asáfir,	indarjao shírín,	do.	Echites antidysenterica,	Púrab.
473	Luffá,		root,	Atropa mandragora,	Surat.
474	Lakmana,	Lakmaní,	plant,		Delhí.
475	Lodh,		bark,	Symplocos racemosa,	Hills.
476	Louz-hulúv,	Badám shírín,	seed,	Amygdalus communis dulcis,	Kabúl.
477	—— mur,	Badam karwa,	do.	—— amara,	Do.
478	Mazareyún,				
479	Mál-kangni,		do.	Celastrus nutans,	India.
480	Mámisa,				
481	Mámírán,	(2nd kind),	root,	Ranunculus Ficara,	Kashmír.
482	*Manas rohaní,*		leaf,	Myrsine bifaria,	Hills.
483	Máhú-daneh,				
484	Máhí zaharaj,				
485	*Mirchai,*	Kawa thonthí,	seed,	Ipomœa	India.
486	*Mirch kal,*		fruit,	Capsicum pubescens,	Do.
487	Marzan-jush,				
488	Marv,	Kanouncha,	seed,	Hippophae salicifolia,	Kabúl.
489	*Mar-hari,*	Maror phalí,	fruit,	Helicteres scabra,	Khera.
490	Mishk-tará-mashíh,		wood,	Dictamnus fraxinella,	Baghdad.
491	Moghás,	Maeda lakrí,	seed,	Tetranthes,	Kabúl.
492	——— 2nd,				
493	*Makhareh,*		seed,	Euryale ferox,	Patna.
494	*Malím,*		r. and br.		Hills.
495	*Mor-pankhí,*		plant,	Pteris palmata,	Delhí.
496	*Muslí* safed,		root,		Dakhan.
497	—— 2nd,		do.		Gualior.
498	—— safed,	Sembhal ki muslí,	do.	Bombax heptaphyllum,	India.
499	—— seah,		do.	Commelina scapiflora,	Kherí.
500	*Múndí,*		plant,	Sphæranthus Indicus,	India.
501	*Maeda lakrí,*	Chandan,	bark,	Tetranthera spitala,	Almora.
502	Nárjíl,	Naryel,	seed,	Cocos nucifera,	Bengal.
503	—— bahrí,	Daryaí naryel,	do.		Surat.
504	Nár-mushk,	Nag kesar,	flower,	Manna ?	Guzerat.
505	Nán khwáh,	Ajwain,	seed,	Ligusticum *ajwain,*	India.
506	Nah,		plant,	[rubaceæ],	Delhí.
507	*Nirgandhí,*		root,		Dakhan.
508	*Nirmalí,*		seed,	Strychnos potatorum,	Do.
509	*Nigand,-bábarí,*		plant,		Delhí.
510	Nímb,	Nim,	seed,	Melia azadirachta,	India.
511	Nil,	Níl,	do.	Indigofera tinctoria,	Do.
512	*Níl-kanthí,*		plant,	Ajuga	Delhí.
513	Nylofar,	Bhambhúl,	flower,	Nymphæa	India.
514	Waj,	Bach,	root,	Acorus Calamus,	Khorasán.
515	Ward,	Guláb,	fruit,	Rosa damascena,	India.
516	*Halha jorí,*		plant,	Polypodium,	Lucknow.
517	*Húlhúl,*		seed,		
518	Halyún,		fruit,	Asparagus officinalis,	Surat.

Resins, Gums, and Gum-resins.

Arabic name.	Synomymes.	Botanical name of plant.	
1 Ushaq,	Kándar, Ammoniacum ushk, from	Heraclea gummifera,	Kabúl.
2 Anjír ki gond,			
3 Anzerút,	Sarcocoll,	Pinea sarcocolla,	Do.
4 Bárzad, ganda beroza,	Galbanum,	Bubon Galbaniferum,	Hills.
5 *Padam ki gond,*		Prunus *puddum,*	S. B. G.
6 *Pachdhára do.*		Euphorbia angularis,	Do.
7 Taranj bín, Persian manna,		Alhagí Maurorum,	Kabúl.
8 *Tun kí gond,*		Cedrela Toona,	India.
9 ———			
10 Jawashír, gaoshír *p.*	Gum opopanax,	Pastinaca opopanax,	Arabia.
11 [1]*Jingan ki gond,* Kaní gond,		Icica gummifera,	Kheri pass.
12 Dam ul-akhwain, Hira dukhí, Khún kharábá, Dragon's blood,		Dracæna draco, Calamus rotang, Pterocarpus draco,	Surat. Arabia.
13 Rátiánaj,	Rajína, Colophony?	Burseria paniculata,	Surat.
14 Zard álu kí gond,		Prunus *chooloo,*	S. B. G.
15 Zift,	Resin, pitch,		Room.
16 *Saleh ki gond,*	Kundan?	Boswellia serrata,	Kheru.
17 Sakmúnya,	Scammony,	Convolvulus scammonia,	Surat.
18 ——— 2nd,			Do.
19 Sakbínaj,	Kandal Sagapenum,	Ferula persica,	Arabia.
20 Sandrús,	Chandrús, Sandarach,		Marwar.
21 ——— 2nd,	Kharwa, Copal,		
22 *Sahajné ki gond,*		Hyperanthera morunga,	India.
23 *Siris ki gond,*		Mimosa serissa,	Do.
24 *Sem ki gond,*	Gota gond,	Bauhinia gummifera,	Dehra.
25 Sembal ki gond,	Mochrus,	Bombax heptaphyllum,	India.
26 Sibr,	Elwa, musabba,	Aloe perfoliata,	
27 Samgh Arabí,	Gum Arabic,	Acacia vera,	Arabia.
28 Elk-ul-bútm,	Chian turpentine,	Pistacia Terebinthus,	Surat.
29 Farfiyún, afarbiyún,	Euphorbium,	Euphorbia officinarum,	Arabia.
30 *Karch,*	Nál,	Shorea robusta,	Khera.
31 Kirásia,	Cherry gum,	Prunus cerasus,	Surat.
32 Katira, Kasira, Katíla,	Gum tragacanth,	Bombax gossypium,	Kherí.
33 Kundur,	Lobán, Olibanum,		Surat.
34 ——— 2nd,	Frankincense,	Juniperus Lycia,	Púrab.
35 *Kaení gond,*			
36 *Kamarkas,*	Dhawe kí gond,	Butea frondosa,	India.
37 *Khaer ki gond,*		Mimosa catechu,	Deyra.
38 Kah ruba,	Amber,		Hills.
39 Ládan, lázan,	Labdanum,	Cistus ladaniferens,	Surat.
40 Lúk,	Lák, Láh, Gum Lac,	Coccus lacca,	Seharúnpúr.
41 Múr,	Bol, Myrrh,		Surat.
42 Mustaká,	Mastich,	Pistacia lentucus,	Kabúl.
43 Moql,	Gogal,	Bdellium,	
44 —— 2nd,	——— 2nd,		Hills.
45 Nágaurí gond,			Nagore.

VII.—*Proceedings of the Asiatic Society—Physical Class.*

Wednesday Evening, 3rd October, 1832.

Sir Edward Ryan, President, in the Chair.

The proceedings of last Meeting were read and adopted.

Library.

The following books were presented :

" Fragmens de Geologie et de Climatologie Asiatiques, par A. De Humboldt," in 2 volumes. *From the Author.*

" An English Index of Indian Plants, by H. Piddington, Esq. Foreign Sec. Agricultural Society, Calcutta, 1832." *From the Author.*

This very useful compendium has been drawn up with great industry from all the available sources of information. The native synonymes include many corruptions from the right reading, which have found their way into Botanical works : it might perhaps have been an improvement that the correct word should have been distinguished from the rest, and spelt according to some constant system of orthography.

Museum.

The Secretary announced the receipt of the fossil shells of the Paris basin, of the tertiary formations of Italy and Sicily, as well as from Diablerets in Switzerland, and specimens of the bone brescia of Nice, alluded to at the last Meeting, in a letter from Dr. Turnbull Christie, of Madras.

The shells are in the highest preservation, and will form a most useful series for reference on all occasions. A catalogue will be published in the Society's Journal, that members at a distance may be aware what fossil shells are in our possession.

A letter was read from Mr. James Calder, Vice-President, presenting in the name of C. Telfair, Esq. President of the Mauritius Natural History Society, the following geological specimens and minerals :

1. *Mammellated black oxide of Manganese*, found in a state of great purity, and in vast quantities, in the interior of Madagascar.
2. *Capilliform Obsidian*, (Actynolite?) from Bourbon. After the last eruption of the volcano in that island, the country for miles round was found to be covered with crystals of green actynolite, like a hoar-frost, which from its appearance received the name of Neptune's hair.
3. *Petrified wood and fossil shells*, from Basse's Straits and New Holland.

   Unfortunately the labels on these are lost, which is the more to be regretted, as the shells and their matrix resemble very closely those from the Himalaya : especially two, which are identical with Nos. 22 and 25 (Producta and Spirifer ?) of Mr. Everest's Plate, in the Trans. Phys. Cl. 2nd Part.
4. *Asbestus ;* veins in serpentine—locality not specified.

A letter was read from Dr. G. G. Spilsbury, dated Jabalpúr, 7th September, presenting three specimens of the fossil bones recently discovered in that neighbourhood.

The Secretary read a note upon the subject, which appears in the present number.

A geological notice was submitted, explanatory of a series of specimens collected between the plains of Assam and Chíra Punjí, in the Kasya Mountains, and presented to the Society by W. Cracroft, Esq. through the President.

Two boxes, containing 415 specimens of different kinds of wood, from India, Assam, Ava, Arracan, the Cape of Good Hope, Australia, and Pitcairn's Island, with a catalogue describing their native and Botanical names, was presented by Captain Baker, Superintendent of Iron Suspension Bridges.

Captain Baker has just completed an elaborate series of experiments on the strength and elasticity of these woods, of which a partial account was printed in the GLEANINGS. The paper will appear in the RESEARCHES.

A model of Theodore Jones and Co.'s new Patent Suspension Wheels, with a full description of their various advantages, was presented by Lieut. Col. Watson.

Of this invention, we shall give a particular account in our next.

Papers read.

1. Note on the Saline Deposits near Cawnpúr. By Mr. H. H. Spry.

This paper will appear in our next.

2. On the Ice Manufactory at Huglí. By Dr. Wise.

3. Report on the present state of the Boring in Fort William. By Dr. Strong.

The holidays had for a period suspended proceedings, and the overseer was employed in making up a claw and spring tool for the extraction of the rods, which had again unfortunately broken in the second shaft, at a depth of 130 feet. This accident had frequently occurred from the falling in of the sand, notwithstanding the protection afforded by the tubing of the present shaft. It would, probably, be necessary to withdraw the tubes to get hold of the rod; in which case, Dr. Strong proposed to replace them carefully, and proceed with the perforation: but, for this a further supply of cash would be requisite; the last grant of 500 being expended, and money being still due to the workmen.

A motion by Dr. Strong, seconded by Mr. D. Ross, that 500 rupees should be granted unconditionally for the continuation of the experiment, was negatived: an amendment was proposed by Mr. Wilson, and carried, "that the Committee recommend to the Society to make a further grant of 500 rupees to the gentlemen in charge of the Boring experiment, on the express condition, that it shall be the last, unless they shall be then able to shew convincing proof, that its further prosecution will be attended with success."

4. Report of the Sub-Committee, on the subject of the proposed extension of the Museum.

The report pointed out the difficulty of furnishing suitable accommodation for a resident curator on the premises, and proposed instead, that a small house in the immediate neighbourhood should be hired, in which all the preparations of the specimens could be made, leaving the whole of the lower floor of the Society's premises open for their reception. The expence of this arrangement, including the contingents of making and altering cabinets, stuffing, &c. was estimated at 200 rupees per mensem. After some discussion, the report was referred back to the Sub-Committee, to inquire what means exist to meet such an expenditure, before going before the Society with the proposition.

VIII.—*Notices in Natural History. By Lieut.* T. Hutton, 37*th N. I.*

The commencement of the rainy season is the period of vital activity among the insect creation : their rapid and prolific increase presents some of the most astonishing facts among the wonders of nature ; it seems as if every avenue of comfort and health would be choked up and destroyed by the millions which crowd into existence ; but means are wisely ordained to preserve each link of the chain of nature in equilibrium with the rest : thus beasts prey upon beasts, birds on birds and on insects, and these upon other species, so that the various tribes of living beings are kept within the limits which the purposes of their creation require. I will adduce a few instances of this amazing increase which have just fallen under my view.

1. *Ova of the Spider.*

A lad, whom I employ to bring specimens for my museum, brought me a small white ball, about the size of a pea, which proved to be the silky bag with which some spiders envelope their ova. It was closely constructed of silky threads, strongly interwoven, and glazed on the exterior, for the purpose probably of guarding against moisture. At first sight, its contents appeared to be small white eggs, but on closer inspection, I found them to be young spiders seemingly fully formed, at least as far as I could determine with a tolerable magnifier.—I then took a needle, and drew them forth one by one to the surprising number of *three hundred* and *ten* living spiders.

What numbers of insects must be destroyed to furnish this vast increase with food, while they themselves will in turn fall a prey to birds, &c. before the period of ovipositing shall again arrive ; and immense as the increase from one pair of spiders appears, yet having aided in keeping other families within their proper limits, perhaps not one in a hundred will survive to perpetuate the race.

2. *The Scorpion.*

The second instance I shall notice was a scorpion—*Scorpio Afer ?* Pecten with 15 teeth ; eyes 8 ; colour dark bottle-green ; legs and poison sack dirty straw-colour ; clasps or forceps tuberculated—length 3¾ inches.

The above was dug out of a hole in the ground ; it had ten young ones clinging about it ; these were a quarter of an inch long, and perfectly white, very soft, and the sting not perceptible through a magnifier, although the poison sack was formed —the point, where the sting should be, being quite obtuse in the whole of the young ones.

3. *Fresh-water Crab.*

The third and last instance which I shall at present advert to, was a fresh-water crab, which I found in a small hole, apparently that of a mouse, at the foot of a tree, and which for the present I have referred to the genus *Thelphusa*, Lat.

This had the two exterior antennæ placed at the base of the ocular peduncles ; jaw feet covering the mouth ; legs 8 ; forceps of equal size nearly, with a spine on the second joint ; shell cordiform, and truncated posteriorly, slightly wrinkled on the side with a short spine anteriorly, near the eyes ; colour greenish or livid grey above, dirty white beneath ; a mark in form of an impressed ♓ on the back, and two rows of small white spots placed in parallel lines at the anterior part of the shell, viz. two spots in the first line and four in the second, thus $_{*}{}^{*}{}_{**}{}^{*}{}_{*}$. On lifting the ventral plate, if I may so term it, in which the ova are found, I counted to my astonishment no less than *eighty-five* young ones, all alive, and seemingly fully formed; they were pale-greyish above and white beneath.

On placing them in a basin of water, they appeared very lively, swimming about quite briskly, but the next morning I found them all dead; probably in consequence of their not being sufficiently matured to leave the parent*.

From the situation in which I found this specimen, I was at first induced to think that it belonged to the land crabs (*Gecarcinus*), from which it does not much differ, if at all; but some few days afterwards finding another in every respect similar, in a small jhíl, I referred them to the genus above mentioned.

Although I have frequently seen crabs carrying their ova, I never before met with one which had young ones clinging to it; and as several works which I have consulted, state that the ova are deposited in the water, I am still inclined to think that I have not referred my specimens to their proper genus: moreover, the circumstance of the second specimen having been found in the water does not at all militate against the supposition of its being a land crab, as they are said to repair to the water for the purpose of ovipositing.

Stark, in his Elements of Natural History, speaking of land crabs, observes, "They pass the greater part of their lives under ground, coming out in the even- " ing for food. Once a year in the breeding season, they assemble in numerous " troops, and take the shortest direction to the sea, for the purpose of depositing " their ova; and when this object is accomplished, return again to their haunts. " It is said they stop up their holes at the period of their changing their shell."

I shall now conclude my letter with a sketch of an insect, which by Shaw is stated to be a native of Surinam, in South America; and as I had the good fortune to procure a very fine specimen a few evenings since at this station, I feel happy in being able to communicate the same to you, in case it may not hitherto have been acknowledged as an inhabitant of the East.

Order HEMIPTERA, genus NEPA, Water Scorpion, *Nepa grandis*. Snout inflected; wings four, cross complicate, coriaceous on the upper parts.

Fore feet cheliform; the rest formed for walking.

Colour dull brown, darkest on the scutellum and thorax; on the last of which are two pale longitudinal lines—Length 3½ inches.

This species is aquatic, and preys on water insects and tadpoles. I was dining with a friend whose house stands on the bank of the Ganges, when I captured the above.

These insects leave the water and fly during the night, and its coming into the house was probably from the attraction of the lights.

The genus *Nepa* of Shaw, in which he includes the present species, are all inhabitants of stagnant waters; I have collected, besides the *Nepa grandis*, several of the *N. cinerea*, *N. cimicoides*, and *N. linearis*, being all that Shaw mentioned in his General Zoology.

I may perhaps take occasion to mention some other genera in a future letter, as I have made a very tolerable collection of insects since the commencement of the rainy season.

I shall also take an early opportunity of noticing several varieties of scorpion, which, if the number of teeth in the pectinated plates on the abdomen is to be

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* Size of the young ones about as big as a capsicum seed; the old one the size of a dollar.

taken as a distinguishing mark, will amount to many more species than I have hitherto found described in any author I have been able to consult.

I had intended sending a drawing of the *Nepa grandis*, but not being able to delineate it myself with sufficient accuracy, I have been obliged to delay it, until I can get it drawn correctly.

IX.—*Miscellaneous Intelligence.*

1. *Roman Coins in Upper India.*

In a letter published in the *India Gazette* of the 19th October, Dr. R. Tytler mentions that many of the *Diocletian* coins noticed in the catalogue of the Society's Cabinet were presented by himself, and that they were collected at *Allahabad*, *Mirzapúr*, and *Bindáchal*. His inference is, that they were brought to India by Christian emigrants, during the ten years' persecution which occurred in the reign of that Emperor, and that some of the doctrines of the Christian religion were then engrafted upon the superstitions of Hindústán. The coins of *Carinus* and *Numerianus* were from *Mirzapúr* and *Chunar*: and another of *Diocletian's* was procured at Kanouj. If diligent inquiry be made in that part of India, probably an extensive collection of coins of the third century may be made. More remains of the sort will naturally be discovered in the neighbourhood of ancient towns, and the most prevalent date of the coin will in some way prove the period at which these cities were in the most flourishing condition. P.

2. *Spontaneous Combustion of Coal.*

On Friday, the 26th instant, smoke was observed to issue from the hold of the *London*, one of the ships severely handled in the late storm, which on examination was found to proceed from 300 tons of coals then on board that vessel. Means were taken to discharge the cargo, and the river engines were kept at work for two days and nights, pumping water in to swamp the ignited mass: the only damage sustained was in one of the pillars of the lower deck, which was nearly burned through. A portion of the coal was examined by Mr. Ross, of the Mint, and found to contain a considerable portion of pyrites: this mineral by the action of water and air is rapidly converted into sulphate of iron, and developes sufficient heat, when the mass is large, to ignite the coal: frequent accidents of the same nature have before happened. The steamer Emulous on sailing from England was forced to put back on account of the ignition of the coal stores. H. M. Ship Ajax is supposed also to have been destroyed in the same way. Commanders of vessels should take particular care that coals taken on board are quite dry, and shew no yellow veins or nodules: and they should not be placed where they are liable to be wetted, nor too near the powder magazine.

3. *Transit of Mercury observed in England.*

The 5th of May proved in England, as in India, a cloudy day. The planet was seen only thrice on the sun's disc by Mr. Barker of Deptford, and then only for intervals of two or three seconds: the spectacle therefore, as that observer writes in the Literary Gazette, was more gratifying than satisfactory in a scientific point of view. At 9h. 1m. A. M. Mercury was seen advanced about half his diameter on the disc. 9h. 3m. was observed to be the period of the first internal contact; but it is not mentioned whether the chronometer employed was at mean solar, or apparent time.

4. *Rain at Chira Púnji, from* 1*st September to* 8*th October*, 1832, *registered by* W. Cracroft, *Esq.*

	inches.		inches.
1	1.195	16	0.305
2	1.117	17	1.050
3	1.575	18	6.375
4	2.510	19	1.850
5	4.680	20	0.130
6	1.689	21	0.760
7	0.000	22	0.985
8	not meas.	23	4.600
9	4.232	24	5.010
10	9.494	25	0.000
11	6.332	26	0.000
12	0.000	27	0.000
13	0.085	28	1.235
14	0.000	29	0.000
15	0.000	30	0.000

1	0.000
2	0.000
3	0 000
4	0.000
5	0.125
6	0.000
7	3.015
8	12.650

Rain in Sept.	55.309
In 2 days of Oct.	15.790
Already regt.	154.690
in four months,	225.789 in.

Maximum temperature, 16th....81° 5′

Minimum, 29th....60

5. *Electric Spark from the Magnet.*

The modes in which Sig. Nobili, in Italy, Mr. Faraday, and Mr. Ritchie, in London, and Mr. Forbes in Edinburgh, have successively arrived at this satisfactory result of their researches, are now given to the world.

Signor Nobili was the earliest in point of date, but he was led to the discovery of the spark entirely by the theoretical views and previous experiments of Mr. Faraday, who also arrived at the same conclusion immediately after, and without a knowledge of his rival's labours. The apparatus necessary to display the phenomenon is exceedingly simple. The following are the views upon which it is framed.

" The voltaic pile gives a spark only when composed of a certain number of pairs of plates. A single Wollaston's voltaic element yields it ; and when of a certain activity, produces it constantly at the surface of the mercury, to which the conjoining wires destined to close the circuit are conducted. In the voltaic pile, having a certain degree of *electric tension*, the sparks pass between the zinc and copper poles, either in the case of opening or of closing the circuit. In a single Wollaston's element, the tension is feeble and the spark occurs only when the circuit is interrupted. At that moment, the current, which was before moving, accumulates as it were at the place of interruption, and acquires the intensity necessary to cause the spark. Such tension is wanting in the other case of closing the circuit, and the spark also is absent.

"The currents developed in the electro-dynamic spirals by virtue of magnetism are also in motion, but circulate only for the moment during which they are approaching to or receding from the magnet.

" It was, therefore, Sig. Nobili and Antiniori concluded, in one of those two moments that the circuit ought to be opened in making the experiment for the spark."

Experiment. A coil of wire is wound round the cross-bar or armour of a horse-shoe magnet ; the ends of the wire are brought away to a short distance from the bar, and bent so as to meet ; and, to ensure their contact, a disc is attached to the extremity of one wire, upon which the point of the other impinges at right angles : the contact is then made perfect by amalgamation with mercury. When the bar is separated from the magnet or brought to it, the jerk at contact separates the points of the wire for an instant, and a *spark* is seen to pass from one to the other, and when the armour is suddenly removed it is again visible: the experiment may be repeated at pleasure.—*Phil. Mag.* lxvi. 406.

Meteorological Register, kept at the Surveyor General's Office, Calcutta, for the Month of October, 1832.

Days of the Month.	Minimum Temperature observed at sunrise.					Maximum Pressure observed at 9h. 50m.					Max. Temp. and Dryness observed 2h. 40m.					Minimum Pressure observed at 4h. 0m.					Observations made at sunset.					Observations at 10 P. M.					Rain Gauge, No. 1.	Rain Gauge, No. 2.
	Barometer reduced to 32°.	Temper. of the air.	Depres. of M. B. Ther.	Wind.	Aspect of the sky.	Barom. red. to 32°.	Temper. of the air.	Depres. of M. B. Ther.	Wind.	Aspect of the sky.	Barom. red. to 32°.	Temper. of the air.	Depres. of M. B. Ther.	Wind.	Aspect of the sky.	Barom. red. to 32°.	Temper. of the air.	Depres. of M. B. Ther.	Wind.	Aspect of the sky.	Barom. red. to 32°.	Temper. of the air.	Depres. of M. B. Ther.	Wind.	Aspect of the sky.	Barom. red. to 32°.	Temper. of the air.	Depres. of M. B. Ther.	Wind.	Aspect of the sky.		
1	29,807	79,	1,8	n.	cu.	,864	88,	8,1	n.	cu.	,740	92,	12,8	n.	cu.	,722	85,7	7,2	n.	cu.	,728	85,5	7,3	n.	cl.	,834	85,4	7,9	cm.	cl.		
2	,799	78,5	1,3	n. w.	do.	,840	85,	5,1	n. w.	do.	,723	91,	13,5	n. w.	do.	,712	90,3	11,8	n. w.	do.	,714	84,	4,8	cm.	do.	,815	85,5	8,0	do.	do.		
3	,779	80,	2,1	do.	cl.	,851	86,	6,1	do.	do.	,735	91,3	9,8	n.	do.	,725	90,3	9,6	n. e.	cl.	,731	85,3	4,6	do.	do.	,831	82,3	3,2	s. w.	do.		
4	,816	78,5	1,	cm.	cu.	,860	88,	8,5	n. e.	do.	,726	91,3	12,8	n. e.	do.	,734	86,	7,5	do.	cu.	,737	83,	4,8	n. e.	cu.	,852	82,4	6,2	e.	do.		
5	,812	78,	1,8	n. e.	do.	,861	85,5	7,6	do.	ci.	,733	89,5	10,6	do.	do.	,763	77,3	1,6	s. e.	rn.	,765	76,	1,3	s. e.	rn.	,816	79,2	4,0	do.	rn.		
6	,758	76,	1,8	do.	rn.	,823	76,3	1,8	do.	rn.	,692	74,5	1,	do.	ru.	,688	74,7	1,8	n. e.	do.	,664	74,5	1,	n. e.	do.	,687	75,5	1,9	E.	gale	1,71	1,44
7	,561	77,1	2,1	E.	do.	,522	77,1	2,8	E.	do.	,254	80,0	4,0	SW.	do.	,201	80,0	3,5	S.	do.	,320	79,2	3,0	SW.		,535	75,0	0,8	SW.	do.	3,54	2,74
8	,665	74,	1,8	s. w.	do.	,755	78,5	3,8	n. w.	cu.	,697	84,7	6,5	do.	cu,	,696	84,5	6,	do.	ci.	,699	79,5	1,6	cm.	cl.	,798	78,2	3,8	cm.	cl.	1,65	0,80
9	,747	74,	0,8	s. e.	cl.	,796	82,3	4,8	s. e.	do.	,699	87,	9,1	do.	cl.	,697	87,3	8,6	s.	cl.	,705	84,	4,8	s.	do.	,760	79,2	2,0	s. w.	do.		
10	,711	78,5	1,	s. w.	do.	,790	83,5	5,8	s. w.	cl.	,693	91,	11,8	do.	ci.	,691	90,5	11,6	do.	do.	,698	86,5	6,5	cm.	do.	,778	81,2	2,2	w.	cis.		
11	,748	78,	1,2	do.	do.	,826	83,7	7,	do.	do.	,734	91,7	13,	do.	cl.	,733	90,5	13,6	s. w.	do.	,737	86,	8,5	do.	do.	,852	81,0	4,2	cm.	cl.		
12	,855	73,5	1,6	cm.	do.	,926	82,3	10,2	n. w.	do.	,825	91,	15,5	n. w.	do.	,825	90,	14,1	n. w.	do.	,839	83,	5,6	do.	do.	,895	79,1	8,7	s. w.	do.		
13	,884	73,	1,3	s.	do.	,952	83,	7,5	s. w.	do.	,855	89,	13,5	s. w.	do.	,844	87,3	12,3	w.	do.	,840	83,	7,5	do.	do.	,876	79,0	5,2	do.	do.		
14	,870	73,5	0,8	cm.	do.	,930	85,5	11,3	do.	do.	,848	89,	12,8	do.	do.	,823	88,3	12,4	s. w.	do.	,841	82,5	6,8	do.	do.	,895	80,2	6,2	s.	do.		
15	,879	73,	1,3	do.	do.	,956	84,	7,8	n. e.	do.	,855	87,8	13,9	n. e.	cu.	,853	87,3	13,6	n.	do.	,859	83,	6,8	do.	do.	,952	79,8	7,1	cm.	do.		
16	,930	71,7	1,2	do.	do.	,968	83,7	9,	n.	do.	,863	87,	14,3	do.	cl.	,857	86,	13,3	do.	ci.	,865	80,5	7,	do.	do.	,909	79,2	7,0	do.	do.		
17	,893	71,5	1,3	do.	do.	,969	82,7	11,	n. e.	do.	,856	87,	13,	n.	cu.	,849	85,5	11,6	do.	cl.	,849	82,	8,3	do.	do.	,917	78,2	4,9	do.	do.		
18	,867	71,7	1,	do.	do.	,917	82,5	8,3	n. w.	do.	,816	87,7	11,5	n. w.	cl.	,816	85,	10,8	n. w.	do.	,829	82,5	7,5	n.	do.	,891	78,2	5,4	n. e.	do.		
19	,863	72,5	2,8	n. w.	do.	,899	81,7	8,9	do.	ci.	,800	86,7	10,5	do.	ci.	,795	85,8	10,1	do.	ci.	,800	82,3	7,1	cm.	cis.	,867	79,5	5,8	do.	cis.		
20	,833	74,7	3,	n. e.	cis.	,900	80,7	6,	n. e.	cis.	,798	85,	7,3	n.	cis.	,792	83,5	12,6	cm.	cis.	,793	81,5	4,3	do.	do.	,869	80,0	5,0	do.	str.		
21	,837	75,7	1,8	do.	rn.	,916	74,3	1,6	do.	cy.	,845	75,3	1,8	n. e.	rn.	,828	75,	1,8	n. e.	rn.	,828	74,5	1,3	do.	rn.	,879	75,0	2,0	e.	rn.		
22	,867	76,	2,3	cm.	cis.	,906	79,3	4,1	do.	cu.	,784	82,8	6,1	do.	cu.	,782	82,5	5,5	do.	cis.	,797	78,	2,8	do.	do.	,870	77,2	2,0	do.	do.		
23	,808	74,7	0,8	do.	do.	,868	77,	1,8	cm.	do.	,752	82,3	4,1	do.	do.	,745	81,5	3,8	e.	do.	,751	78,	1,8	s. e.	cu.	,840	77,6	2,9	cm.	do.		
24	,777	76,	1,3	s. e.	do.	,829	82,3	3,8	s. e.	do.	,708	85,3	6,6	s. w.	do.	,695	84,7	7,2	s. w.	cu.	,705	82,	4,8	cm.	cl.	,790	77,2	1,8	s.	cl.		
25	,780	76,	1,3	cm.	cu.	,842	81,	4,3	s. w	do.	,760	85,7	8,8	do.	do.	,752	84,7	7,7	n. w.	do.	,775	82,	5,7	do.	cu.	,860	76,2	3,2	e.	rn.		
26	,863	74,5	1,3	n.	do.	,927	80,3	5,3	n. .	do.	,829	83,3	8,4	n. w.	do.	,829	83,	7,	do.	do.	,859	78,	2,8	n. w.	do.	,948	76,4	3,2	n. w.	str.	0,22	0,16
27	,934	74,5	1,	cm.	cl.	,993	80,	5,2	n. e,	do.	,887	85,5	9,	n.	do.	,883	83,5	8,	n. e.	do.	,898	81,5	7,3	n.	cl.	,978	78,8	5,0	n.	cl.		
28	,941	73,	2,3	n. e.	cis.	,994	82,	6,1	do.	do.	,872	86,7	10,8	n. e.	do.	,870	86,	10,8	do.	do.	,909	81,3	5.6	cm.	do.	,988	79,3	4,5	s.	cus.		
29	,946	75,5	2,8	cm.	cu.	,018	79,8	4,6	do.	cis.	,937	85,	1,8	do.	rn	,924	75,5	2,3	do.	cis.	,937	76,	2,1	do.	cis.	,995	76,0	2,7	e.	do.		
30	,955	73,5	1,3	n. e.	cis.	,009	77,	3,	do.	do.	,921	76,5	3.	do.	cis.	,919	76,	2,5	do.	do.	,898	75,	1,8	do.	do.	,952	74,1	3,7	n. e.	rn.	0,28	0,22
31	,893	73,	1,8	do.	rn.	,954	74,	1,1	do.	rn.	,832	76,5	2,3	do.	n.	,822	74,5	1,5	dc.	n.	,811	74,	1,3	do.	cy.	,863	73,6	1,0	do.	do.	0,75	0,65
Mean,	29,837	74,7	1,6			,898	81,5	5,7			,794	85,6	9,2			,789	84,1	8,3			,795	80,8	4,8			,850	78,7	4,2			8,15	6,01

Note.—On the 7th it blew a heavy gale, beginning in the north-east, and veering round to east, south, and south-west. As the Barometer was much affected thereby, its altitude on that day is omitted in the monthly averages.

JOURNAL

OF

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No. 11.—*November,* 1832.

I.—*Notice of the peculiar Tenets held by the followers of Syed Ahmed, taken chiefly from the "Sirát-úl-Mústaqím," a principal Treatise of that Sect, written by Moulaví Mahommed Ismaíl.*

The *Sirát-úl-Mústaqím*, or "The True Path," is the most important of several treatises which have been composed by followers of Syed Ahmed, the modern Mahommedan zealot and reformer, with whose name the European public has recently become familiar. It gives also the fullest account generally known of his tenets and pretensions. The interest attaching to his personal pretensions, has in a great measure ceased with his death, but the influence of his tenets still continues extensive, being understood, indeed, to have reached to almost all parts of India; and the subject is one which deserves attention, with reference to the marked distinction of opinions and usages which has arisen between those who have adopted his doctrines, and the mass of the Mahommedan population of the country. A subordinate portion only of this work is devoted to a statement of such opinions as affect points of common and obvious usage; but it is respecting these that curiosity may generally be supposed to exist. The main object of the author in composing it was, in the first instance probably, to shew his own learning; in the next, to justify the claims of Syed Ahmed, (of whom he was a constant and confidential adherent,) as a devotee, gifted with a surpassing degree of religious capacity and illumination. Its professed purpose is, kindly to impart to the world the benefits of the experience and inspired discoveries of a saint so eminent as Syed Ahmed was proclaimed to be, in those modes of religious exercise which are believed by the most orthodox Mahommedans to have an influence in purifying and strengthening the higher orders of human minds, which enables them, even in life, to attain to a knowledge of the hidden meaning and essence of the institutes of their faith, to an intimate communion with the immediate presence of the Divinity, and to the most exalted state of spiritual dignity and power. The whole is written in a strain of what may most appropriately be termed Orthodox Súfíism. Touching but little on the metaphysical subtleties of the Súfí opinions, and utterly denouncing such of their professors as are not strict believers, it is still devoted to an exposition of many of the admitted Súfí tenets and practices, and is full of the technicalities of Súfí phraseòlogy. It makes reference especially, in its explanations and allusions, to the peculiar divisions which prevail in India, among those who aspire to the honours of religious initiation. These are generally numbered as the followers of one or other of three venerated *Pírs*, each of whom has given a name to a distinct school or sect; the first, the "*Taríqa-i-Qádiría*," which traces its origin to *Abdul Qádir** *Jílani*, of *Jilan*, or Ghilan. Another, the "*Taríqa-i-Chishíta*," so called from its founder Khwája Múín-ud-dín Chishtí, whose tomb† is at Ajmere; the third, the "*Taríqa-i-Nakshbandía*," derived from a Khwâja‡ Bahá-ud-dín Nakshband, a native of Bokhâra. It was one of the peculiar pretensions of Syed Ahmed, that he held himself privileged, instead of confining himself, as is usual, to giving admission to one only of these schools, to receive followers at his pleasure into any, or into all of them, and he aimed also at becoming the founder of a school of his own, to which he gave the appellation of the "*Taríqa-i-Muhammedia.*"

It was not, however, to exercises of speculative piety, that this aspiring adventurer chiefly trusted to gain himself reputation and influence among his Mahommedan countrymen. The whole object of his career was to rouse and unite Mahommedan feeling in support of his own views of fanaticism and aggrandisement; and he naturally employed for that purpose methods more likely to have a generally active effect. The following sketch of the principal events of his career, and of the means by which he sought to obtain distinction, taken from the written or oral accounts generally current, may not be without interest, before proceeding to the detailed description of the peculiarities of belief and practice which his followers have adopted from him.

He began life in an indifferent school for the character of reformer and saint, which he ultimately assumed, as a suwar serving

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* The name at full length, with all its titles, is Ghous-ul Azim Mahí-ud-dín Abdúl Qádir Jílaní. Born 471, Hijrí. Died 561, Hijrí.

† Died 633, Hijrí.

‡ Born 718, Hijrí. Died 791, Hijrí.

with Amír Khán's free-booting horse in Málwa. Quitting that service, about the time when the body of Amír Khán's followers was disbanded, he repaired to Delhí, and became a disciple of Shah Abdúl Azíz, a very celebrated devotee of the city; the fame of whose knowledge and piety has been widely extended throughout this side of India. It is frequently said by Natives, that it was from Sháh Abdúl Azíz, that Syed Ahmed derived the peculiar opinions which he subsequently promulgated, and the design which he adopted of preaching up a religious crusade. It is at least certain, that the chief of his first disciples, and the most constant associates of all his fortunes, were two near relatives of Abdúl Azíz, one his nephew, and the author of this work, named Moulaví Muhammed Ismaíl, the other his son-in law, and also partially a contributor to the book, named Moulaví Abdúl Hye. Of these persons, Muhammed Ismaíl is generally esteemed to have been a man of much talent and learning. The extreme honour which he and his brother Moulaví paid to Syed Ahmed, who was himself nearly illiterate, had a powerful effect in attracting towards him the respect of the vulgar. They rendered him almost menial offices, running, it is said, with their shoes off, by the side of his palankeen, when he moved out, like common servants. Attended by them, he set out from Delhí on his way to Calcutta, and thence on the sacred duty of a pilgrimage to Mecca. He chose a circuitous route for the purpose; for he is said to have first gone north to Seháranpúr, and then west with a sufficiently intelligible motive to Rámpúr; the jagheer held by the descendants of the Rohilla chief, Fyzúlla Khan, and the seat of a large body of turbulent Patháns. From his first leaving Delhí, he assumed the character of a religious teacher, and commenced spreading his reforming doctrines. The general spirit by which these were animated, (identical nearly with that of the tenets of the Arabian Wahabís, of whom the sect of Syed Ahmed may perhaps be accurately termed an Indian imitation,) was the ardent profession of Mahommedanism in its primitive simplicity and fervour, and the utter rejection of all idolatrous or superstitious innovations, whencesoever derived. It is obvious, that such tenets were well calculated to awaken the sincerity of religious zeal, and to gratify the pride of Mahommedan feeling; while, on the other hand, they were likely to meet with much opposition in the influence of long established customs and indulgencies. The manner in which they were at first actually received was however highly favourable. When Syed Ahmed at last came down to Bengal, he had got together many followers, and had established an extensive reputation. He arrived in Calcutta with a considerable retinue towards the end of 1821, and immediately a great majority of the Mahommedans of the place, of all ranks and stations, flocked to become, or to profess themselves, his disciples. In the early part of 1822, he proceeded with his friends, the two Moulavís, to Mecca, from whence he returned in October of the next year, having touched for a few days at Bombay, where, with reference to the shortness of his stay, his success, in gaining numerous followers, was nearly as remarkable as in Calcutta. In December, 1823, he again started for Upper India. The next important event of his career, his commencing a religious war in the Lahore territories, did not occur till after a considerable interval, though the enterprise was one in which he had long openly announced his intention to engage. Its date is given in the following extract from the "*Targhíb-ul Jihád*," or "Incitement to Religious War," a little treatise written in Hindustaní during the continuance of the struggle, by a Moulaví of Kanouj, with the view, as its name purports, of rousing the Faithful to rally round the standard which had been raised in the Panjáb. "The tribe of Sikhs," says the indignant Moulaví, "have long held sway in Lahore and other places. Their oppressions have exceeded all limits. Thousands of Mahommedans they have unjustly killed, and on thousands have they heaped disgrace. The '*Azán*,' or summons to prayer, and the killing of cows, they have entirely prohibited*. When at length their insulting tyranny could no longer be borne, Hazrat Syed Ahmed, (may his fortunes and blessings be permanent!) having for his single object the protection of the faith, took with him a few true Mussulmáns, and going in the direction of Kabúl and Peshàwar, succeeded in rousing the Mahommedans of those countries from their slumber of indifference, and nerving their courage for action—Praise be to God—some thousands of believers became ready at his call to tread the path of God's service; and on the 20th Jummadí-úl-úla, 1242, Hijrí, (or the 21st December, 1826,) the Jihád against the Káfír Sikhs began." The events of this war were watched with a natural interest by the Mahommedan population of India generally, whether followers of Syed Ahmed or not. Many of the inhabitants of our Western Provinces went in bodies to range themselves under the

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* This is a grievance of old standing among the Mahommedans of the Lahore territory. Malcolm, speaking of the period when our army under Lord Lake pursued Holkar into the Punjáb, in 1805, says, "The Mahommedan inhabitants of the Punjab used to flock to the British camp, where they said they enjoyed luxuries which no man could appreciate, that had not suffered privation. They could pray aloud, and feast upon beef."

standard of the *Amír-ul Mominín*, or Leader of the Faithful, the title which he had now assumed to himself; and his emissaries gathered large contributions of money and jewels, even from our own distant Presidencies, and from the principal Mahommedan towns of the Dekhan. The prominent occurrences of the war, the perseverance with which it was kept up, the temporary and occasional successes which Syed Ahmed met with, and his ultimate death in battle, are well known. With his death, the struggle appears to have entirely ceased. That event, as was to be expected, is one which the people of his sect have been very reluctant to believe, and reports are still every now and then circulated among them, that he has been seen or heard of alive, and that the Sikhs are yet to have a rough waking from the dream, in which they are vainly indulging themselves, that they have got for ever rid of this inveterate antagonist.

But the notice of Syed Ahmed's personal fortunes has extended perhaps further than the subject merited. The account contained in the treatise, from which chiefly this paper has been compiled, of his rapid progress in spiritual illumination, deserves however to be adverted to, as affording a curious insight into the state of opinions among Mahommedans on such subjects at the present day; and an abstract of it will be given, in referring to the portions of the work which relate more especially to speculative or Súfí practices. The following string of questions, translated from a *risáleh* or tract, composed in refutation of Syed Ahmed's peculiar doctrines and pretensions, by an anonymous "*Fázilí Madrási*," or learned man of Madras, furnishes a convenient summary of the more important of them, and forms an appropriate introduction to the more lengthy statements of the Sirát-ul Mústaqím.

The questions are given with the short preface which precedes them in the original. "To the skilled in religion and law, these queries are submitted, in the hope that the perplexing doubts which have in this age seduced the more illiterate among the faithful into the thorny ways of error may by their sound explanations be removed, that right doctrine may be distinguished from deluding falsehood, and the actual relations and bearings of the truth, made clear to those now lost about and wandering in uncertainty."

Queries 1, 2, and 3. "Can any one properly lay claim to be the founder of a new and independent sect of law and morals, (to be a *Mújtahid-i-mústuqill)* after the time of the four chief Mújtahids, (the heads of the four legal sects, the Hanáfi, Málikí, Sháfií, and Hanbalí,) and before the appearance of the Imám Mehdí? Has any one ever advanced such a claim? And, shall a claim of the kind now be recognized on the part of any one, who in these degenerate times, because he has picked up more or less knowledge of the ordinary books of commentaries and traditions, shall choose to set up a sect of his own, differing in a minute point or two from the four established ones? Is it too permitted to an uninformed person of any of those sects, to act on a tradition not recognized by his own sect, or by any of the sects?" (These three questions have reference to one of Syed Ahmed's opinions, which is asserted distinctly in the Sirát-ul Mústaqím, that it is improper to follow the authority of the four Mújtahids, or Imáms, where an opposing tradition* of the Prophet's precepts, or example, may be found of proved authenticity, and not subsequently rescinded. The established opinion is, that the mere fact of a tradition not having been received by one or other of the Imáms, shews it to be not authentic.)

Queries 4 and 5. "Is it proper to found a new sect, and school, (of Súfí, or enthusiastic devotion is meant,) and to give it the name of the Prophet of God, in the sense in which the appellation of "Múhammedía" has been given to the school of Syed Ahmed? and is it competent to any person not skilled in all branches of knowledge, external and spiritual, to claim to be a "Mujaddid," or Renovator of Religion? (This last claim was advanced by Syed Ahmed on the ground of a generally received tradition to the effect, that after every hundred years, God will send forth a person to renovate the faith. The objection to the term "Muhammedia," as it was used by Syed Ahmed, is, that it implied an almost exclusive claim to connection with the Prophet. Had "Múhammad" formed a part of his own name, it might have been employed by him without impropriety, to denote the connection of the school, or sect, with himself personally.)

Queries 6 and 7. "Is it lawful for a person to assume the title of "Amír-ul Mominín," or Leader of the Faithful, who holds no sovereignty, and cannot enforce his own orders? And what is the true meaning and application of the tradition which says, that he who does not recognize the Imám of his age, dies the death of ignorance, (that is, similar to that of the Arabs, in what was called their state of ignorance, or before the time of Mahommed); and is it absolutely binding on men to establish an Imám, or conditional only on their power to sup-

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* Such traditions, which, after the Qoran, are the standard authorities on all questions of Mahommedan Religion or Law, are intended wherever the word is used here.

port him, and on the absence of opposing circumstances?" (These questions need no explanation, though the remark obviously occurs, that they suggest very convenient excuses for declining to give support to the enterprise of a mere fanatic adventurer.)

Queries 8 and 9. "Is it a violation of the Unity* of the Godhead to add to the true believer's profession of faith, "There is no God but God," the further declaration that "Mahommed is the prophet of God."

Is this giving a companion to God, or is it the very essence of the true faith? And is it unlawful to invoke the Prophet by the words, "Ya Rasúl Alla," or "Oh! Prophet of God." (These relate to branches of the Syed Ahmedí doctrine, of avoiding every thing which may bear the appearance of a departure from a pure belief in the Unity of God. It seems however questionable, whether the opinion implied in the first query is fairly imputed to the sect. Regarding the subject of the last question, the writer of the tract maintains, that to invoke the Prophet as an intercessor only is perfectly allowable. The point is not minutely dwelt upon in the Sirát-ul Mústaqím, but in another printed treatise, by the same author, in the Hindustání dialect, named the "*Taqwiat-ul-Imám*," the opinion animadverted upon is supported by a little refinement in argument. There is, it is admitted, nothing heretical in supposing, that departed Prophets and Saints may be able to *intercede*, but the faculty of hearing at the distance at which they are now removed from this nether world belongs to God alone.)

Queries 10 and 11. "Is it not lawful to make pilgrimage to the tombs of Prophets and Saints *(Ambiá wa Auliá)*, or of Mahommedans generally, repeating on such occasions texts and prayers from the Qoran, and avoiding what are notoriously abusive innovations? "And is the practice of performing the ceremony of the Fatiha in honor of the Prophet, of his companions, (the Sahába,) of Saints, or of any Mahommedan without distinction, by reading, at stated periods and anniversaries, sentences of the Qoran, and then conferring the blessing annexed to them, and to the food distributed at such times, on those exalted spirits—an innovation to be received as acceptable and praiseworthy, or is it to be rejected?"

(The practices here referred to are among the most obviously prominent of those in which the members of Syed Ahmed's sect have

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* It is not easy to find any single English word which shall convey the meaning of "Ishrak" (اشراک), or the giving or attributing a companion to God. It has been rendered, as here, a violation of the Divine Unity throughout this paper.

departed from the general and deep-rooted usages of their Mahommedan brethren in India. Occasionally their pious zeal impels them to remove altogether such dangerous temptations to what they consider a violation of the Unity of the Godhead, as the tombs of Saints, by forcibly pulling them down. The word Fatiha, which denotes originally the first chapter of the Qoran, is commonly used to signify the whole ceremonies performed and prayers offered in behalf or in honour of the deceased, on the anniversary of their death or other fixed periods. Such ceremonies are observed in honour of relations or of any venerated Saint, and as practised by the vulgar, they go much beyond the simple form described in the queries. At celebrated shrines, they are kept up with great pomp and solemnity ; and what are mentioned in the queries as offerings, distributed for the benefit of the spirits of the Saints, are in reality ordinarily regarded as propitiations presented to secure their favour and protection. Saints are in effect commonly made direct objects of worship. Against the customary abuses of this ceremony, therefore, Syed Ahmed's instructions and denunciations were peculiarly directed ; long arguments, exposing their impious tendency and character, are contained in the Sirát-ul-Mústaqím, and they are a leading object of invective in all the writings of the sect. A good account of the ceremonies at shrines, with a notice of several of the most venerated Indian Saints, is to be found in the numbers of the Asiatic Journal for December, 1831, and January and February 1832, abridged from an article in the Journal Asiatique, on the peculiarities of Mahommedanism in India, by M. Garçin de Tassy.

Queries 12 and 13. " Is it unlawful, or unattended with reward or benefit, to repeat prayers sanctioned by the example of Mahommed *(Súnun)*, whether of fixed forms or numbers, or occasional and supererogatory prayers, when unobjectionable seasons are chosen for them ? And is any one privileged to prohibit the giving of blessings to Mahommed, (that is, the expression by men, of blessings upon him,) or repeating from books in which such blessings are set forth ? (It appears from the answers to these queries, that Syed Ahmed denied that there was any excellence or virtue in the practices adverted to.)

Queries 14 to 18. " Have the leaders in the path of religious contemplation held it admissable to receive men indiscriminately as disciples into several of the Súfí schools at the same time, or to receive as a disciple one who has already adopted a religious instructor or guide, of a virtuous and pious character ; such instructor being living and present, and not having given his consent ? And is it not prohibited that any one, for his own corrupt and interested purposes, and not possessing the requisite purity of heart and spirit, should deceive the vulgar with false stories of his soul having ascended into the heavens, and conversed with angels and the souls of the Prophets? Is not the using frauds in religion, and the turning the heads of the vulgar from the fixed and certain way, a thing of fatal consequence, and an obstruction to union with the Deity, (the mystical union with the divine Spirit is meant?) And is it proper or possible for any one justly to claim such an union with the Deity, who has abandoned the established rules and methods of the *Ahl-i-Sharíyat wa Taríqat*, the teachers both of the external institutes of religion, and of the more refined and contemplative devotion?" (These concluding queries refer exclusively to Syed Ahmed's pretensions to eminent success as a religious enthusiast and devotee, and sufficiently explain themselves.)

5. The Sirátul Mustaqím, which was composed before its hero, (as he may fairly enough be termed,) had proceeded with its author on pilgrimage to Mecca, and was printed in Calcutta during their absence at Mecca, by an active member of the sect, Moulaví Mohammed Alí of Rámpúr, discloses little or nothing of the designs which the party entertained of stirring up a war of religious fanaticism against the numerous infidels of India, though it breathes, in treating of the duty of religious war, a sigh of pious regret over the darkness which has in these later days overspread the land. Compare, it says, the state of Hindústán with that of Rúm and Túrán! Compare it even with its own condition two or three hundred years ago. Alas! where are now the *Oulía* and *Ulama* of those times? But the subject is only incidentally touched upon, and the part of the treatise which relates to external duties of piety and morality includes it in a very general review of those duties in all their branches. This review is contained in the second chapter of the treatise, where it is inserted to shew the preparation necessary before any real benefit can be gained by entering on the exercises of religious contemplation. The chapter is thus entitled, "On the avoiding innovations in religion, and the mode of performing acts of religious duty and worship; on the purifying of the heart from vices, and adorning it with virtues." In much of this chapter, there is nothing peculiar beyond the degree of extreme purity and fervent zeal, which is insisted upon as indispensable for an aspiring devotee, though it is expressly stated as being in excess of what is required for acceptance as a true Mahommedan. The denunciations against innovations are all that it is interesting to notice; and these, illustrated by more detailed explanations of the generally prevalent abuses

from other treatises, fully mark the puritan system of doctrines, which wherever it has been embraced, pointedly distinguishes the followers of Syed Ahmed from the bulk of the Mahommedan population. Scattered in comparatively small bodies, over numerous parts of the country, these people will probably be found to present everywhere nearly a uniform character, modified only by such broad traits of differences as exist between the natives of Bengal and those of Upper India. Mahommedanism, as it came pure from the lips, or was exemplified in the life, of the Prophet, was the aim and profession of the founder of the sect. Its members consider themselves the only true Mahommedans, and regard the faith and practices of their countrymen as little in advance of the idolatry of their Hindú neighbours. They guard themselves as separate communities, apart from the contagion of the ordinary superstitions; they refuse to join their nearest relatives in their most solemn and cherished ceremonies; they are arrogant, intolerant, ready to give offence by proclaiming their contempt for the commonly received opinions and prejudices, often, where they are strong enough, by open acts of turbulence and violence. Wherever they exist, more or less of irritation may be expected to arise between them and their brethren from whom they have separated; but being commonly very much the inferior party in numbers, they are likely to be kept down, or to get only noted and laughed at for their excessive and precise zeal, and the ignorant conceit, (the remark applies to the condition of the ordinary peasantry of the country,) which accompanies their pretensions as the professors of a reformed belief and worship. They will, at the same time, probably, deserve the credit of being strict and sincere in the performance of the prescribed exercises of their religion, and of having improved in many points of moral character, in consequence of their change of doctrine. All these circumstances, and the nature of the doctrines themselves, seem sufficiently to shew, that the sect is not calculated to be permanently popular, or to spread very generally and rapidly, unless under the impetus of some strong causes of excitement, of the occurrence of which there is now but little probability.

The innovations to be carefully shunned by every true Mahommedan are divided in the treatise under three classes. The first, those which have sprung from association with sceptics or heretics, and with those who sin against the Unity, and give companions to God, appearing like genuine Súfís*. The second, those which have been

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* (ملحدین و مشرکینِ صوفی شعار و متشبهین بصوفیهٔ کبار).

caused by association with Shías. The third, such as have had their origin in the imitation of bad and corrupt usages generally.

Among the abuses included within the first of these classes are the following. Excess of respect to Murshids, or religious instructors. The numerous innovating ceremonies, which have become generally observed at tombs; and the making offerings in honour of saints: abuses, which may be said to constitute, in practice, nearly the whole religion of the common Mahommedans of the country. These have almost universally their Murshids, to whom they pay implicit deference. To their venerated saints they apply in every difficulty, undertaking long and expensive pilgrimages to their shrines, and propitiating them by offerings and vows, to lend their aid in the attainment of every object of earthly desire—children, health, fortune, or honour. These innovations however may more accurately be ascribed to familiarity with the rites and customs of Hindúism, than to the influence of any Súfi speculations. The resemblance between a Mahommedan Murshid and a Hindú Gúrú, is obvious. In India (to adopt the phrase of the "Hidáyatul Mominín," also a Syed Ahmedí treatise,) more than in any other Mahommedan country, Islám and Káfr have been mixed like *khichrí!* "If the Hindús have their Gyah, their Mathura, and their Káshi, the Mahommedans have their Makwánpur, (where the tomb of the saint Madár is,) their Baraich, (where the holy Salár, or Salár Masúd Ghazí is buried,) and their Ajmir, (where the attraction is the well known tomb of Khwája Moyin-ud-dín Chishtí.) The one set build mat'hs over their idols: the other, not to be behindhand, raise domes over their saints' tombs. In the mat'hs, you will find Mahants and Gosains: at Mahommedan shrines, Khádims, Mujáwirs, and Pírzádas:"—the latter being a numerous and influential race, whose interests, fortunately perhaps, are directly opposed to the spread of the doctrines of these strict and sweeping sectaries.

The rule laid down in the Sirátul Mustaqím, respecting the reverence due to a religious instructor and guide, is, that it is quite proper to adopt such a person, and requisite indeed to those who desire to tread the path and obtain the rewards of contemplative devotion. But that he should not be so honoured as to be obeyed in preference to the orders of the Qorán and the Prophet. In indifferent things, his authority should be held paramount. "Follow no one," says the Taqwíatul Imán, "be he Mújtahid, Imám, Ghaus, Kutb;" (these two are appellations given to personages supposed to possess a certain high degree of spiritual power); "Moulaví, Mushaikh, King, Minister, Padrí, or Pandit, against the authority of the Qoran and the Traditions." These opinions are evidently connected with the pretensions which Syed Ahmed has been mentioned to have advanced of disregarding the authority of the four Mújtahids, whenever opposed to a tradition which might appear to be authentic, and never to have been rescinded.

Respecting the abuses prevalent in regard to the tombs of saints, and the offerings and honours paid to them, the Sirátul Mustaqím declares them to be endless—but selects a few for prominent reprehension. The subjoined is a concise abstract of the diffuse arguments and illustrations into which it enters on the subject. "First," it says, "the vulgar think it more of a sacred duty to make long and difficult pilgrimages from all quarters to the shrines of Saints, than to perform the pilgrimage to Mecca, though the end of all the trouble they impose on themselves, may be to run them into heresy and impiety, and by consequence to God's wrath. The performance of such pilgrimages may certainly yield a little benefit to the spiritual devotee, but it causes such excessive injury to Mahommedans in general, that all ought entirely to abandon it. Secondly; The asking favour and assistance from the Saints of the shrines, with a belief in their independent power, which is open blasphemy. Thirdly; The burning of lamps on tombs, which is actually believed to have the virtue of rendering prayers acceptable, though the practice is strictly prohibited in traditions of unquestionable authority; and all who are careful to choose that as the period for offering their prayers, if they have not ignorance for their excuse, are clearly Káfirs. As to the offerings made on behalf of Saints, as at the ceremony of Fátiha, their origin was good, and according to the law; but the grossest abuses have crept in upon them, varying from the lowest, which is, imposing on oneself as absolutely obligatory what is really not so, to the greatest, which is openly to sin against God's Unity. The devotions of the living doubtless confer benefits on the dead, but this may be done in two ways: One, by leading a life of general piety and goodness, by which alone the duty which men owe to God, the Prophet, their religious instructors, (all in the religious family, to the Saint, its first founder, are understood to be included,) and their natural parents will be fully fulfilled, and therefore a pious man may abandon the performance of Fàtihas altogether. The other, by doing some specific virtuous act for the benefit of the departed. The ceremony of Fátiha belongs to this latter class, and if performed with the sincere desire and hope, assisted by prayer or not, that the reward of the gifts distributed, may be conferred on the deceased, it is blameless; but then there must be no restriction as to times of distribution, kinds of food, modes of serving it, or the descriptions of persons who are to be privileged to share in it"—a condition, which at once strikes at the root of all that is thought most valuable in the usual practices of the Fátiha, and separates completely Syed Ahmed's followers from the ordinary community. It will be seen, how the doctrine tends to break up families, when one who has adopted it would refuse to join his brother in the ceremonies thought most binding in commemoration of their father's death. A variety of objections are urged against the propriety of the restrictions which are to be so entirely rejected. The sum and climax of all is, that the observance of them, replete with abuse as they are, has come to be considered as alone constituting the real essence of faith; that it isnot *for* Saints, but *to* them that the offerings are regarded as being made; and that saints are therefore in reality worshipped, while God is neglected or forgotten.

Besides the going in pilgrimages to distant tombs, and observing the common ceremonies of the Fátiha, there are a variety of superstitious practices connected with those usages, and with the veneration paid to Saints generally, each of which is separately detailed, and its relinquishment *insisted upon* in the Taqwíatul Imán. The modes in which a pure belief in the Unity of God is departed from, are there classed under the four divisions of "Ishrák f'il Ilm, Ishrák f'il Tasarraf, Ishrák f'il Ibádat, Ishrák f'il Adat," or the assigning to God an associate or sharer in his Omniscience, in his exercise of the functions of Omnipotence, in the worship rendered to him, or the reverence shewn to him in any of those acts, among the practices of common life, which are indicative in any degree of sentiments of adoration orawe towards a superhuman power. Among the most popular practices springing from reverence for saints, which are denounced as belonging to one or other of those classes, are the applying to them for any particular desired blessing, as for children, &c. in the supposition, that their favour can, in a manner, reverse the order of fate—the dedicating in vows, and setting apart, animals to be sacrificed as offerings to them, or in honour of them, and the placing distinguishing marks upon animals for that purpose, which is declared to be an impiety, though even the orders of the law should be complied with by the "B'ism Illah" being repeated when the animal is actually killed—the making offerings of gratitude or propitiation to Saints after the birth of children—the giving to children names implying that they have been obtained through their favour; such as "Nabi Baksh," "Imám Baksh," "Madár Baksh," "Abdul Nabí," "Banda Alí," &c.—the allowing particular locks, or patches of the hair of children to grow untouched for certain periods, or the boring their noses or ears, as a mark of devotion to, or reliance for protection on, a Saint—generally the shewing the same signs of respect to Saints, as by standing up in repeating their names or invoking them, as to God himself—the making Sijda, or entire prostration to any one but God—and the making the "Tawwáf," i. e. a circuit or number of circuits, round the tombs of Saints, a ceremony to be performed round the holy Káába only.

The doctrine laid down in the Taqwíatul Imán, the authority or influence of Saints, as respecting intercessors is, that they may undoubtedly be privileged to intercede, but only when God has first granted them permission; and that the proper course is not to depend at all on their assistance, or to make any special prayer for their intercession, but to leave that, with all the other desires or necessities of man, to God alone, who, should such be requisite, will be careful both to provide an intercessor, and to give a sanction to his requests.

Of the second class of prevalent abuses, or those which have sprung from association with Shías, the first is an alleged departure from the established and orthodox belief respecting the relative superiority and precedence of the four first Caliphs, Alí being by many considered as possessing a higher degree of dignity and honour than his predecessors. This error is said to have in part arisen from the circumstance that most of the families or schools of religious devotees trace their origin up to Alí. The second abuse of this class consists in the ceremonies of the Moharram, which are observed as solemnly by very many of the common Súnís of the country, as by Shías. "A true believer," it is declared, "should regard the breaking a Tázia, by force, to be as virtuous an action as destroying idols. If he cannot break them himself, let him order others to do so. If this even be out of his power, let him at least detest and abhor them with his whole heart and soul."

Of the abuses which have sprung from bad and corrupt customs generally, those first marked for reprobation are the showy or expensive ceremonies on occasions of festivity and mourning—at marriages, and after the death of relatives. It is thought better, our author indignantly exclaims, that children should starve at home, than that these extravagancies should be abandoned. From such customs, a true Mahommedan should as far as possible keep free. He should labour indeed zealously to put a stop to them, reverting in such things to the orders of the Prophet, and the practice of his companions. "Follow the example of Mohammed of Arabia," is the concluding direction in this part of the treatise, " and relinquish all the usages of Hind and Sind, of Fars, or of Rúm;" a comprehensive exhortation which gives in a few words the whole spirit of the reforming doctrines.

Another abuse of this class, attributed to intercourse with Hindús, is the prohibition of widows from a second marriage. " If there be a widow among your relations," (is the injunction on the subject,) " make her, if you can, marry a second time, whether she wishes it or not. Should she persist in refusing, relinquish all kindly intercourse with her—Shrink not, should you in this depart from the fixed customs of your ancestors; God has a higher claim upon you than they." It should be mentioned, however, that it is not known how far this injunction is at present respected, or at least practically acted upon, by the members of the sect generally.

Of the further abuses, referrible to this last division, there may also be mentioned, from either the Sirâtul Mustaqím, or the Taqwíatul Imán, the vain glorious relying on the good qualities of pious ancestors, which is noted as the special sin of Syeds and Pírzádas—the placing faith in the practices of astrology or soothsaying in any shape, or in omens or Fáls from the Qoran—the attending to lucky or unlucky days—the worshipping, like the Hindús, their goddess of the small-pox, Sítalá, or even [a curious excess of enthusiasm] the adopting the infidel custom of keeping children from going near others who have the small-pox—the keeping pictures of the Prophet or of Pírs—the swearing by any one but God—the using the words Málik and Banda to express the relation between master and slave—besides which are enumerated very many others, defying any concise enumeration, against each of which the Taqwíatul Imán arrays a battery of texts from the Qoran and traditions, made accessible to all readers by translations and comments in the plainest Hindústaní.

The above comprises as complete a sketch of the peculiar opinions of the sect of Syed Ahmed, in all matters of external worship and morals, as has been found immediately procurable from information and books to be obtained in Calcutta, and presents doubtless a sufficiently accurate outline of them. The effect which they must have in separating their professors as distinct communities will be obvious on the mere perusal of them—for they may be literally said to affect every important event in which men can be concerned from their cradle to their grave.

It is to be remarked, as a new feature in the history of efforts for the propagation of Mahommedanism, or for the reform of its corruptions, how extensively the emissaries of this sect have availed themselves of the press to disseminate their tenets. The Sirátul Mustaqím, the Taqwíatul Imán, the Hidáyatul Mominín, and a little tract attached to it, named the "*Múzihul Kubair wa'l Bidaút,*" and two other tracts, entitled the "*Nasíhatul Muslimín*" and "*Tambíhul Gháfilín**," have all been printed at private presses in Calcutta or at Hooghly.

The pretensions of Syed Ahmed as a holy Súfi devotee, and his system of enthusiastic discipline and devotion, remain to be adverted to—but any thing beyond a very cursory notice of them would be tedious. A few words will explain all that appears to be peculiar in the system, and the details here given do not therefore extend beyond the account which has been stated to be contained in the Sirátul Mustaqím, of the rapid progress of this apt scholar in the paths of spiritual knowledge. With this branch of his opinions and instructions, it is to be supposed, that the great mass of his followers have but little, if any, minute acquaintance.

It has been mentioned, that the author utterly denounces the infidelities, which have attended the more refined and metaphysical speculations of numerous Súfi professors. This denunciation is to the following púrport. "Among the greatest obstructions of the path to God are infidel or heretic pretenders to Súfiism (Mulhidín i Súfi Shïár), who so far from fearing to violate the commands of the law, make the doing so their habit and characteristic—who teach and learn detestable, innovating, impious exercises or practices—and propagate infidelity (Ilhád) in the world; Let such be dealt with according to their deeds. Let those who deserve death, be put to death; and let those who merit the other grades of punishment (Tázírwa Tambíh) receive them. If it be not in your power to enforce the orders of the law, look on such persons with loathing, and regard the very sight of them as an abomination."—On the question of the identity of God and matter—an opinion very prevalent among Súfís—it is declared, that the point is one which it is worse than useless to be constantly discussing, but that what has been said respecting it by the illustrious authorities of Súfiism—the Akábr i Taríqat—does not go beyond

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* Since this paper went to Press, the writer has seen another Treatise printed in the course of last year, the *Miáyatul Masáil*, or the hundred questions: being answers by Shèkh Mohammed Ishak, a grandson of Shah Abdúl Azíz, to queries stated to have been put to him by some of the Royal family at Delhi.

this, that created things are not to be considered as actually one with the Deity (*eyn i haqq*), though they have their stability and permanence in him, and are the *muzahir i sifát*, the media in which he has chosen to manifest his qualities.

The foundation of spiritual progress in the school of Syed Ahmed, as with Súfis generally, is an entire abstraction from personal or worldly reflections and interests, and an ardent and unceasing adoration of, and love for, the Deity. But it is held to be important to distinguish between two kinds of love, of which our nature is capable, and which are of separate characters, though, with a true saint, like Syed Ahmed, they may exist, and be cultivated in full vigour together; and the difference between these and the relative value of the two are stated to have been too much lost sight of, especially in these later days. The one designated *hubbi ĩshki*, has its origin in feeling and passion, in the longing of the soul to rejoin its divine source; the other, termed *hubbi imáni* or *hubbi aqli*, (to which an indirect preference is given,) springs from the intense admiration and affection, with which it is inherent in the constitution of man's reason and perceptions, that he should regard a Being possessing all the qualities of beneficence, power, and infinite perfection, which are combined in God. Of the former love, the aim and reward are a certain mystical absorption in or junction with the Deity, accompanied by the highest degrees of spiritual knowledge and dignity. Of the latter, the result is an entire devotion of thought and purpose to the service of God, which is recompensed by its possessor being employed as an inspired and prominent instrument for working the divine will, or promulgating the divine commands, in the world. The former is declared to have been the special state and ornament of the Oulía or saints, and the exercises by which it is to be perfected are therefore termed the *ráhi wiláyat ;* the latter was the peculiar attribute of the various Ambia, or prophets and messengers to man, and the modes of acquiring and strengthening it, to the degree to which it can now be carried, are termed the *ráhi nabúwat.*

So much of introduction explanatory of the nature of these fanciful opinions has been necessary to render intelligible the following abstract of the history of Syed Ahmed's progress towards the perfection of the saintly character. It will seem strange, that such wild delusions should ever have received* acceptance, which it must be sup-

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* It is not known, that the Sirátul Mústaqím, though printed, has any extensive circulation. The pretensions which it puts forward for Syed Ahmed, are however, the same as those which he actually advanced for himself, and on which

posed that they in some degree did from the reputation which this fanatic generally acquired. The aim of the whole to serve his object of establishing a claim to a high mission, and attracting followers, is very obvious; but the familiarity with which his alleged intercourse with the Deity is spoken of would, to our notions, indicate rather a near approach to irreverence than the excess of devotional awe, which is inculcated throughout this treatise. The names which occur of the three Súfi schools, the Kadiría, the Chishtía, and Nakshbandía, have been already explained.

"Let it be known," says Mohammed Ismael, "that all the perfections of the *Tariq i nabúwat* were implanted from his birth in the nature of this holy man, as evidenced by the delight which he took in the exercises of piety, and practice of virtue from his childhood. At length, when he was admitted into the society of the venerated Shèkh Abdúl Azíz, (who received him as a disciple into the Nakshbandía school,) by the propitious effects and influence* of the enlightened spirit of his instructor, the concealed excellencies of his nature developed themselves in a rapid succession of wonders. Of these, the first was that he saw the Prophet himself in a dream, who fed him with three dates in succession, which circumstance he knew to be true by the effect which he found to be remaining (on his palate, it is to be supposed) when he awoke. This was the commencement of his progress in the Taríq i nabúwat. A further eminent advance in it was gained by him from the following event: In another dream, he saw the sainted Alí and the holy daughter of the Prophet, Fátima—when the former bathed him with his own sacred hands, and washed him carefully, as parents wash their children, and the latter clothed him in garments of exceeding richness. On this the favour and acceptance, which had been set apart for him from eternity, became directly visible, and he was taken under the

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he founded his claim as the head of a new school and sect. The genealogical tree of his religious family, a copy of which, like other religious teachers, he consigned to each of his disciples, contains statements of his communications with the Deity and with the spirits of saints, similar to those of the passage here translated. It gives also the names of the different Pírs of each religious stock in which he professed initiation, up to their respective founders: his claims being thus of two kinds, one of direct communication from the spirits of the several saints, the other of initiation in the ordinary mode.

* The words are "*Barakat i tawajjúhát.*" "Tawajjúh" is used in the passage in a technical Súfí meaning, implying the devotion by a teacher of all the contemplative powers of his mind to the object of communicating his own illuminations to his disciple, which it is supposed that he has the faculty of doing.

immediate guidance and guardianship of God. One wonder followed upon another, till one day the Deity taking his right-hand with his own arm of power, and placing before him some of the rare treasures of heaven, said to him, 'This I have given to you, and I shall give you yet more.' About this time, some one entreated urgently to be received by him as a religious disciple; when he put off giving a final answer for a few days, and in the interim, applied with the eye of contemplation to God, saying, 'You have taken my hand, which whoever in this world does*, attends always to the obligation thereby assumed, and what relation can the virtues of mortals bear to the qualities of God? What course then is it your will that I should follow towards this man who desires to adopt me as his religious guide?' The reply from God to this application was, 'Should thousands and thousands seek to be your followers, I shall provide for (or be sufficient to) them all.' And in this way event crowded on event with him, and fresh miracle upon miracle, till he reached the ultimate perfection of the Taríq i nabúwat, and attained to inspired knowledge.

Next as to the Taríq i wiláyat—respecting this it is to be understood, that the modes of exercise and contemplation followed in each of the separate schools lead to a certain peculiar capacity of connection in the spirit of the devotee with the Deity, which ordinarily is not acquired till after all those preparations have been gone through. But occasionally with some higher or more favoured spirits, this capacity precedes any use of preparatory discipline. So it was with Syed Ahmed. In the Kádiría and Nakshbandía schools, it was gained in a few hours, and directly from communication by the spirits of the founders of those schools—they having contended for nearly a month with each other for the exclusive possession of him, and having in the end agreed to descend upon him together. In the Chishtía school, its acquisition was commenced by communication from the spirit of the revered Kútbul aktáb Khwaja† Bakhtiár Káki, when Syed Ahmed was sitting in contemplation on the tomb of that saint, and it was afterwards perfected by communication from God himself. This happened to him in the Akberábádí Masjíd at Delhi, when he was engaged in devout contemplation with a number of his followers, among whom the writer,

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* The form is that by which a Murshid, or religious guide, receives the adherence of his followers.

† He was a celebrated Saint of the school.

Mohammed Ismael, himself was. When the assembly had broken up, he told the writer what had occurred in the course of it, viz. that God had himself vouchsafed directly to complete what had remained imperfect in his knowledge in the Chishtía school. From that time he began giving instructions in that school also, and introduced of himself the new and more expeditious method of performing its exercises, which has been described in this treatise."

The above is a sufficient specimen of the extravagances of enthusiasm or imposture which pervade the book. What is claimed as the peculiarity of the system which it explains, consisting of the distinction drawn between the two kinds of love towards the Deity, by which a devotee may be actuated, and of the grades of spiritual distinction to which they severally lead, much of it is occupied by expositions and illustrations of the grounds on which that distinction rests. These form the subject of the first chapter. The second chapter treats of the religious and moral duties and observances, the exercise of which prepares the devotee for spiritual contemplation. The third relates to the modes of contemplation prescribed by Syed Ahmed, for attaining to the perfections of the Taríq i wiláyat, with reference to the peculiarities of each of the several prevalent schools, and contains much which might be thought curious, could its technical details be brought within any short compass. The fourth describes the process of acquiring the excellencies of the Taríq i nabúwat, and a *Khátim* or conclusion sets forth the wonders experienced by Syed Ahmed himself, in the passage which has just been translated.

It has only to be added, that the treatise professes to have been written throughout, though not under the dictation, yet under the immediate eye and revision of Syed Ahmed. He, it is stated, having been endowed with a nature resembling in all respects that of the Prophet himself, was unacquainted with the forms and technicalities of worldly science. So that, to render the subject intelligible to general readers, his sayings and lessons have not been given exactly as he uttered them, but have been explained and arranged by the author according to the ordinarily understood rules of composition. The whole however was carefully read over to, and corrected by, him before being given to the world.

J. R. C.

II.—*Description of an Instrument for trisecting Angles. By Lieut.* T. S. Burt, *Engineers.*

I have the pleasure of sending you, for insertion in the Asiatic Journal, a description of an instrument I have lately made for trisecting any plane angle, which I should not probably have been induced to trouble you with, had I not seen, in the United Service Journal, for January last, an account of Captain Burton's problems for effecting the trisection, but they are all, you will have perceived, founded on trials, which in these cases are not allowed: and also, in the same volume, Major Mitchell's problem; but his attempt is very easily disproved, notwithstanding the confidence with which he gives it forth, as the true mode of trisecting an acute angle, which it is well known cannot be effected geometrically, and which, moreover, has been proved to be impossible.

Description. The accompanying Plate XII. fig. 1, exhibits a sketch of the instrument or trisector, which consists of four pieces of brass connected together at, but moveable on the points A and O. The leg or piece, A B, passing through a groove or opening at the extremity of the leg O B, in order that it may allow of O B being slided at B, over and along its length. The piece A D is made rather thinner than the others to admit of its passing underneath O B, whenever O B is made to slide along the leg A B towards A, as above noticed. A D is moveable on the point A.

This instrument will trisect any angle from 1° to 180o, and the correctness of its principle is evident from the annexed diagram, (fig. 2.) It may not seem irrelevant to remark, that No. 22, volume I. of the Mechanic's Magazine, contains the description of an instrument for performing a similar operation, invented in the year 1824; but that machine contains, of necessity, no less than 14 pieces, (see note at the end of this statement,) and its principle of construction is quite different from that of this instrument, which, as above stated, consists of only four pieces, and may, as I shall hereafter shew, be reduced to three.

Application. Let *a o c*, fig. 2, be *any* angle required to be trisected. Draw the chord *a c*, and lay the leg of the trisector, A O, upon one side *a o* of the angle, so that the point A of the instrument may coincide with the point *a* of the given angle, and O with *o*, respectively. Next, place the leg A D, which, as before described, is moveable on the point A, along the chord *a c*, without paying any regard to the length of this chord, until the leg and the chord coincide. Then slide the leg

O B, which is also moveable on the point O, until A D becomes equal to A B; this can be easily effected, (because A D & A B have each a scale of equal parts (of degrees) attached to them, commencing from A.) The given angle *a o c* is now trisected, and A O B is the third part of it.

Proof. The two triangles *a o b*, *a b d*, are equiangular, for the angle *a b d* is common to both triangles, as well as equal, both to the angle *b a o*, (because rad. *b o* = rad. *a o*,) and to the angle *b d a*, (because *a b* = *a d*, by construction or application of the instrument.) The two triangles, having 2 angles in the one, equal to two angles in the other, have therefore their third angles equal, namely, the angle *a o b* =angle *b a d*. But the angle *b a d*, at the circumference of the circle *a b c*, being measured by half the arc it stands upon, *b c*, is half of the angle *b o c*, at the centre of the same circle, measured by the whole arc *b c*; therefore, the angle *a o b*, its equal, is half of the same angle *b o c*, or one-third of the whole angle *a o c*, which was to be trisected.

The legs of the instrument may be reduced, in number, to three, thus —The piece A B is absolutely necessary to the first construction, in order to affix a scale of equal parts to A D, similar to that upon A B, (one of degrees is the best, because the angle can then be read off, not forgetting, in dividing it, that A D is to be considered the *chord* of an arc; but as soon as the parallels have been cut upon both legs, A B becomes superfluous.

To show this, I will state how A D is divided;—1st, set off upon A B a scale of equal parts, making their productions pass through the centre O, at whatever position of the instrument, but governed by O B. 2dly, when these have been cut upon the leg A B, set off an equal scale upon the other leg A D, and make their productions pass through the corresponding lines upon A B, conveying to the centre O likewise.

This being done, it must be evident, that the subsequent use of A B is superfluous, because the leg O B, after it has been placed parallel to, that is, immediately over and upon, any line that has been cut upon A D, and that was made by construction, to pass through corresponding parallels on the leg A B, no longer requires, for this very reason, the aid of the latter piece; so that the trisector, in this state, will, as before mentioned, consist of only three pieces, (as shewn in fig. 3.) But, in this case, having applied A O and A D, as before, to the side and chord of the angle to be trisected, O B must be moved towards A, until O B become parallel to, or coincide with one of these

Trisection of Angles.

fig. 1

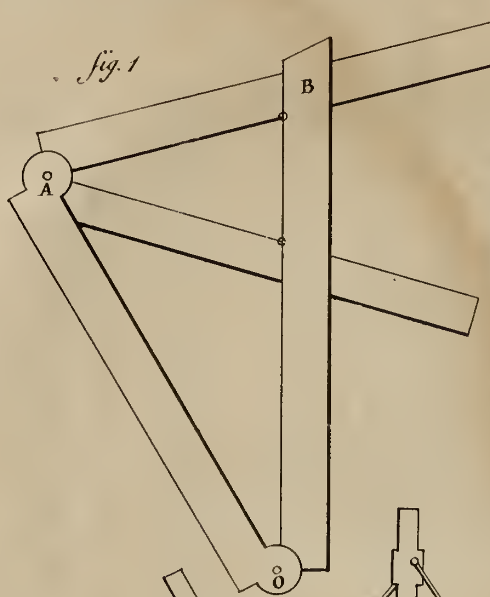


fig. 2.

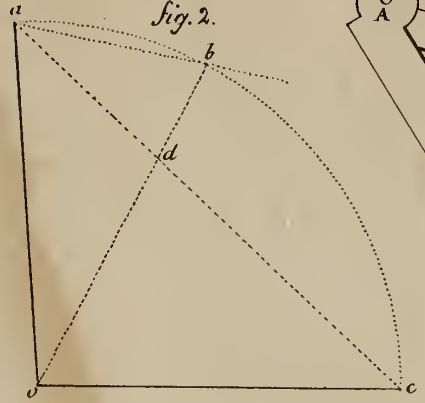


fig. 3

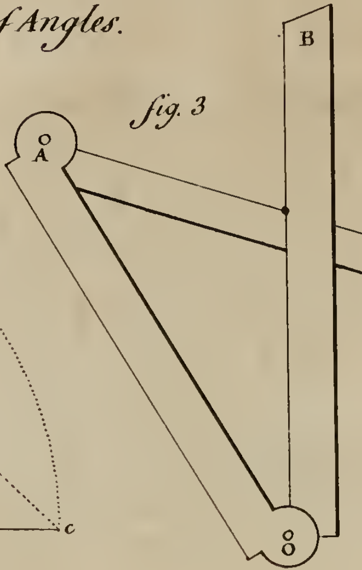


fig. 5

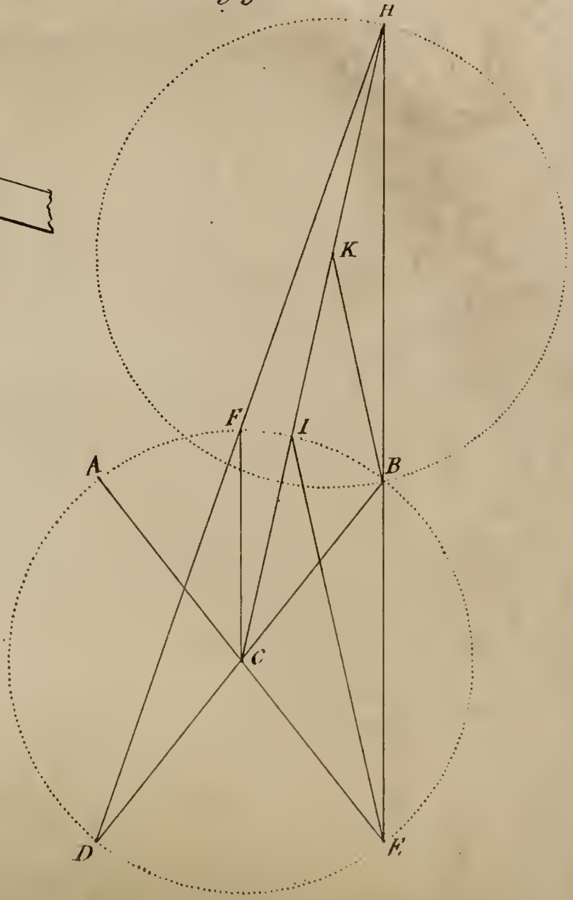


fig. 4

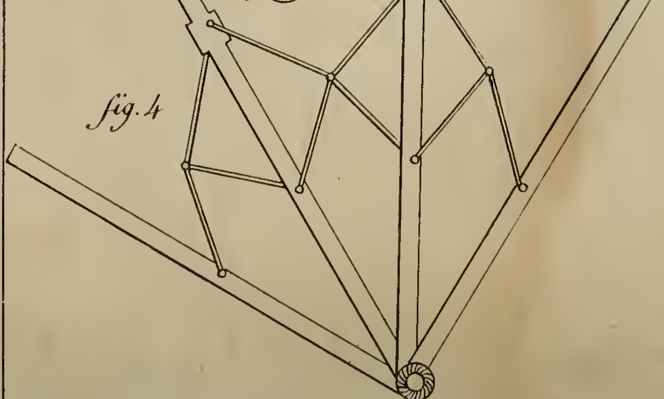
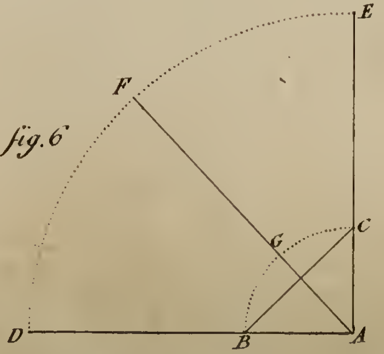


fig. 6



Calcutta. J.B. Tassin lith.

lines of equal parts, which are cut upon the piece A D, and then the given angle will be trisected.

Note.—Fig. 4 is a sketch of the instrument above alluded to: it is copied from the 1st volume of the Mechanic's Magazine.

III.—*On the Trisection of Angles. By Mr.* W. Masters, *Verulam Academy.*

In one of the late numbers of the United Service Journal, there is an article on the trisection of an angle, written by a Major in the British Army, resident at New South Wales. This gentleman believes he has solved the problem, and demonstrated his solution, which is in substance as follows:

Let A B C be the angle to be trisected; from C as a centre, and with any radius C B describe a circle; produce A C, B C, to E and D; join E B; trisect the arc A B in F; join C F and D F, and produce the line D F, till it meets the line E B produced in H; join C H; C H cuts the arc A B in I; the arc B I is one-third of the arc A B: this is his solution of the problem. In the demonstration, he proceeds to say, take B K=B C, and from the centre K, with the radius K B, describe a circle, &c. &c. The demonstration appears to be complete, and the gentleman exults at his success; but it escapes his sagacity, that his demonstration is built upon the hypothesis, that the circle K passes through the point H. Now, this is a very important point; the whole solution depends upon it: it is obtained by the intersection of the lines E B and D F produced. My object is to prove, that the *locus* of the point of intersection, of the two lines E B and D F, is not the circumference of a circle, which passes through B, and whose radius B K is equal to B C.

If possible, let the point H be in the circumference of the circle K, described as stated above.

$\therefore BK = KH = BC = CD.$
$\therefore BK + KH = BC + CD = BD$; but
$BK + KH \succ BH \therefore BD \succ BH.$ Again
$\angle EBD = BHD + BDH$ and
$EBD = BCF$, because $EH \parallel CF$,
$\therefore BCF = BHD + BDH$; but
$BCF = \checkmark BDF \therefore BDH = BHD$

$\therefore BD = BH$, and it has been proved to be greater, which is absurd. Therefore the point of intersection of E B and D F is not in the circumference of the circle K, and *therefore*, a line, H C, drawn from this point to the centre C, does not cut off a third part B I of the arc A B ; because

If B 1 be a third part of the arc A B, the locus of the intersection of C I with E B is the circumference of a circle passing through B, whose radius B K is equal to B C.

Let B C I be the one-third of B C A, and let C I and E B produced meet any where in H ; (it is easy to prove, that they will meet in that direction :) join E I, and through B draw B K $\parallel$ to E I.

$\angle CKB = CIE = CEI = \frac{1}{2} ACI = ICB \therefore BC = BK.$

Again $\angle CKB = KCB = 2IEB = 2KBH$; but

$\angle CKB = KBH + KHB \therefore KBH = KHB \therefore KH = KB$, and $\therefore$ K is the centre of a circle passing through H and B, and having its radius $BK =$ to B C.

The Major, therefore, has not trisected the angle : I believe, the problem remains just as it was before the Major took it in hand.

I hope I may be allowed to correct an error, relating to the present subject, into which many fall, who have not leisure to *examine* geometrical theories, &c., but yet have occasion to employ them. To trisect an angle, they are directed by some treatises, (Adam's Geometrical Essays, I believe, is one,) to find an arc that is equal to the third part of the given arc, and to *lay it off* on the given arc ; and a cumbersome mode is taught of finding this required arc, which is easily obtained thus :

Let D A F be the given angle ; take $AD =$ any length $= 3$ (for instance) ; and take $AB = \frac{1}{3} AD = 1$, and describe the circles D F E, B G C ; then according to Newton's 5th lemma, $AB : AD ::$ arc B G : arc B F $\therefore$ arc $BG = \frac{1}{3}$ arc D F. Now the difficulty is to *lay off* the *arc* B G upon the *arc* D F, so as to divide D F into three equal arcs. Recourse is had to a pair of compasses ; but it is very plain, that the compasses measure only the *chord* of B G, which is a *straight line*, and not the *arc* itself, which is a *curve.* Let the right angle D A E be trisected after this manner, and it will be found, that the chord B C will not answer the purpose. If it do, each portion of the arc being equal to 30°, $BC = \sqrt{2} = 1.41$, &c. will be the chord of 30° ; whereas the chord of 30° to the radius 3 is equal to 1.55, &c.

V.—*Note on Indian Saline Deposits. By Mr.* Henry Harpur Spry, *Bengal Medical Service.*

[Read 3rd October.]

In the fourth number of the Journal of the Asiatic Society, a note was published by the Rev. R. Everest on Indian saline deposits, in which particular attention was directed by that gentleman to the large quantities of *carbonate* of soda found in a plain about a mile to the west of Ghazípúr. He states also, that " As the sulphate of soda, is said to be collected in large quantities, from the soil of the basaltic districts on the western side of India, it is not improbable, that these saline deposits are distributed over the peninsula of India co-extensively with the nodules of *kankar* (corbonate of lime), and hydrated iron ore."

I have never met with any saline deposits among the trap formations of this district; but I am induced to believe the following notice regarding the sulphate of soda deposit in the Gangetic portion of the Oude territory, contiguous to Cawnpore, may not be unacceptable.

This saline deposit abounds in very large quantities about Unaú, and is found in the ravines all the way on to Sultanpur. It has a light earthy, and sometimes a dirty white, appearance in the mass, and its fracture is brittle. It yields by the common native process full 50 per cent. of pure Glauber's salt, of which quantities are annually manufactured by them ; and on analysis I found 200 parts to contain of

Dried Sulphate of soda,	145.9
Muriate of soda,	6.0
Alumina,	25.0
Trace of iron,	1.5
Silicious sand,	9.0
Trace of lime,	1.0
Loss,	12.0
	200.4

The *kankar* formation is very abundant along the Cawnpore bank of the Ganges, but the new sandstone formation of Bundelkhand, (which is the nearest approach I am aware of,) must be further, even from the sulphate of soda deposit of Unaú, than the Ghazipúr saline deposit described by the Rev. R. Everest.

Ságar, Aug. 14, 1832.

VI.—*Eclipses of Jupiter's Satellites.*

[Observed at *Chuprah,* Lat. 25° 47′ 26″ N., Long. 5h. 39m. 7s. E. by Mr. Walter Ewer.]

		Mean Time. *h. m. s.*		Difference from Greenwich.
2nd October,	Emersion of Sat. II. at	7 57 56.3	very clear.	5 39 04.3
3rd Ditto,	Emersion of Sat. I. at	9 53 50	ditto.	5 39 12
19th Ditto,	Ditto at	8 13 32	ditto.	5 39 02

Troughton's 5 feet achromatic, power about 200, aperture 3.8 inches. This telescope has been 25 years in the country, and is in excellent order.

Observations in Calcutta.

19*th October*, 1832.—On this day by the Ephemeris the whole of Jupiter's satellites were to be eclipsed, and of the phenomena no less than four out of six, viz. two immersions and two emersions, should have been visible at Calcutta. The weather having been unusually fine and clear for some days past, it was thought to be a good opportunity for trying the power of the superb reflecting telescope, lately presented to Mr. James Calder, by Sir John Herschell:—one of the last made under his father's directions. The following gentlemen undertook to make simultaneous observations with their own telescopes, by way of ascertaining the extent of uncertainty in the use of different instruments under precisely similar circumstances: Captain D. Ross, Marine Surveyor General, at his residence in Chowringhee, and his assistant Lieut. Lloyd, with a second telescope at the same place; Captain Wilcox, Mr. Logan, and Lieutenant Waugh, at the Surveyor General's office, in Park Street; Mr. H. Barrow, H. C. Mathematical instrument maker, in Loudon Street, Chowringhee; and Mr. Gray, at his observatory in Garstin's Buildings; while Lieut. Pemberton with his own telescope, Mr. Gordon with his, and myself at the large reflector, should make the observation at Mr. Calder's residence in Esplanade-row.

The evening proved hazy, and it was only at intervals that Jupiter could be seen to advantage; still, however, with all three telescopes, and particularly with the large reflector, the belts and satellites were distinctly visible through the haze. The immersion of the fourth satellite expected at 8h. 17m. 30s. was not visible on account of the mist —indeed the satellite had disappeared several minutes previously, or when we first stationed ourselves at our glasses. The emersion of the same at 11h. 3m. 20s. and the immersion of the third at 16h. 48m. 9s. were likewise lost from the same cause; so that the emersion of the first satellite, was the only one we were fortunate enough to obtain. The sky too was less hazy at that moment, and the belts were distinctly marked : still the observation was under unfavourable circumstances; and affords results applicable only to such. To save trouble all the observations have been reduced to the same meridian, namely, that of the Ochterlony monument, by applying—2 sec. to those of the Surveyor-Genl. Capt. Ross, and Mr. Barrow, and + 1 sec. to those of Mr. Gray: during the remainder of the month other observations were made in a similar manner :—they have been reduced to the same meridian, and the telescopes used are distinguished by letters of reference. **P.**

19*th October.*—Emersion of Jupiter's first satellite, Calcutta.

Observer.	*Telescope.*	*Aperture.*	*Power.*	*Note.*	*Obs. Me. Ti.*	*Longitude.*
Prinsep,	*a.* ten-foot reflector	9 in.	160	hazy	8 27 58	5 53 28
Pemberton,	*b.* four-foot achrom.	3.7	110	do.	8 27 59	5 53 29
Gray,	*c.* 42 in. achromatic,	2.7	80	do.	8 28 12	5 53 42
Logan,	*c.* 42 in. ditto, ...	2.7	80	do.	8 28 05	5 53 35
Ross,	*c.* 42 in. ditto, ...	2.7	80	dull glass	8 28 37	5 54 07

26*th October.*—Emersion of I Sat. observed in Calcutta.

At the Surv. Gen.'s,	Wilcox,	*c.*	[42. in. 2.7 ap. 80 p.]	10 23 15	5 53 05
	Waugh,	*c.*		10 23 41	5 53 31
	Logan,	*c.*		10 23 25	5 53 15
At Mr. Calder's,	Pemberton,	*b.*	[4 ft. achr.]	10 24 09	5 53 59
	Prinsep,	*a.*	[10 ft. ref.]	10 24 09	
At Mr. Gray's,	Gray,	*c.*		10 24 01	5 53 51

drifting clouds were passing the planet from the N. W. at the moment, and when the satellite was first seen, it had evidently been some seconds out of eclipse. There were eight seconds between the two last observations, which was about the time occupied by the cloud in passing from one station to the other. The sky was cloudless in Chowringhee.

	h. m. s.	*h. m. s.*
3*rd Nov.*—Emersion of II Sat. observed by Mr. Gray, tel. *c.*	7 52 8	5 53 20
4*th Nov.*—Emersion of I Sat. observed ;		
By Captain Ross, with telescope *c.* 42 inches.	6 48 38	5 53 46
By Lieut. Lloyd, with the telescope used by Captain Ross on the 19th ultimo, the object glass tarnished, the emersion was not visible until 14 seconds after. The evening was very favorable and clear.		
By Mr. Logan, at the Sur. Gl. office. *c.*	6 48 12	5 53 20
10*th Nov.*—Calcutta, very clear sky ; moonlight, (16th day.)		
Emersion of III. Sat. Gray, telescope *c.* very good	7 54 5	5 53 33
Gordon, *d.* 60 in. 3.7 ap. 110 p. doubtful,	7 54 56	5 54 34
Logan, *d.* 60 in. 3.7 ap. 99 p. moonlight,	7 53 41	5 53 19
Em. II. Sat. Prinsep, 10 feet Refl. *a.* bad focus,	10 27 17	5 52 53
Gordon, *b.* good,	10 27 27	5 53 03
Gray, *c.* good,	10 27 27	5 53 03
Logan, *c.*	10 27 32	5 53 08

11*th Nov.*—Em. I. Sat.	Prinsep,	*b.*	very good,	8 43 57	5 53 12
	Gordon,	*d.*	do.	8 44 05	5 53 20
	Logan,	*d.*	do.	8 43 48	5 53 03
	Barrow, (power 70)	*c.*	do.	8 44 32	5 53 47
17*th Nov.* Imm. III. Sat.	Barrow,	*c.*	do.	9 0 43	5 54 34
18*th Nov.*—Em. I. Sat.	Gordon,	*d.*	very clear,	10 40 01	5 53 19
	Prinsep,	*b.*	do.	10 39 47	5 53 05
	Wilcox,	*c.*	do.	10 39 50	5 53 08
	Logan,	*d.*	do.	10 39 43	5 53 01
	Barrow,	*c.*	do.	10 40 06	5 53 24
27*th Nov.*—Em. I. Sat.	Gray,	*c.*	good,	7 5 10	5 53 10
	Logan,	*c.*	doubtful,	7 5 15	5 53 32
	Barrow,	*c.*	do.	7 5 22	5 53 39

VII.—*Abstract of Observations of the Temperature, Pressure, and Hygrometrical state of the Air in the vicinity of Dehli. By Major* Oliver.

The observations were made at various places within the Dehli territory, not exceeding 50 miles distance from the city, and generally much less. It would of course have been more satisfactory had they been made at one and the same place, but I was not stationary and had not always the opportunity of making my observations at the most favourable hours: notwithstanding these disadvantages, I trust it will be thought that the mean results are at least as consistent as could reasonably be expected.

Referring to table I, my barometer is one of Dollond's: it was compared five or six years ago with the one then used in the Surveyor General's office, when it stood ·055 higher than the latter: the reduction has been made accordingly. The mean daily range during these eleven months, appears to be too little; but on taking the mean of a long series of observations made in camp, I find the mean is ·103. I had no observations at Gúrgaon in April, but as the Barometer in that month stands at nearly its mean height, the want of these is perhaps of little consequence. It will be observed, that there is an extreme difference of about 120 feet in the elevation of Gúrgaon above Calcutta, as deduced from the observations at the two places for the several months: when it is considered that each of the results in the Table is deduced from the mean of about sixty observations at each place, it is evident how little dependence can be placed on the results of *single* observations at places so far distant*.

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* The difference of the altitudes deduced from the monthly means, is just of the nature which was anticipated in consequence of the annual barometrical range increasing with the latitude; (vide page 30 of this Journal,) for all places in India north of Calcutta, the summer observations will give too high an altitude,—the winter, one too low: for southern latitudes the reverse will occur. We hope to furnish a correction for this hereafter.—Ed.

The observations in table II, were made at various places within the limits already mentioned. The mean temperature of each month has been deduced generally, from the observations at sunrise and 2½ P. M.; but occasionally (when others were wanting) from the observation at sunset only; in the latter case 3° have been deducted from the temperature at that time; as I find from the mean of a long series of observations, that the temperature at sunset is 3° above the mean of maximum and minimum. For the temperature of the night I have taken the mean of sunset and sunrise.

In Table III, for the dew points (headed S in the table) I have used the formula $\left(f = F' - 6{\cdot}056\,\frac{D^{1{\cdot}233}}{L}\ \frac{B}{30}\right)$ given in the GLEANINGS for July 1829, page 192, altering the constant 6.056 to 5.84, for, when I received this number of the GLEANINGS, having by me Daniell's Meteorological Essays, and finding that the table of the force of vapour there given, page 596, differed from the one used by the author of the valuable paper above referred to, I had the curiosity to calculate the value of $\frac{A}{e}$ (see the paper same page) and found it = 5.84; the difference is not perhaps very material, but as I have always used the table of the force of vapour given in Daniell's Essay above quoted, I thought it more consistent to use the constant modified accordingly. The two last columns of table III, (mean dew point and mean comparative tension) have been thus formed: the mean dew point is the mean of all the observations (or rather of all the results derived from the wet thermometer depressions) for several months: the force of vapour answering to the mean dew point, divided by that answering to the mean temperature of the month, gives the mean comparative tension. I have adopted this mode, not only from my having by necessity or choice so often altered my hours of observing, but from the consideration that as the dew point generally varies but little during the day, it appeared to me that it would be more accurate to deduce the mean comparative tensions from even one observation of the dew point and the mean temperature, than by taking it as the mean of results calculated for any two or more hours, not excepting even sunrise and 2½ P. M. How far I may be right in this, I leave to more competent judges to decide.

Table IV, is nothing more than an abstract of table III, the force of vapour at the dew point being substituted for the dew point itself. It appears, that May is the driest and August the dampest month, considering the comparative tensions as the fairest scale of the humidity of the air. There is a less quantity of aqueous vapour in a given quantity of air in January than in May, but the difference of temperature makes the drying power of the air in the latter month superior to that in the former. I find by a rough calculation that the weight of aqueous vapour in a cubic foot of air varies from 3·3 grains in January to 10.3 in August. Comparing the driest month at Dehli with the driest in Calcutta, I find the ratio as 5 to 3 nearly : the dampest month is nearly the same at both places, and the mean of the year as 5 to 4 nearly : I should have expected a much greater difference.

I have added a table of the factor $\left(5{\cdot}84\,\frac{D^{1.233}}{L}\right)$ for finding the dew point from observations of the temperature of the air and that of the wet thermometer ; also the table of the force of vapour which I have used in my reductions : should these be thought worth printing, it will be as well to give an example of their use to prevent misconception. Suppose the temperature of the air 100°, that of the wet thermometer 70° ∴ D = 30°, the barometer standing at 27·0 inch ; required the dew point and comparative tension ?

For wet thermometer 70° and D = 30° Table IV. gives ·402
For barometer 27.0 inch, deduct ·402 × ·1= ·040

·362
Force of vapour at 70° ·723

Dew point 49°.9—force of vapour answering thereto = ·361 log. = 9·55751
Force of vapour at temp. of air 100° = 1·874 colog. = 9·72723

Comparative tension = 0.193 = 9·28474

Table I. *Barometer reduced to 32°, and Temperature of the external Air observed at Gúrgaon.*

Year and Month.	10 A. M.		4 P. M.		Mean.		Daily range of Bar.	Monthly difference from mean.	Elevation of Gurgaon above Calcutta.
	Bar.	Temp.	Bar.	Temp.	Bar.	Temp.			
	in.	°	in.	°	in.	°	in.	in.	Feet.
May, 1829.	28.832	100.6	28.712	107.6	28.772	104.1	.120	— .182	868
June, ...	.813	96.1	.714	100.5	.763	98.3	.099	— .191	841
July, ...	.717	84.0	.646	87.0	.682	85.5	.071	— .272	855
August, ...	.791	83.9	.711	85.8	.751	84.8	.080	— .203	803
September,	.882	86.6	.798	91.7	.840	89.2	.084	— .114	807
October, ..	29.034	84.5	.955	91.1	.995	87.8	.079	— .041	808
November,	.223	72.7	29.143	79.1	29.183	75.9	.080	+ .229	750
December,	.255	62.4	.158	71.3	.207	66.8	.079	+ .253	771
Jan. 1830.	.230	66.0	.140	74.9	.185	70.5	.090	+ .231	854
February,	.153	69.8	.067	76.0	.110	72.9	.086	+ .156	813
March, ..	.052	77.3	28.963	83.4	.008	80.4	.089	+ .054	814
April, ...	..	..	..	..	..	..	..	..	..
					28.954		.089		817

TABLE II. *Mean Temperature of each month for three years, as observed at various places in the vicinity of Dehli.*

	1827.		1828.		1829.		MEAN.		DIFF. FROM MEAN.	
	day.	night.	day.	night.	day.	night.	day.	night.	day.	night.
	°	°	°	°	°	°	°	°	°	°
January, ..	56.7	51.4	53.7	50.3	58.4	53.5	56.3	51.7	— 19.7	— 19.1
February,..	66.0	58.6	56.8	51.8	62.0	55.8	61.6	55.4	— 14.4	— 15.4
March,....	74.0	66.0	70.6	63.8	73.0	66.0	72.5	65.3	— 3.5	— 5.5
April, ...	83.8	75.5	79.3	74.2	86.6	77.9	83.2	75.9	+ 7.2	+ 5.1
May,......	90.4	..	87.0	82.2	96.7	88.9	91.4	85.6	+ 15.4	+ 14.8
June, ...	91.7	..	93.7	90.4	92.0	90.0	92.5	90 2	+ 16.5	+ 19.4
July,......	90.1	..	88.2	85.5	79.7	80.6	86.0	83.0	+ 10.0	+ 12.2
August, ..	85.5	..	83.6	80.9	82.5	79.4	83.9	80.1	+ 7.9	+ 9.3
September,	83.2	79.3	85.2	..	81.7	77.6	83.4	78.5	+ 7.4	+ 7.7
October, ..	77.7	70.2	76.2	71.6	77.5	72.4	77.1	71.4	+ 1.1	+ 0.6
November,	65.7	60.3	65.2	55.2	65.8	61.7	65.6	59.1	— 10.4	— 11.7
December,	57.1	53.1	62.3	54.8	57.3	52.1	58.9	53.3	— 17.1	— 17.5
Means.....	76.8		75.2		76.1	71.3	76.0	70.8		

The mean of six observations of the temperature of water in wells from 74 to 94 feet deep gives 74°.0 : varying from 71° to 78°.

TABLE III. *Temperature of the Air—Depression of Moist Thermometer (D), Point of Saturation (S), or the dew Point, and mean comparative Tension, (T.)*

Year and Month.	SUNRISE.			10 A. M.			NOON.		
	Temp.	D.	S.	Temp.	D.	S.	Temp	D.	S.
	°	°	°						
April, 1827.	67.0	8.9	52·4						
May, ...	77.5	9.9	63.5						
June, ...	82.1	9.4	69.0						
July, ...	82.1	6.3	73.8						
August, ...	79.3	2.7	75.9						
September,......	74.9	2.3	72.0						
October, ...	61.5	4.9	53.8						
November, ...	49.7	4.1	42.4						
December, ...	46.5	0.8	45.2						
January, 1828. ..	43.8	1.2	41.8						
February, ...	42.3	1.5	39.7						
March,..........	52.5	5.1	43.3						
April, ...	63.1	8.3	48.7						
May, ...	71.3	14.0	46.0						
June, ...	82.8	11.9	65.5	96.5	20.7	66.0			
July, ...	81.7	5.2	75.0	92.3	12.6	75.4			
August, ...	78.4	0.8	77.5	85.0	6.0	77.3			
September,......				87.0	7.8	76.8			
October, ...				87.0	14.0	66.8			
November, ...				72.0	14.0	47.2	76.0	17.0	44.8
December, ...							73.0	13.0	50.8
January, 1829. ..							68.0	12.0	46.4
February, ...							74.0	15.0	47.3
March,..........							90.0	23.2	50.2
April, ...							99.0	30.0	45.5
May, ...				100.6	26.0	60.2			
June, ...				96.1	17.5	71.7			
July, ...				84.0	5.0	77.7			
August, ...				83.9	4.9	77.7			
September,......				86.6	11.9	70.0			
October, ...				84.5	18.4	54.2			
November, ...				72.7	15.4	44.1			
December, ...				62.4	13.0	35.0			
January, 1830. ..				66.0	14.7	35.2			
February, ...				69.8	8.8	55.9			
March,..........				77.3	15.8	49.8			

TABLE III. *(continued.)*

Year and Month.	2.30 P. M.			4 P. M.			SUNSET.			MEAN.	
	Temp.	D.	S.	Temp.	D.	S.	Temp.	D.	S.	S.	T.
	°	°					°	°	°	°	
April, 1827...	100.5	30.3	47.8				84.1	19.1	517	50.1	.320
May, ..	103.2	29.8	55.0							59.2	.359
June, ..	101.4	24.1	65.8							67.4	.456
July, ..	98.1	18.4	72.5							73.2	.581
August, ..	91.8	11.4	76.7							76.3	.744
September,..	92.2	14.0	73.0				83.8	8.7	72.0	72.5	.706
October, ..	94.0	25.8	49.5				78.9	16.7	50.0	51.7	.412
November,..	81.8	21.4	40.8				70.9	15.3	41.3	41.6	.425
December,..	67.7	10.5	49.6				59.8	5.5	50.7	47.4	.706
Jan. 1828. ..	63.6	9.2	47.4				56.8	5.5	47.5	44.6	.723
February, ..	71.3	16.7	37.7				61.3	10.4	41.3	38.7	.518
March, ..	88.8	27.0	34.2				75.0	18.2	40.0	38.7	.324
April, ..	95.5	28.6	43.0				85.3	23.3	41.0	45.9	.317
May, ..	103.0	33.0	43.3				93.0	24.1	52.7	44.7	.238
June, ..	104.7	27.9	62.1	101.5	24.7	64.6	97.9	24.3	60.6	63.8	.379
July, ..	94.8	15.2	74.0	93.6	15.1	72.8	89.2	11.7	73.3	74.5	.644
August, ..	88.7	8.3	77.9	87.0	7.0	78.0	83.4	3.9	78.6	77.7	.827
September,..				88.0	9.9	74.8				75.8	.738
October, ..				92.0	22.0	56.5				61.7	.615
November, ..				79.0	20.0	40.3				44.1	.475
December, ..										50.8	.668
Jan. 1829, ..										46.4	.651
February, ..										47.3	.595
March, ..										50.2	.457
April, ..										45.5	.248
May, ..				107.6	33.3	52.3				56.2	.265
June, ..				100.5	23.2	66.4				69.0	.476
July, ..				87.0	7.0	78.0				77.8	.941
August, ..				85.8	6.7	77.5				77.6	.854
September, ..				91.7	15.8	69.2				69.6	.671
October, ..				91.1	25.6	44.5				49.4	.382
November, ..				79.1	20.6	38.3				41.2	.417
December, ..				71.3	18.1	32.5				33.8	.424
Jan. 1830. ..				74.9	20.5	29.6				32.4	.394
February, ..				76.0	14.1	52.3				54.1	.654
March, ..				83.4	21.9	42.0				45.9	.416
Mean first year,										55.1	.523
second,										56.9	.550
third,										54.4	.512
Mean of three years,										55.5	.528

TABLE IV. *Comparative Tension, (T.) and Force of vapour at the Dew point, (F.)*

	T.	F.		T.	F.		T.	F.	MEANS.	T.	F.
Ap. 1827.	.320	.363	Ap. 1828,	.317	.312	April, ..	.248	.308	April, ..	.295	.328
May, ..	.359	.501	May, ..	.238	.299	May, ..	.265	.450	May, ..	.287	.417
June, ..	.456	.663	June, ..	.379	.586	June, ..	.476	.699	June, ..	.437	.649
July, ..	.581	.804	July, ..	.644	.840	July, ..	.941	.936	July, ..	.722	.860
August,..	.744	.891	August,	.827	.933	August,	.854	.930	August,	.808	.918
Sept. ..	.706	.786	Sept. ..	.738	.876	Sept. ..	.671	.713	Sept. ..	.705	.792
October,	.412	.384	Oct. ..	.615	.546	October,	.382	.354	Oct. ..	.470	.428
Nov. ..	.425	.266	Nov. ..	.475	.292	Nov. ..	.417	.262	Nov. ..	.439	.273
Dec. ..	.706	.329	Dec. ..	.668	.372	Dec. ..	.424	.199	Dec. ..	.599	.300
Jan.1828,	.723	.298	Jan.1829,	.651	.317	Jan.1830.	.394	.189	Jan. ..	.589	.268
February,	.518	.239	Feb. ..	.595	.328	Feb. ..	.654	.418	Feb. ..	.589	.328
March,..	.325	.234	March,	.457	.365	March,..	.416	.312	March,..	.399	.305
Means.	.523	.480		.550	.506		.512	.481		.528	.489

TABLE V. *For finding the dew Point from the Temperature of the Air, and that of the Wet Thermometer.*

D.	Temperature of the Wet Thermometer.									
	110°	100°	90°	80°	70°	60°	50°	40°	30°	20°
1°	.006	.006	.006	.006	.006	.006	.007	.007	.007	.007
2	.013	.013	.013	.014	.014	.014	.014	.014	.015	.015
3	.021	.022	.022	.023	.023	.023	.024	.024	·025	.025
4	.030	.031	.032	.032	.033	.034	.035	.035	.036	.037
5	.040	.041	.042	.043	.044	.045	.046	.047	.048	.049
6	.051	.052	.053	.054	.055	.056	.057	.058	.060	.061
7	.062	.063	.065	.066	.067	.068	.070	.071	.073	.075
8	.073	.074	.076	.077	.079	.081	.082	.084	.086	.089
9	.084	.085	.087	.089	.091	.093	.095	.097	.100	.103
10	.095	.097	.099	.101	.104	.106	.109	.111	.114	.117
11	.107	.109	.111	.114	.116	.119	.122	.125	.128	
12	.120	.122	.124	.127	.130	.133	.136	.139	.142	
13	.132	.134	.137	.140	.143	.146	.150	.153	.156	
14	.145	.147	.150	.154	.157	.160	.164	.168	.171	
15	.157	.160	.164	.168	.171	.175	.179	.183	.187	
16	.170	.174	.177	.181	.185	.190	.194	.198	.203	
17	.183	.187	.191	.195	.199	.204	.209	.214		
18	.196	.200	.205	.209	.214	.218	.224	.229		
19	.210	.215	.219	.224	.229	.234	.239	.245		
20	.224	.229	.233	.239	.244	.250	.256	.261		
21	.238	.243	.247	.253	.259	.265	.272	.278		
22	.252	.258	.263	.269	.276	.282	.289	.295		
23	.266	.272	.278	.284	.290	.297	.305			
24	.281	.286	.292	.299	.306	.313	.321			
25	.295	.301	.307	.314	.321	.329	.337			
26	.309	.316	.323	.330	.337	.345	.353			
27	.324	.331	.339	.347	.354	.362	.370			
28	.339	.346	.354	.362	.370	.379	.388			
29	.354	.362	.370	.378	.386	.395				
30	.369	.377	.385	.394	.402	.411				
31	.385	.393	.402	.411	.420	.429				
32	.400	.408	.417	.427	.437	.447				
33	.416	.425	.434	.444	.454	.464				
34	.431	.440	.450	.460	.470	.480				
35	.447	.457	.467	.476	.487					
36	.462	.472	.482	.493	.504					
37	.478	.488	.499	.510						
38	.494	.505	.516	.527						
39	.510	.521	.532							
40	.526	.538	.549							

Bar.	Mul.
29.5	.02
29.0	.03
28.5	.05
28.0	.07
27.5	.08
27.0	.10
26.5	.12
26.0	.13
25.5	.15
25.0	.17
24.5	.18
24.0	.20
23.5	.22
23.0	.23
22.5	.25
22.0	.27

N.B.—The numbers in this Table to be multiplied by $\frac{B}{30}$, B being the height of the Barometer: or, which will be easier, deduct therefrom the product of the tabular number by the multiplier opposite the height of the barometer in the small table above*.

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* We omit Table VI. of the Force of Vapour, because it may be found in any physical or chemical work; besides which, the tensions of vapour at temperatures between 60 and 120, require to be more accurately determined for the present state of atmospherical knowledge.—ED.

VIII.—*Proceedings of the Asiatic Society.*

Wednesday, 7th November, 1832.

The Honorable Sir Edward Ryan, President, in the Chair.

Read the proceedings of the last Meeting.

The following Members were ballotted for, and unanimonsly elected:—Monsieur Richy, Captain Sage, Rajah Kalikrishen.

The communication from Baron Ferussac, referred to the Committee of Papers at the last Meeting, having been considered by them, they report, that they consider it unadvisable to take any share, but recommend to the Society to subscribe for a complete annual set of the Bulletin Universel.

With regard also to the List of Books submitted by Dr. Tytler, the Committee recommend, that only such as have an oriental character be purchased.—Resolved, that the recommendations of the Committee be adopted.

The Secretary reported the completion of the 17th volume, also the preparation of an ample Index to the first 17 volumes.—Resolved that the Index be printed.

The Secretary to the Physical Class reported, that it had been determined to recommend a further grant of 500 rupees for the Boring Experiment, on condition of that being the last grant to be made by the Society.—Resolved, that the grant, subject to the stipulation, be confirmed.

Resolved also, as a matter of general convenience, that in future the Proceedings of the Physical Class shall form part of the business of the General Meetings, which shall be held once a month on the first Wednesday, as heretofore.

Museum.

An Image of Bhairava. Presented through Dr. Twining on the part of General O'Halloran.

This image of Mahadeo was found at Bijrah Ghat, situated in a wild jungle on the right bank of the Nerbadda, on the rout from Jabalpur to Garwarreh, about 14 miles from the former town, and about three miles from the high road; it is approached through heavy ravines.

On the top of a circular hill, about 150 feet high, in the centre is a temple dedicated to Mahadeo, and on its brow, surrounding the temple, is an arcade, divided into 72 compartments, in each of which is a large image, of good workmanship, more or less mutilated, as tradition states, by the army of Aurangzeb, when in progress to the Dekhin. At the foot of this hill, and at a small distance, close to a temple, falling into decay, the above image was found, and conveyed to Ságar, and from thence to Calcutta.

The arcades on the crest of the hill appear to be very ancient, and are built of large stones, without cement.

Bijrah Ghat is considered as a sacred spot, where an immense crowd of pilgrims congregate three days in the year, for the purpose of traffic and devotion.

A figure of Nemnáth. Presented through Mr. Kyd.

Read a letter from Captain Boileau, presenting several coins dug up at Agra.

The Secretary reported, that the Committee had authorised the purchase of a set of Roman Coins. A list of which, prepared by Mr. Prinsep, was submitted.

The head of a Saw-fish. Presented by Mr. Hutchinson.

The thanks of the Society were voted for the above.

Library.

Read a letter from Counsellor Von Hammer, presenting the following works:

1. 8th Vol. of the Ottoman History.
2. Persian Translation of the Meditations of Marcus Antoninus.
3. Account of Oriental Manuscripts in the Library of Turin.
4. Nos. 53 to 56 of the Johrbucher of Vienna.

"The Ass overladen." Presented by Mr. Fisher.

Read a letter from the Secretary to the Royal Academy of Bourdeaux, presenting 2 vols. of their Proceedings.

Transactions of the Geological Society, part 2nd of the 3rd Vol. presented by the Society.

Notes on the Hitopodesa, by Messrs. Schlegel and Lassen. By the authors.

New edition of De Sacy's Arabic Grammar. By the author.

Memoir on the Mussulman Religion in India, by M. Garcin de Tassy. By the author.

2 small Persian Manuscripts on Astrology, &c. By Ensign Readbold.

Meteorological Journals for August and September, 1832. By the Surveyor General.

Resolved, that the thanks of the Society be returned for the above.

The Secretary reported the purchase of the following Books.

1. Franklin's Observations made on a tour from Bengal to Persia, 1 vol.
2. Scott's Ferishta's History of Dekhan, 2 do.
3. Bentley's Hindu Astronomy, 1 do.

Literary.

Translation of an extensive Bauddha Vocabulary and Abstract of a Tibetan Medical work. Made and presented by Mr. Csoma de Körös.

A notice of some of the Arabic Poets. By Ensign Readbold.

An Abstract Account of the contents of the volumes presented by Ensign Readbold. By Baboo Ramdhun Shèn.

Read Extracts from a Letter from Major Burney, from Ava, to the Secretary, regarding the historical records of that country.

Inscriptions from Vijayanagar, with translations and a pedigree of the Kings of that city. Presented by Mr. Ravenshaw.

Read also observations on the same by the Secretary.

The thanks of the Society voted for the above, and the papers referred to the Committee.

IX.—Scientific Intelligence.

Slate Quarries in the Western Ghâts.

From official reports lately communicated from the Bombay Government to this presidency, with the perusal of which we have been kindly favored, we learn that Lieut. Jervis of the Bombay Engineers has brought forward propositions for the working of quarries in the extensive clay slate formations in the southern Marhatta country. That officer has sent down specimens of slates adapted to the several purposes of roofing, flooring, monumental stones, dials, dripstones, whet-stones, and drawing slates; accompanied with samples of marble, porphyry, lithographic stone, mill-stone, sand-stone, &c. all of which he shews may be turned to great advantage in an economical point of view. He calculates, that slates may be substituted for tiles in roofing and flooring, with a saving of weight and expence—the weight of a 100 square feet of slate being 1 to 3 cwts. while that of single tiles is 7 cwts. The expence of the slates at Bombay would be 8 to 15 rupees per 100 sq. ft. cut and squared. There seems, however, a difference of opinion on the subject among those conversant with building; and it does not appear, that the best slates in Europe are much, if at all, lighter than the tiles used in this country. The slates would, like the Chunar stones used in our western provinces, admit of the beams being placed further apart, and of the burgars being dispensed with; and this alone, if the land carriage be not very heavy, will produce a demand for so useful and elegant a roofing material. The following is an extract from Captain Jervis's report on the subject, dated March, 1832.

"The above varieties of slate alternate with strata of the most beautiful descriptions of marble and porphyry; in the latter of which are found nodules of jasper, of considerable size, and those strata pass off into micaceous schist, hornblende, corundum, and trap, with a less distinct transition into alum-slate, and secondary limestone.

"The strata run nearly east and west, and exhibit all the characteristics of the primitive rocks to which they pertain, both in respect of their fracture, dip, and the absence of all vestiges of animal remains; so far as I have yet been able to examine them, a small portion of these valuable productions lie within the Honorable Company's district of Bajulkota; but nine-tenths, and those of the very finest quality, are in the territories of a number of independent jaghírdars and chieftains. The natives have no name for slate; are utterly ignorant of its nature, use, or the method of quarrying it; and after a most diligent search in every village, where I have traced it, I have not found a bit, so much as an inch square, in any wall, or building, or in any way whatever applied to the purposes of life. I shewed the native shop-keepers, in the presence of a number of people, its value as a writing material, which delighted and astonished them beyond measure; but from the native chieftains downward to the lowest individual, not one, though living on the very spot, was acquainted with its use or value. The chieftains are anxious that I should carry on my researches within their respective limits, as likely to be attended with great advantage to themselves and their people, as well as to the community at large. The finest description of roofing slate is at Lokapur, not in the Company's territory; but there are scarcely any two villages which have the same kinds of slates—some kinds are good for one, others for another, purpose. The districts in which these slates are found are most commodiously situated within a short distance of the confluence of the Gatparba and

Kristna rivers, which latter flows through Rastea's, the Nizam's, the Nagpur Rajah's, and the Honorable Company's territories, into the bay of Bengal; in its way hence, it traverses the Kalkapur Rajah's and Satarah Rajah's territory, and the states of the Putwårdhans and other numerous jaghírs, independent of Government.

" The existence of these extensive beds of marble has hitherto been equally unknown and despised : as the several varieties are very hard, they are little sought after for building purposes, and I have scarcely met with twenty houses plastered, or even built with lime—to which at least it might be supposed the natives would have applied it where the marble abounds."

The existence of the slate, although but little worked, seems to have long since been pointed out by Mr. Thomas Marshall, Statistical Reporter to the Bombay Government, from whose report, dated Dharwar, 29th July, 1821, we take the folowing extract.

"The next most general rock is a bluish clay slate, which however never assumes the elevation of hills, but is seen to traverse a great part of the country on both sides of the Gatparba, in the direction of W. by N. and E by S. Its layers are almost exactly perpendicular to the surface of the earth. It plainly dips under the sand-stone hills—one of its softest quarries, near Kundargí, supplies the surrounding country with whet-stones; but they are of a very inferior quality. It is not uncommon for a few layers of this clay slate to pass suddenly into semi-transparent greyish-white felspar, which in a few yards resumes the colour and texture of the slate. Throughout, this slate is traversed by numerous most irregular veins, which have the appearance of having once been a liquid matter poured into transverse and curvilinear fissures, which run in all directions. The matter filling the veins seems a mixture of quartz and clay, and is much harder than the substance of the slate; very beautiful crystals of quartz are frequently found in it."

X.—*Progress of European Science.*

THEORETICAL GEOLOGY.

Following up the design proposed in our notice, of the progress of Electrical Science, we seek the most concise, comprehensive, and authentic materials for our present review, in the annual addresses of the presidents of the Geological Society. These do not merely embrace the practical labours of the associates of the Society itself at home and abroad, in their examination of the earth's surface, the description of rocks, the order of strata, and the classification of the fossils of every formation ; but they at the same time deliver what we may consider an orthodox judgment *ex cathedrâ,* upon the various theories which the most eminent authors of the day have promulgated to the world: such, in the present period, are—the remarks of Herschel upon the influence of Planetary perturbation on Geological phenomena ;—Lyell's estimate of the effect of causes still in action, upon the past modifications of the earth's crust, and Elie de Beaumont's theory of the contemporaneous upheaving of parallel mountain ranges;—the temperature of the globe ;—the connection of thermal springs with volcanic action ;—the gradual transition of fossil species, and a multitude of other questions of the greatest interest to the geological theorist. Thus Geology has almost ceased to be the science of observation alone, as it was so long its boast to be called; and it now challenges a share in the physical speculations of the astronomer, the dynamical calculations of the mecanician, and the primeval chronology of the cosmogonist and historian. Upon the first of these connections, the Rev. Professor **Sedgwick** thus states the actual state of opinions.

" Some great and simple problems in physics have so immediate a connexion with the structure of the earth, that we may almost claim their solutions for our own.

" The form put on by a fluid body in rotation is an abstract question, which might or might not have any real application to the bodies of our solar system. But direct geodesic observations, as well as the relative position of land and water, prove that the stratified matter on the crust of the earth is deposited in near conformity to the surface of a true spheroid of rotation. Here then we have, in spite of one of the arbitrary dogmas of the Huttonian theory, an indication of a primeval fluidity before the commencement of any one phænomenon coming within the direct speculations of geology. And again, the direct phænomena of geology are in the strictest harmony with this conclusion. For, after passing through a few stages of stratified matter, formed by the degradation of matter in a prior state of solidity, we are conducted to other unstratified masses with that crystalline structure which implies an anterior fluidity—in some cases unequivocally, and in all cases probably, derived from the solvent power of heat.

" But if the earth ever existed in any state approaching to igneous fusion, it must have undergone a great diminution of temperature, before it was fitted for the habitation of any organized being. And here again geological facts are at least in a general accordance with the hypothesis ; for the forms of the living beings, entombed among the ancient strata, not only seem to indicate a high temperature, but also a gradual refrigeration of the surface of the earth.

" Here however we meet with an unexpected difficulty. If during any period, the earth have undergone a sensible refrigeration, it must also have undergone a contraction of its dimensions; and also, as a necessary consequence of a well known mechanical law, an acceleration round its axis of rotation. But direct astronomical observations prove, that there has been no sensible diurnal acceleration during the last 2000 years ; and therefore, by inverting the steps of the reasoning, we prove—that during that long period there has been no sensible diminution in the mean temperature of the earth. This difficulty does not, however, entirely upset the previous hypothesis : it only proves, that the earth had reached an equilibrium of mean temperature before the commencement of good astronomical observations.

" But if our speculations are thus limited and guided by the observations of astronomy, we have in part paid back to that exalted science the obligations we owe to it. The great bodies of our system leave behind them no marks to track their progress through the heavens; and the vast secular periods we can calculate, reaching to ages long anterior to the records of our being, might be mere fictions of the mind, which have never had any archetype in nature. But in the phænomena of geology, we are carried back, almost at our first step, into times unlimited by any narrow measures of our own ; and we exhibit and arrange the monuments of former revolutions, requiring for their accomplishment perhaps all the secular periods of astronomy. Nor is this all. We show, by help of records, not to be misinterpreted, that during this vast lapse of time, in the very contemplation of which our minds become bewildered, the law of gravitation underwent no change, and the powers of atomic combination were still performing their office.

" If the phænomena of geology be coeval with long returning astronomical periods (and it is at least impossible to prove the contrary), a question may arise, whether some of the first difficulties we meet with (such as those connected with the transport of diluvial gravel, and the gradual diminution of temperature) may not be attributed rather to effects of planetary perturbation than to any change in the internal condition of the earth. This question has been admirably discussed in a recent paper by Mr. Herschel.

" Of all the secular inequalities produced by perturbation, those of the moon alone can produce any visible effects upon the tidal level. The lunar inequalities considered are of two kinds—change of mean distance, and change of eccentricity. Both are confined within narrow determined limits ; and Mr. Herschel shows, by actual calculation, that they could not have produced any of the great movements contemplated in geology.

" The planetary perturbations of the orbit of the earth are next considered, and the influences they may have produced on the diffusion of light and heat. The secular variation of obliquity is too small to have ever caused any sensible effect on our climates : but he proves, by direct calculation, that the mean annual diffusion of solar light and heat varies inversely as the minor axis of the orbit ; or, in other words, increases or diminishes with the increase or diminution of eccentricity. Now, as a matter of fact, the eccentricity of the earth's orbit has been for many ages slowly diminishing, and is now very small ; but the limits of its secular variation have not yet been calculated. He assumes, therefore, hypothetically, that the eccentricity of our orbit *may* once have been as great as that of some of the inferior and superior planets; and on that supposition, he proves, that the slow diminution of eccentricity *may* have produced a gradual change of climate, of the very kind indicated by geological phænomena.

"Into the solution of the great problem of the heavenly bodies, there enter only a few simple and unchangeable mechanical elements, and the conclusions are of a simplicity corresponding to the simplicity of the premises. All the celestial movements return into themselves ; and even the most complex of the deviations produced by mutual perturbation, are confined within narrow limits, and are completed in secular periods. The solution of this problem is incontestably the greatest triumph of exact science. But with what semblance of physical truth can we apply such mathematical results as these to the great phænomena of geology—where the combinations are mutable and indefinite—where we have no vestige of returning periods—and where the fixed elements of force are either unknown or imperfectly comprehended ?

If all the complex groups of crystalline and stratified rocks ; if, in a word, all the material things existing on the surface of the globe, be bound to each other by laws like those which govern the movements of the heavenly bodies—*then* every material combination we now see must re-appear with all its complicated relations after the lapse of some long period of time. But would not such a supposition be now regarded as the mere wantonness of hypothetical extravagance ? And let it not be said, that it is only in the greater combinations on the surface of the earth that we are to look for returning cycles. Great and small have no meaning, except in reference to us and our conceptions. The earth is an atom in comparison with the visible creation ; and all we now behold may be but as an atom in comparison of that which is unseen ; and the meanest combinations of material things submitted to our senses propagate their influence through all space co-extensive with gravitation, and play their part in keeping up the stability of the universe.

To the supreme Intelligence, indeed, all the complex and mutable combinations we behold, may be but the necessary results of some simple law, regulating every material change, and involving within itself the very complications, which we, in our ignorance, regard as interruptions in the continuity of Nature's work. In contemplations of this kind, our understanding is lost among the stern doctrines of philosophical necessity. But, as far as regards us and our faculties, there is no such thing on earth as undeviating moral or physical necessity. For as, in morals, necessity is made, in part, at least, subordinate to the freedom of human will, so, in physics, the continued action of immutable causes may and does co-exist with mutable phænomena.

" The study of the great physical mutations on the surface of the earth is the business of geology. But who can define the limits of these mutations? They have been drawn by the hand of Nature, and may be studied in the record of her works —but they never have been, and never will be fixed, by any guesses of our own, or by any trains of *á priori* reasoning, based upon hypothetical analogies. We must banish all *á priori* reasoning from the threshold of our argument; and the language of theory can never fall from our lips with any grace or fitness, unless it appear as the simple enunciation of those general facts, with which, by observation alone, we have at length become acquainted."

The above observations are introductory to the Professor's objections to Mr. Lyell's system of "geological dynamics," which, although highly praised, as a new province of the science studied with immense research, and pregnant with facts necessary to be borne in mind, in the explanation of every observed phænomenon, seems to him to have been strained beyond the limits of logical inference, in its application to the vast efforts of displacement and deposition, of the gigantic epoch of geology.

"Mr. Lyell appears not only as the historian of the natural world, but as the champion of a great leading doctrine of the Huttonian hypothesis; in the language of an advocate, he sometimes forgets the character of an historian. In reading his graphic and eloquent descriptions of the mighty works of degradation yearly going on through the eastern shores of England, or of the enormous weight of solid matter hourly rolled down by the Ganges* or the Missisippi, I have fancied, that the earth was sliding from under my feet, and that it would soon pass away, like the sand of an hour-glass, beneath the waters of the ocean.

" But are there no antagonist powers in nature to oppose these mighty ravages— no conservative principle to meet this vast destructive agency? The forces of degradation very often of themselves produce their own limitation. The mountain torrent may tear up the solid rock, and bear its fragments to the plain below: but there its power is at an end, and the rolled fragments are left behind to a new action of material elements. And what is true of a single rock is true of a mountain chain; and vast regions on the surface of the earth, now only the monuments of spoliation and waste, may hereafter rest secure under the defence of a thick vegetable covering, and become a new scene of life and animation.

" It well deserves remark, that the destructive powers of nature act only upon lines, while some of the grand principles of conservation act upon the whole surface of the land. By the processes of vegetable life, an incalculable mass of solid matter is absorbed, year after year, from the elastic and non-elastic fluids circulating round the earth, and is then thrown down upon its surface. In this single operation, there is a vast counterpoise to all the agents of destruction. And the deltas of the Ganges and the Missisippi are not solely formed at the expense of the

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* For a correction of the estimate of Major Rennell, see the pages of this Journal and of the Gleanings.

solid materials of our globe, but in part, and I believe also in a considerable part, by one of the great conservative operations by which the elements are made to return into themselves.

"According to the principles of Mr. Lyell, the physical operations now going on are not only the type, but the measure of intensity of the physical powers acting on the earth at all anterior periods: and all we now see around us is only the last link in the great chain of phænomena, arising out of a uniform causation, of which we can trace no beginning, and of which we see no prospect of the end. And in all this, there is much that is beautiful and true. For we all allow, that the primary laws of nature are immutable—that all we now see is subordinate to those immutable laws—and that we can only judge of effects which are past, by the effects we behold in progress. Whether there be, or be not, any physical traces of a state of things anterior to the commencement of our geological series of deposits, is a question of no real importance. But to assume, that the secondary combinations, arising out of the primary laws of matter, have been the same in all periods of the earth, is, I repeat, an anwarrantable hypothesis with no *à priori* probability, and only to be maintained by an appeal to geological phænomena.

"Each formation of geology may have required a very long period for its complete development; and of such an element as past time, we grudge no man the appropriation. But after all, the successive formations, about which we speculate, however complex in their subdivisions, are small in number: and after decyphering a series of monuments, we reach the dark ages of our history, when, having no longer any characters to guide us, we may indulge at will in the creations of our fancy. We may imagine indefinite cycles, and an indefinite succession of phænomena; and in the physical world, as well as in the moral, we may have our long periods of fabulous history. But these things belong not to inductive geology; and all I now contend for, is—that in the well established facts brought to light by our investigations, there is no such thing as an indefinite succession of phænomena.

"If the principles vindicated in Mr. Lyell's work be true, then there can be no great violations of continuity, either in the structure or position of our successive formations. But we know, that there are enormous violations of geological continuity; and though, relatively speaking, many of them may be local, of this at least we are certain, that they have been produced by forces adequate to the effects, and co-extensive with the phænomena.

"The very first step we take, we see a violation of continuity. Between the alluvial silt, deposited by the waters now flowing off from the inequalities of the earth, and the masses of diluvial gravel scattered over so many parts of its surface, we can seldom establish any appearance of continuity, or give any intelligible proof of their common origin. I am not going now to plunge into this long debated question; but I may remind you of the enormous waterworn blocks (derived from the primary chains to the north of the Baltic Sea), which lie scattered over the great European plain, extending from the eastern states of Holland to the Steppes of central Russia. Where are the inclined planes down which these boulders could have descended? Where are the grooves and channels cut out by the rivers which once propelled them? Where is the alluvial silt accumulated by the erosion of these ideal waters? No answer can be given to these questions; and to talk of river action, aided as it may have been by every ordinary power of nature, appears to me, in a case like this, little better than a mockery of my senses."

"If indeed we were to admit a period of intense volcanic violence, and a sudden elevation of the Scandinavian chain, we might then have a cause commensurate to the effects observed, and in the rush of the retiring waters, we might explain the transport of those great boulders which lie scattered over the northern plains of Europe. But in the speculations I am combating, all great epochs of elevation are systematically, and I think unfortunately, excluded. Volcanic action is essentially paroxysmal ; yet Mr. Lyell will admit no greater paroxysms than we ourselves have witnessed—no periods of feverish spasmodic energy, during which the very frame-work of nature has been convulsed and torn asunder. The utmost movements that he allows are a slight quivering of her muscular integuments."

These objections to Mr. Lyell's theory are perhaps carried too far: he does not insist upon the absence of all violent paroxysms, so much as he labours to give due weight to the power of causes now in operation. The existence of a vast depression on the earth's surface, extending beyond the Caspian and the Aral, might be adduced as an illustration of great operations still working before our eyes ; should any fissure be laid open by subterranean force, so as to connect this basin with the nearest ocean, we should suddenly witness a deluge, attended with proportionate convulsions, over a space ascertained by M. de Humboldt and Col. Monteith to extend over at least 18000 square leagues, reaching to Saratof Orenburg, and the low regions of the Oxus and the Jaxartes : the lowest level of this vast basin is 300 feet below the Mediterranean*.

Mr. R. J. Murchison, the present President of the Geological Society†, was a fellow labourer with Mr. Lyell, when his mind was first led to the line of investigation which he has since developed. It was in their tour along the southern shores of the Mediterranean, and subsequently in the north of Italy, that Mr. Lyell's attention was particularly directed to the distribution of the tertiary strata into new groups, according to the proportional number of shells identical with living species, found fossil in each formation : after examining the Sub-Apennine shells, he pursued his inquires in Naples and Sicily, where disturbing causes have been in continual action from remote antiquity, hoping to ascertain whether successive and distinct creations of organic remains might not have been elevated from beneath the sea, by a series of subterranean convulsions, continued from the period of the mixed Sub-Apennine deposits, uninterruptedly, to the historic æra. He here began to unfold the true papyri of geological history : in many mountains of considerable magnitude, the extinct species had nearly disappeared, and in other vast accumulations of fossil marine shells, nearly all were specifically identical with those now inhabiting the adjoining sea. Thus, by a series of deductions, he removed as arbitrary and untrue those lines of demarcation between what had termed the ancient and the existing orders of nature; and he had the satisfaction to find, that the same train had been developed by M. Desnoyers and M. Deshayes, from a close examination of the Paris basin.

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* Professor Murchison's Address, 1832, Phil. Mag. lxv. p. 384.—Gl. in Sc. III. 330. The Academy of St. Petersburg, at the instigation of M. de Humboldt, is now engaged in directing surveys and barometrical "soundings," as they are emphatically styled, by which the precise extent, depths, and true shore of this dry Caspian will be accurately defined.

† Annual Address, 1832, Phil. Mag. lxv. 375.

Mr. Lyell has engaged the latter to co-operate with him in classing the tertiary formations chronologically, according to the relative number of existing species in each group. Their joint labours will form a most valuable "Manual of Fossil Conchology," which is announced as forthcoming in the third volume of Mr. Lyell's "Principles of Geology." It was subsequent to these studies that the latter author was prompted to continue his examination of the various causes still in operation on the surface of the globe, which form the subject of his second volume. In the former, we were presented with the effects of inorganic forces; in the second, we find an abundance of facts connected with the fluctuations in the organic world. So ample are the data in natural history, upon which the author has established his conclusions, that they cannot fail to relieve him from the charge of visionary speculation*.

Prof. Sedgwick felt alarmed, lest the gradual course of nature, upheld in the first volume, should favor the doctrine of spontaneous generation and transmutation of species, with all their train of monstrous consequences; but nothing can be fairer or more impartial than the manner in which the untenable parts of Lamarck's dogmas are refuted in the second volume, and the recent appearance of man upon our planet, satisfactorily confirmed.

Turning now from the view of gradual changes, upon which we have impartially quoted the opinions of an opponent and of an advocate, we come to the hypothesis of mundane convulsions, where, as might be expected, the late and the actual Presidents change sides. In the words of the former, the theory of M. Elie de Beaumont si thus described†:

"M. Elie de Beaumont, by an incredible number of well conducted observations of his own, combined with the best attested facts recorded by other observers, has proved, that whole mountain chains have been elevated at one geological period—that great physical regions have partaken of the same movement at the same time—and that these paroxysms of elevatory force have come into action at many successive periods. Distinguished as are his merits, he so far claims not an undivided honour. But in the next great step of generalization, he reaches a position where he stands entirely by himself.

"Step by step, we had been advancing towards the conclusion—that different mountain chains had been elevated at several distinct geological periods; and by a long series of independent observations, Humboldt, Von Buch, and other great physical geographers, had proved—that the mountain chains of Europe might be separated into three or four distinct systems; distinguished from each other, if I may so express myself, by a particular physiognomy, and, above all, by the different angles made by the bearings of their component formations with any assumed meridian. All the subordinate parts of any one system were shown to be parallel; while the different systems were inclined at various angles to each other.

"By an unlooked-for and most felicitous generalization, M. Elie de Beaumont has now proved, that these two great classes of facts are commensurate to each other; and that each of these great systems of mountain chains, marked on the map of Europe, by given parallel lines of direction, has also a given period of elevation, limited and defined by direct geological observations. The steps by which he reaches this noble generalization are so clear and convincing, as to be little short of physical demonstration. It forms an epoch in the history of our science; and I am using no terms of exaggeration when I say, that in reading the admirable researches of M. de Beaumont, I appeared to myself, page after page, to be ac-

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* Phil. Mag. 377.

† Anniversary Address, 1831,

quiring a new geological sense, and a new faculty of induction ; and I cannot express my feelings of regret, that during my recent visit to the Eastern Alps I did not possess this grand key to the mysteries of nature.

"I am aware how impossible it is in a few words to give any clear notion of a volume of condensed original researches. Dropping all minor details, I may, however, claim your indulgence, while I point out the author's manner of induction in four great systems of European chains : not indeed in the wish of quenching the curiosity of those who have not studied this question, but rather in the hope of urging them to seek the fountain of original information.

"1. The first system includes the higher elevations, in eastern France, of the Côte d'Or and Mont Pilas, and a portion of the Jura chain. It may be traced towards the valley of the Rhine, where it is suddenly cut off ; but it re-appears in the chain of the Erzgebirge, between Bohemia and Saxony. It never rises into mountains of the first order, but is marked throughout (as may be seen on a good physical map) by many longitudinal ridges and furrows, ranging nearly parallel to each other, in a direction about north-east and south-west. So far the statement is only an enumeration of certain connected facts in physical geography. But it is followed by a co-ordinate series of geological phænomena.

"A number of formations, including in the ascending order the whole oolitic series, enter here and there into the composition of the geographical system above described ; and without exception, wherever they appear, all are in turn elevated, broken, or contorted; yet in their lines of range they preserve a parallelism to the general direction of the ridges. On the contrary, wherever rocks, of an age not older than that of the green-sand or chalk, appear in the vicinity of any portion of this system, they are either found at a dead level, and expanded from the neighbouring mountains into horizontal planes, like the sea at the base of a lofty cliff; or if, since their first deposit, they have undergone any great movement, it is shown to have no relation to the bearing of the older ridges, and to have been produced at a later period.

"From all these combined facts follow three important consequences : 1st. That the whole system of parallel ridges, from one end to the other, was elevated at the same period of time, after the development of the oolitic series, and before the deposition of the green-sand and chalk. 2ndly. That the action of elevation was violent, and of short continuance; for the inclined strata are shattered and contorted, and between them and the horizontal strata there is no intermediate gradation of deposits. 3rdly. That the period of elevation was followed by an immediate change in many of the forms of organic life.

"2. The next great system includes the whole chain of the Pyrenees—the Northern Apennines—the calcareous chains to the north-east of the Adriatic—nearly the whole Carpathian chain—and a great series of inequalities, continued from that chain through the Hartz mountains, to the plains of Northern Germany. Through the whole of these vast regions the principal inequalities range nearly parallel to each other, and have a mean bearing about west-north-west and east-south-east. So far again the statement is purely geographical, and its truth is seen at once in glancing over any good physical map of Europe; and will be still more clearly comprehended, by comparing some of the principal ranges of colour on Von Buch's great geological map with the bearing of the Pyrenees. But it is followed by a series of co-extensive geological phænomena.

"Through all parts of this great system, formations of the age of the green-sand and chalk have had an enormous development, and without exception, their strata are ruptured and contorted, and often lifted up to the very pinnacles of the mountains. But, on the contrary, wherever any tertiary formations approach the confines of this system, they are stated to be either in a position almost as horizontal as the surface of the waters in which they were deposited ; or if they have been moved at all, it is by forces uninfluenced by the parallels of the older chains. And the same three conclusions, with a mere difference of dates, follow here as in the former case. All the great parallel ridges and chains of this second system must have been suddenly and violently elevated, and at a period of time between the deposition of the chalk and the commencement of the tertiary groups ; and the corresponding change in organic types is, in this instance, still more striking than in the former.

" 3. The third system embraces a great number of parallel inequalities, bearing about north-north-east and west-south-west, and includes the whole Western Alps, from the neighbourhood of Marseilles to the volcanic ridges near the foot of the Lake of Constance. And by an hypothetical, but I think probable extension, it also takes in the whole of the great Scandinavian chain.

" I cannot enter on the elaborate and satisfactory details by which it is proved —that all these great parallel inequalities in the region of the Western Alps had their origin after the tertiary *molasse*, a deposit partaking of all the elevations and contortions of the older strata—that the elevatory movements were sudden and violent, and commenced at a time when tribes of mammalia (the remains of which in England are hardly ever found except in the superficial gravel) flourished in many parts of Europe—and that these movements were immediately succeeded by great horizontal deposits of old diluvial gravel at the base of the Western Alps, and probably also by that vast offshot of Scandinavian rocks which lie scattered over the northern plains of Germany.

" 4. The fourth system embraces many great parallel ridges, having a range about east-north-east and west-south-west, and includes several considerable chains in Provence, and nearly the whole chain of the Eastern Alps—from the great flexure in the region of Mont Blanc to the Alps of the states of Austria.

" It would be impossible to follow the author through details occupying a large portion of his volume. I may however state, that he proves the formations of the Eastern and Western Alps not to pass into each other by any flexure of the strata coinciding with the bend of the whole chain ; but to meet at an angle marked by a great double system of breaks and fissures, one passing in the direction of the eastern, and the other of the western, portions of the chain. He further proves, that the system of fissures in the line of the Eastern Alps is more recent than the other system—that in the prolongation of this line, towards the west, the old diluvial gravel has undergone movements of elevation—and that these movements have been propagated to the lacustrine and volcanic regions of Auvergne.

" On a review of the whole evidence, I think he has demonstrated, that there are two distinct deposits of diluvial gravel near a portion of the Western Alps—that the colossal mass of Mont Blanc, and at least a considerable portion of the Eastern Alps, were elevated after the deposit of the older dilivium—and that the newer diluvium (including all those enormous crystalline erratic blocks so admirably described by Saussure) rolled off from the regions of the higher Alps during this last period of their elevation.

" There are six other supposed periods of elevation briefly considered in the researches of M. Elie de Beaumont, each marked by distinct geographical features : but I will not now detain you with their enumeration. If the generalizations to which I have pointed be true, (and as far as I comprehend them, they seem to be based on an immovable mass of evidence,) we must then conclude that there have been in the history of the earth long periods of comparative repose, during which the sedimentary deposits went on in regular continuity, and comparatively short periods of violence and revolution, during which that continuity was broken. And if we admit, that the higher regions of the globe have been raised from the sea by any modification of volcanic force, we must then also admit that there have been several successive periods of extraordinary volcanic energy.

"How we are to escape from this conclusion I am unable to comprehend, unless we shut out the evidence of our senses. Of volcanic powers we know nothing, except during the irregular periods of their activity—and returning periods of intense activity, after long ages of comparative repose, may be among the enduring principles in the mechanism of nature. I do not throw this out as even a probable hypothesis : but it is, at least, as probable as any other hypothesis unfounded on the evidence of geological phænomena.

"That the system of M. Elie de Beaumont is directly opposed to a fundamental principle, vindicated by Mr. Lyell, cannot admit of doubt. And I have decided to the best of my judgement, in favour of the former author, because his conclusions are not based upon any *a priori* reasoning, but on the evidence of facts ; and also, because, in part, they are in accordance with my own observations*."

Mr. Boué and other able writers have opposed the views of this eminent geologist ; they deny him the merit of being the first to point out, that different formations and masses of land have been elevated at distant and separate periods, and reject that part of his system which asserts the synchronous elevation of distant mountain chains parallel to each other. Before we are warranted in arriving at general conclusions on this latter point, numerous facts must be collected, and we can but urge all our working brethren to try the adequacy of M. de Beaumont's ingenious theory, by an appeal to nature† ; M. de Humboldt believes, that the four great chains of Asiatic mountains are parallel to one another, and that circumstance tends powerfully to confirm the theory. As however, the personal observations of this traveller have not extended beyond the Altai, we must still look for evidence whereon the synchronism of the elevations of these mountains may rest to our Indian geologists, whose exertions will naturally be stimulated to attempt the solution of the problem. Russia has been before hand with us in exploring their newly acquired portion of Asia ; their government, with its characteristic enterprize, being desirous of acquiring accurate information respecting the structure, natural history, and heights of the Caucasus, sent hither in the summer of 1829, under a strong escort, commanded by General Emanuel, a party of men of science, the chief of whom, M. Kupfer, has given in his report to the Academy of Sciences of St. Petersburg.

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* "For example, the vertical position of the green-sand and chalk on the eastern flank of the Hartz mountains, and the horizontal position of the same formations on the flanks of the Erzgebirge, were remarked by Mr. Murchison and myself, in the summer of 1829. During the same tour, we had repeated proofs of the recent elevation of the chain of the Eastern Alps ; of the high elevation of the green-sand series in the calcareous chain to the north-east of Trieste ; and of the horizontality of the tertiary deposits of Styria. All these facts (of which we did not at the time comprehend the whole importance), harmonize with the system of M. de Beaumont."

† Address, 383.

From the geographical and geological chapters of this interesting report, we learn, that the low hills, which rise above the Steppes of the Black Sea and Sea of Azof, are composed of limestone, filled with littoral shells, the collections of which made by M. Pander, on this and a former occasion, must prove of great geological importance. On ascending from the Steppes towards the Caucasus, grits and older limestones, with ammonites, occupy an undulating country, diversified by several peaks of trachyte, the principal of which, the *Bechtan,* or five mountains, is stated to be 4000 feet above the sea. The outer zone of the Caucasus is described as being a rugged and lofty plateau from 8000 to 9000 feet above the sea, the strata of which present tabular summits, chiefly composed of calcareous grit and conglomerates nearly horizontal, or rising at only a gentle angle towards the central ridge. This table-land is figured by deep transverse rents, in which the rivers flow ; and one of the lowest formations is a limestone, which the author compares with the *calcaire à gryphites.* These secondary strata are separated from the central mountains by a band of transition and old slaty rocks, which have been dislocated by the contact of certain green stones and basalts. The loftiest part of the central chain, culminating in the double peak of Mount Elborz, at the height of 15,400 French feet above the Black Sea, is entirely of igneous origin, being principally composed of a dark-coloured porphyritic trachyte. The volcanic rocks of this region are shown to be of considerable antiquity, because the secondary deposits rest upon them in undisturbed positions, the transition formations having alone been dislocated*.

It did not come within our purpose to particularize any practical geological researches, but we have digressed in this case, because the ground trodden is closely connected with our own Asiatic field, and it may act as an useful stimulus to point out what our neighbours are about. The Court of Directors have appointed to Madras an eminent geologist, Dr. Turnbull Christie†, of whose researches in Sicily, the President of the Geological Society speaks in high terms ; to him, we look with great expectation, when he enters the vast field, hitherto but partially visited by Voysey and Dangerfield.

But to continue our review of Theoretical Geology :—the phenomena of *thermal springs* have been attributed by Dr. Daubeny to volcanic agency, whether they issue from the neighbourhood of action and extinct foci of eruption, or upon linear fissures and dislocations of the ancient strata, produced by expansive forces during former periods of elevation ; in fact, the evolution of gases and increased temperature of springs may be looked upon as proofs of the presence of volcanic action still in force, with as much propriety as eruptions of lava and shocks of earthquakes. Having detected the presence of nitrogen gas in thermal waters, he concludes, that the chemical theory of the origin of volcanoes is still to be maintained, as being more philosophical, and more consistent with facts and experiments, than the hypothesis of a central ignited fluid, which has been from time to time mechanically forced up to the surface of the earth.

The question of the increase of the temperature of the ground, in descending to great depths, still rests upon uncertain data. As far as experiments upon mines and artesian springs have been carried (by M. Cordier in particular), the results

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* Murchison's Address, Phil. Mag. lxv. 385.

† Since the above was written the death of this meritorious and able officer has been announced! He was on his way to the Nilgiri Hills, which he proposed to explore with care, where he was attacked by jungle fever to which he fell a victim in a few days.

are uniformly favorable to such a theory—on the sea they are as steadily opposed to it; observations of the temperature of springs in all parts of the world are invited to solve this question*.

It is now generally acknowledged, that the formation called *diluvial gravel,* and supposed to have reference to the epoch of the deluge, is not the result of one, but of many successive periods. The essays of M. Beaumont have established this point beyond dispute, although it militates against opinions, but a few years since held almost universally as indisputable.

"We now connect the gravel of the plains with the elevation of the nearest system of mountains; we believe that the Scandinavian boulders in the north of Germany are of an older date than the diluvium of the Danube; and we can prove that the great erratic blocks, derived from the granite of Mount Blanc, are of a more recent origin than the old gravel in the tributary valleys of the Rhone.

"Theories of diluvial gravel, like all other ardent generalizations of an advancing science, must ever be regarded but as shifting hypotheses to be modified by every new fact, till at length they become accordant with all the phænomena of nature.

"In retreating where we have advanced too far, there is neither compromise of dignity nor loss of strength; for in doing this, we partake but of the common fortune of every one who enters on a field of investigation like our own. All the noble generalizations of Cuvier, and all the beautiful discoveries of Buckland, as far as they are the results of fair induction, will ever remain unshaken by the progress of discovery. It is only to theoretical opinions that my remarks have any application.

"Different formations of solid rock, however elevated and contorted, can never become entirely mixed together; and the very progress of degradation commonly lays bare all the elements of their structure. But diluvial gravel may be shot off from the flanks of a mountain chain, during one period of elevation, and become so confounded with the detritus of another period, that no power on earth can separate them: and every subsequent movement, whether produced by land floods or any other similar cause, must continually tend still further to mingle and confound them. The study of diluvial gravel is, then, not only one of great interest, but of peculiar difficulty and nice discrimination; and in the very same deposit, we may find the remains of animals which have lived during different epochs in the history of the earth.

"Bearing upon this difficult question, there is, I think, one great negative conclusion now incontestably established—that the vast masses of diluvial gravel, scattered almost over the surface of the earth, do not belong to one violent and transitory period. It was indeed a most unwarranted conclusion, when we assumed the contemporaneity of all the superficial gravel on the earth. We saw the clearest traces of diluvial action, and we had, in the Mosaic history, the record of a general deluge. On this double testimony it was, that we gave a unity to a vast

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* The prevailing practice of boring for water affords an easy method of ascertaining the temperature of the ground of different depths, free from the dubious results of mines:—thus Magnus has found from borings near Berlin, the temperature of the air being 49° 1′ the heat of the ground was as follows:

at 675 feet,	temperature 67.7,	giving for one degree, 36.3	feet.
516 do.	63.9,	34.7	do.
392 do.	62.8,	28.5	do.

succession of phænomena, not one of which we perfectly comprehended, and under the name diluvium, classed them all together.

"To seek the light of physical truth by reasoning of this kind, is, in the language of Bacon, to seek the living among the dead, and will ever end in erroneous induction. Our errors were, however, natural, and of the same kind which led many excellent observers of a former century to refer all the secondary formations of geology to the Noachian deluge. Having been myself a believer, and, to the best of my power, a propagator of what I now regard as a philosophic heresy, and having more than once been quoted for opinions I do not now maintain, I think it right, as one of my last acts before I quit this chair, thus publicly to read my recantation.

"We ought, indeed, to have paused before we first adopted the diluvian theory, and referred all our old superficial gravel to the action of the Mosaic flood. For of man, and the works of his hands, we have not yet found a single trace among the remnants of a former world entombed in these ancient deposits. In classing together distant unknown formations under one name; in giving them a simultaneous origin, and in determining their date, not by the organic remains we had discovered, but by those we expected hypothetically hereafter to discover, in them; we have given one more example of the passion with which the mind fastens upon general conclusions, and of the readiness with which it leaves the consideration of unconnected truths.

"Are then the facts of our science opposed to the sacred records? and do we deny the reality of a historic deluge? I utterly reject such an inference. Moral and physical truth may partake of a common essence, but as far as we are concerned their foundations are independent, and have not one common element. And in the narrations of a great fatal catastrophe, handed down to us, not in our sacred books only, but in the traditions of all nations, there is not a word to justify us in looking to any mere physical monuments as the intelligible records of that event: such monuments, at least, have not yet been found, and it is not perhaps intended that they ever should be found. If however, we should hereafter discover the skeletons of ancient tribes,, and the works of ancient art buried in the superficial detritus of any large region of the earth; then, and not till then, we may speculate about their stature, and their manners, and their numbers, as we now speculate among the disinterred ruins of an ancient city*."

After learning, that so important a change has been effected in the nomenclature of geological formations, we cannot conclude the present compilation better than by presenting our readers with a comparative view of the classification of rocks, according to all the current systems, extracted from the excellent Manual of Geology recently published by Mr. De la Beche, a work which compresses into the most portable form the whole data of Geological Science, and on which Mr. Murchison passes the following encomium:

"Nothing short of this compendious and instructive digest, in which without losing sight of general principles the author has endeavoured to adhere to the impartial rule of *suum cuique* was to have been expected from the pen of so experienced and acute a geologist; and so eager is the demand of the public for a really good work on this subject, that a second edition has been called for, and is already published†."

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* Rev. Prof. Sedgwick's Address, Phil. Mag. 314.

† Murchison's Address, Phil. Mag. lxv. 374.

		De la Beche.		*Improved Wernerian.*	*Conybeare.*	*Omalius d' Halloy,* 1830.		*Brongniart,* 1829.	
STRATIFIED ROCKS.	SUPERIOR STRATIFIED, OR FOSSILIFEROUS.	1. Modern Group.	Detritus of various kinds produced by causes now in action; Coral islands; Travertino, &c.	Alluvion..	Superior Order.	Tertiary rocks.		Alluvial and Lysian rocks.	Jovian Period.
		2. Erratic Block Group.	Transported boulders and blocks; gravels on hills and plains, apparently produced by greater forces than those now in action.	Diluvium: Ancient Alluvion.			Secondary.	Clysmian rocks.	
		3. Supercretaceous Group.	Various deposits above the chalk, such as, in England, the Crag, Isle of Wight beds, London and Plastic clays. In France, the freshwater and marine rocks of Paris, &c.	Tertiary..				Izemian rocks.	Saturnian Period.
		4. Cretaceous Group.	1. Chalk. 2. Upper green-sand. 3. Gault. 4. Lower green-sand. To which may be added, for convenience, 1. Weald clay. 2. Hastings sands. 3. Purbeck beds.	Secondary	Supermedial Order.	Ammonean rocks.			
		5. Oolitic Group.	The rocks usually known as the Oolite formation, including the Lias.						
		6. Red Sandstone Group.	1. Variegated or Red marl. 2. Muschelkalk. 3. Red sandstone. 4. Zechstein; and 5. Red conglomerate.						
		7. Carboniferous Group.	1. Coal measures. 2. Carboniferous limestone. 3. Old red sandstone.	....	Medial.	Hemilysian rocks.		Hemilysian rocks.	
		8. Grauwacke Group.	Grauwacke, thick-bedded and schistose, sometimes red; Grauwacke limestones; Grauwacke clay slates, &c.	Transition.....	Submedial Order.		Primordial.		
		9. Lowest Fossiliferous Group.	Various slates, frequently mixed with stratified compounds resembling those of the unstratified rocks.	....	....	....			
	INFERIOR STRATIFIED, OR NON-FOSSILIFEROUS.	No determinate order of superposition. ..	Various schistose rocks, and many crystalline stratified compounds, such as Gneiss, Protogine, &c.	Primitive, or Primary....	Inferior Order.	....		Agalysian rocks.	
UNSTRATIFIED ROCKS.	Volcanic, Trappean, Serpentinous, and Granitic rocks.		Ancient and modern Lava, Trachyte, Basalt, Green-stone, Corneans, Augite & Hornblende Porphyries, Serpentine, Diallage rock, Sienite, Quartziferous Porphyry, Granite, &c.	Arranged among the stratified rocks, according to the order in which they are supposed to occur.	The same as the improved Wernerian.	Pyroidal & Agalysian rocks.		Modern volcanic rocks, classed as pyrogeneous rocks; igneous rocks of an older date, as Typhonian.	

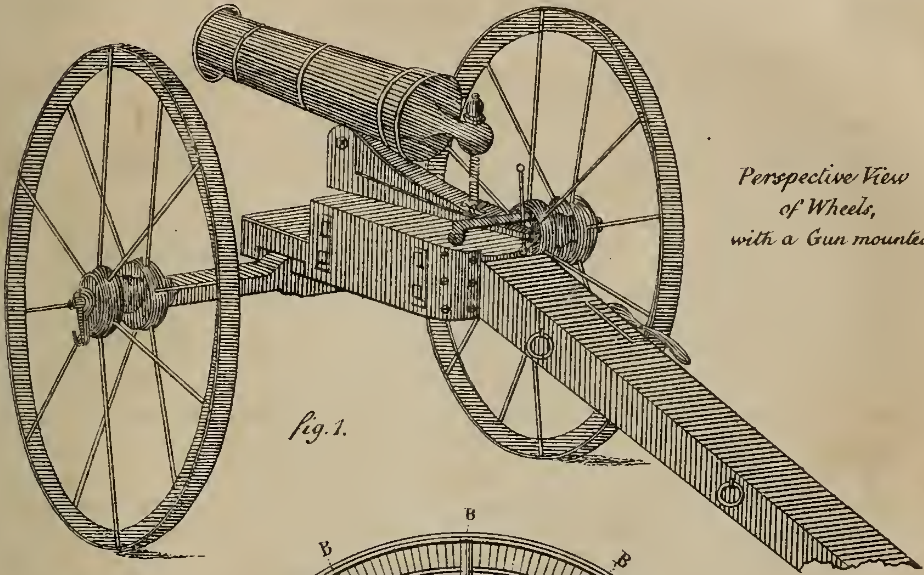

fig. 1.

Perspective View
of Wheels,
with a Gun mounted.

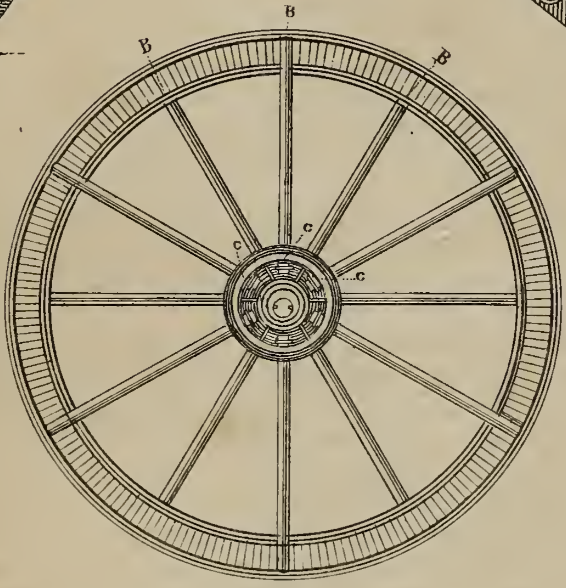

fig. 2.

Front View
with
the Shield of the Nave.

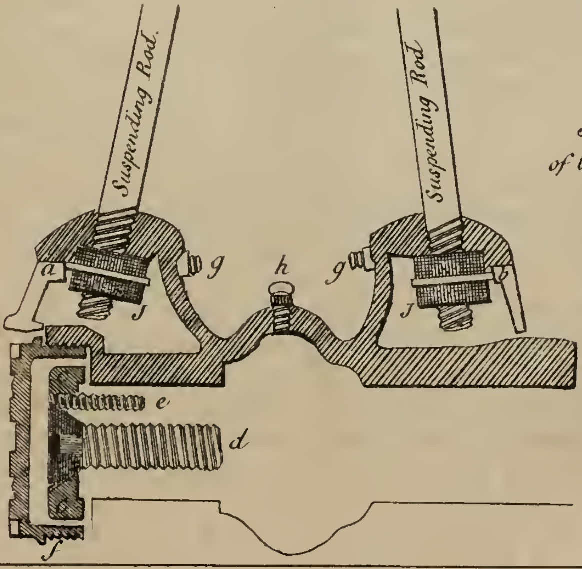

fig. 3.

Section
of the Nave.

J. B. Tassin Lith.

XI.—PROGRESS OF MECHANICAL SCIENCE.

2. *Iron Suspension Wheels.*

[Note accompanying the model presented to the Asiatic Society, by Lieut.-Colonel Watson, 3rd Oct.]

A description of the great improvement in the construction and principle of wheels for carriages of all sorts lately introduced by Mr. Theodore Jones, will be found in most of the journals of mechanical inventions at home; but as such works are not frequently to be met with in India, I will commence by explaining the nature of this invention in the words of a small pamphlet, published by the patentee, referring the reader to the accompanying plate in explanation, or those who are in Calcutta, to the model deposited in the rooms of the Asiatic Society.

"The construction of Messrs. Jones & Co.'s wheels is upon a new principle, that of suspension. In the old wheels, those spokes, which are under the nave, support the weight; in these it is jointly sustained by rods depending from the upper part of the felloe, as will be seen in the plate, fig. 1. The rod or spoke is made thick at the outer end, so as to be drawn firmly into a conical hole, bored from the outside of the felloe, and the nave depends from the rods, being sustained by nuts and screws within the cells, fig. 2. The advantage of this principle is, that it gives an elasticity to the lower part of the periphery of the wheel, which, while it diminishes the draught, is less wear to the road.

An aperture, in which there is a thumbscrew, is made into the centre of the nave, where the oil cell is, and by which it is replenished, without taking the wheel off the axle. The cell contains enough oil to serve the wheel in work for five or six weeks.

The Patent wrought-iron wheels are made either cylindrical, conical, or dishing, and are either sold with the improved axles, or may be fitted to any others.

Fig. 1 of the accompanying plate exhibits a perspective view of the wheels applied to a gun-carriage. Fig. 2 is an elevation of the same, with the ring of the nave open, to show the nuts of the suspension bars: their construction is more fully shewn in fig. 3 wherein *a*, *b*, are the front and back shields; *c*, a collet on the nose of the axle; *d*, a screw with conical head, which passes through the collet, and fastens it to the axle; *e*, a small screw through the side of *d; f*, a collar on the cap, which presses against a leather-washer, to prevent the oil escaping in front; *gg*, small bolts, which keep the shields in their places; *h*, a thumb-screw, where oil is to be supplied; *jj*, the nuts which are screwed on the end of the rods (or spokes) in the nave. The cap (in front of the nave) must be taken off, when the wheel is to be put upon the axle, in order to fasten the *collet* in its place, which is a substitute for a linch-pin.

If the suspending rods of the wheels by any means become slack, each of the nuts must be screwed up (equally), which is done better by giving the head of the rod a blow with a hammer, and turning the nut at the same instant, taking care when done, that each nut presents one of its flat sides in front for the shield to press against, which will prevent the nuts unscrewing."

I shall beg leave now to offer a few remarks on the appearance, durability, strength, efficiency, and comparative economy of the suspension wheels, and to publish, for the satisfaction of those, who wisely wait for the actual trial of an invention, before determining in its favor, the result of some experiments made by order of the Court of Directors, who have in consequence determined on a more extensive trial of the wheels by their ordnance department in India.

The iron wheel, though the same weight, or lighter than the common one in use, is incomparably lighter and more elegant in appearance: to give sufficient strength to wooden wheels, particularly in this country, they require to be made proportionally clumsy; this is particularly observable in the naves which exhibit an unseemly conical block, so shaped to admit of the hoops being from time to time driven home, as the wood shrinks, in the nave of the iron wheel no such deformity is presented.

The material, being iron throughout, is not affected by the atmosphere, which in India is found so destructive to wood, causing the necessity of frequent setting up and constantly recurring outlay for repairs: even new wheels kept 12 months in store, require to be set up before being brought into use, or sent on service. The tire of the iron wheel is so firmly united to the nave, by the suspending rods or spokes, that no working can loosen it—a defect wooden wheels are at all times, and in all places, subject to. The tire or rim of the patent wheel is the only part liable to wear out; when this takes place to a certain extent, fresh tires may be applied, as in common wheels; such tires being put on at a red heat, over the cold rim, grasp it by the contraction that takes place in the process of cooling; almost as firmly as if the parts were welded together. By this simple and expeditious operation, a wheel after 20 or 30 years' service may be put in condition to perform as many more, with this difference however that the spokes are no longer capable of being removed at pleasure, the heads being covered by the new tire; but this can be of little consequence, as such repaired wheels might be appropriated to waggons or other carriages not usually exposed in action, or it might be found advantageous to withdraw the old spokes before applying the new tire, and then to drill fresh holes for a new set of spokes, or for the old ones, with heads readjusted to fit the holes, and thus a complete new wheel would be produced. These wheels are not liable to injury from any concussion, however violent, because they yield to a certain extent to the shock, space sufficient being left, within the cells of the nave to admit of a recoil or spring of the tire by the slight and simultaneous insertion or penetration of the nutted ends of the spokes to the interior surface of those cells.

The strength of the patent wheel is in proportion to the power of the rods forming the spokes to suspend a weight; these spokes not only operate in bearing the weight with which the wheels are loaded, but in binding and keeping the whole together, each acting with its opponent in suspending the nave from the rim. In common wheels, the spokes contribute little or nothing in binding the parts together, which depends solely on the tire; so that the fracture or relaxation of this, whilst the wheel is in motion, would necessarily cause the separation of all the parts. This disruption and consequent breaking down could not possibly take place in the patent wheel, even though the rim were completely severed by a cannon shot. Such was actually the case in the experiments lately tried at Woolwich, and yet the wounded wheel, which had been placed before the butt, was put on to the axle of the gun, and employed to carry it out of the field, whilst the wooden one which had been struck by the shot exactly in the same manner, was left in scattered fragments on the ground. The little model brought out by me sustained with ease 14 cwt., and might safely be loaded with a ton, and from hence a calculation may be made of the great strength of the full-sized wheels.

After an engagement, or during an action, the patent wheel may be repaired in a few minutes, in case of some of the spokes being shot away, by the introduction of fresh ones; whilst in such case the common wheel would be rendered unserviceable: in the former, if even half of the spokes remained, the wheel would continue serviceable—not so the other. It would be superfluous to dwell on the vast advantages which might arise from the being able to keep a gun in action that in ordinary circumstances would be disabled. The iron wheel, if struck by a cannon shot, will not splinter. The trial that took place at Woolwich fully establishes this important fact. Iron wheels may be considered proof against musquetry, if not against grape. Iron wheels will need no repair over rough ground, or stony roads, or from concussions; hence forge establishments with field or battering rams may be greatly diminished, if not dispensed with altogether on this account. In support of the general efficiency of iron wheels, in constant employment for years in drags and heavy carriages of all descriptions, on the paved streets of London, reference can be had to the certificates of many of the principal brewers, builders, and practical engineers of the metropolis. The draught of the patent wheels has been ascertained to be one-fourth lighter than that of the common wheels—three horses performing the work of four.

The first cost of the patent wheels, deliverable in London, is as follows, each being 4 feet eight inches high.

1st, with tire,	3 inches wide,	£18 per pair.
2nd, do.	4½ do.	20 do.
3rd,	6 do.	25 do.

To this must be added the amount of freight from Europe, about £4 per ton. I am not exactly aware of the cost of wheels made at the Gun Carriage Agency, but according to General Hardwicke's statement, it appears fully to equal, if not to exceed, the above; but the great economy that would attend the introduction of iron wheels into the service would result from the abolition of expensive establishments kept up to supply or repair wheels not fairly worn out by service, but decayed or shrunk from exposure to the vicissitudes of alternate heat and moisture. I am not prepared to point out the various particulars in which retrenchment might be made; but it is evident, that repairs would require but little; that less than a third of the sum at present allowed for tar and grease would be more than sufficient for oil for the patent wheels; that less than half the quantity of paint would be required, and that every part of a condemned iron wheel would be worth half of its original cost, whilst the condemned parts of wooden wheels, except the iron work, are only fit for fire-wood. On this point of economy, I may quote the substance of a letter addressed by Messrs. Whitbread and Co. to the Secretary of the Honourable East India Company.

"At the request of Messrs. Theodore Jones and Co. the proprietors of the iron wheels, we beg to state to you, that the saving we have effected, in consequence of the use of iron wheels, amounts to more than £180 per annum on 35 pair of wheels. We take this opportunity of expressing our approbation of the invention in every respect. Whitbread and Co."

With reference to this letter, which was delivered by General Hardwicke to the Secretary, it need hardly be observed, that if a single house of business obtained so large a saving on 35 pair of wheels, the subject must be of immense importance to the Hon'ble Company, as their saving would not only be great in proportion to the number of wheels in the service, but also on account of the unfavourable influence of climate on wooden wheels.

The above remarks are fully corroborated by the following Report of experiments made with the new wheels, under the superintendence of Major-General Hardwicke and Lieutenant-Colonel Forrest, extracted from a lithographed circular, published by the Honorable Court, dated October 19, 1831.

Wheels tried.		Nature of Gun and Carriage.	Charges.	Rounds fired.	Remarks.
Size.	Height and Width of Tire.				
24 or 18 pdr.	Height, 5 feet, Width of Tire, 6 in.	24 pdr. Iron, *cwt. qr. lbs.* Weight, 50 1 25 Ditto of Carriage, 0 0 0	8 lbs.	3	The distance of the Guns from the Butt was about 35 yards.
12 or 6 pdr.	Height, 5 feet, Width of Tire, 3 in.	12 pdr. Brass, *cwt. qr. lbs.* Weight, 18 0 5 Ditto of Carriage, 0 0 0	8 ,,	3	

The experiments commenced with an iron 24-pounder gun and a brass 12-pounder, mounted on travelling field carriages, and their limbers: to the 24-pounder carriage was fitted a pair of the patent wrought iron wheels; to the limber, their own wood wheels were used.

The 12-pounder was equipped in the same manner, and provided with a draft of four horses. The 24-pounder with 6. Thus prepared, both were trotted at a brisk pace, and sometimes gallopped along a very rough pavement for about an hour; the wheels could not have been submitted to trial of strength more severe, some of the hollows in this pavement caused the carriages to bound from stone to stone to the extent of some feet, and the violence was so great as to break the rope lashings used to keep the guns in their places on their carriages, and the 12-pounder carriage was jerked completely off its limber.

On examination of the iron wheels after this trial, without removing them from the axle, no mark of injury was perceptible, nor a joint started: the wheels of the limbers which were wood did not resist the shaking so well, although they had only the weight of the empty limber boxes to carry; several spokes were started more or less from their sockets, one of the openings measured 3-16ths of an inch in width.—It may be observed, these were wheels never before used, and as they had lain several years in store, it is less to be wondered at that the wood had shrunk from the original joinings.

The next experiment was to drag the 24-pounder through marshy ground, with a weight altogether of from 4 to 5 tons, of which the limber wheels had comparatively nothing to carry, say about a 20th part of the weight.—It was started with a draft of six horses, but the weight sunk too deep for that number to drag it out, and the horses were sinking up to their knees; two more were then added, but while stopping the wheels of the carriage had sunk to a depth of 14 inches, and it required the exertions of half a dozen men in addition to set it in motion.

This experiment ought to have been begun with 10 horses, at least eight is the proper number allowed by the Regulations of H. M. service, for a 12-pounder weighing about 18 cwt.—It was therefore not to be expected, that the same number should drag through such a marsh, a load of 50-cwt. exclusive of the weight of the carriage.

This trial was not quite as conclusive as could have been desired, yet it was evident, that had the proper number of horses been given in the outset, the iron wheels would have cut their way through the swamp without a halt, but whether with the same ease as a wooden wheel, remains to be tried.——The 6-inch rim iron wheel has a tendency to sink into and plough up the soft ground, which adheres to the inner part of the rim, and accumulates, an additional weight being thus added to the wheel.—It is however to be remarked, that this objection applies only in very soft ground.

Two 12-pounders were next dragged through the same marsh. One mounted on patent iron wheels, the other on wood, and the draft applied was four horses to each (half the proper number) ; both moved through without stopping, but the draft was evidently difficult to both.—It was observed, that the iron wheels with 3-inch tire, did not collect earth about the rim as a 6-inch tire does when moving through soft ground.

The 24 and 12-pounder. were next placed in battery in front of the earthen butt, and from each gun were fired three rounds with full service charges (shotted one to each)—no visible effect was produced by this discharge.

To learn what would be the effect of a cannon ball fired at one of the patent iron wheels, one wheel was placed in front of the butt : the first discharge from the 12-pounder in the battery disabled two spokes. They were struck in an oblique direction, and the ball cut them as smooth as if it had been done with a sharp cutting instrument, bending both to one side, but without a fracture or fragment flying off.

The second shot was directed to the face of the rim, which broke it, and bent one end inwards ; one spoke was also cut through the nave, was grazed on the under side, one end of the nave box cracked, and a small piece cut off the opposite side of the rim.

The effect produced on the wood wheels differed very materially, the first shot from the same gun shattered two spokes, the splinters from which spread much.

A second shot was then fired at the wood wheel, placed with the face of the tire inclined to the front : the shot struck the tire a little below the centre of the nave, shivered it to pieces, and scattered the numerous fragments of the shattered wheel in all directions, some to a considerable distance.—This wheel was no longer repairable.

From the foregoing experiments, it is but justice to the patentees of the iron wheels to record the advantage under which they appear.

First. They are stronger and not so easily disabled in action, and when struck with a cannon ball, do not splinter.

Secondly. When they sustain an injury to the extent of two or three spokes broken, the wheel might be continued in use till an opportunity occurred of repairing it ; while a wooden wheel under similar circumstances would for the time be unserviceable.

Thirdly. The iron wheels are not subject to those changes which influence of climate and changes of seasons work on wood wheels—we have seen in the course of these experiments, that new wheels, that have lain a few years in store, would require to be set up before sent on service ; no length of time can render that necessary with the wrought-iron wheels.

Under all these circumstances, we are of opinion, that the trial, which has been made at Woolwich of the iron wheels, has been sufficiently satisfactory to warrant a hope, that the further and more extensive experiments, which the Bengal Government will be enabled to made, under all the vicissitudes of Indian climate, will bring their advantages fully to the notice of the Honourable Court.

The battery experiments were obligingly and ably assisted by the exertions of Captain Rawnsley, of the Royal Artillery, who superintended laying the guns, and which was done with an accuracy and effect hardly to be exceeded, and on the present occasion was all that could be wished for.

(Signed) Thomas Hardwicke, *Major-General.*
(Signed) W. Forrest, *Lieut.-Colonel.*

Meteorological Register, kept at the Surveyor General's Office, Calcutta, for the Month of November, 1832.

Days of the Month.	Minimum Temperature observed at sunrise.					Maximum Pressure observed at 9h. 50m.					Max. Temp. and Dryness observed 2h. 40m.					Minimum Pressure observed at 4h. 0m.					Observations made at sunset.					Observations at 10½ P. M. in Calcutta.					Rain Gauge, No. 1.	Rain Gauge, No. 2.
	Barometer reduced to 32°.	Temper. of the air.	Depres. of M. B. Ther.	Wind.	Aspect of the sky.	Barom. red. to 32°.	Temper. of the air.	Depres. of M. B. Ther.	Wind.	Aspect of the sky.	Barom. red. to 32°.	Temper. of the air.	Depres. of M. B. Ther.	Wind.	Aspect of the sky.	Barom. red. to 32°.	Temper. of the air.	Depres. of M. B. Ther.	Wind.	Aspect of the sky.	Barom. red. to 32°.	Temper. of the air.	Depres. of M. B. Ther.	Wind.	Aspect of the sky.	Barom. red. to 32°.	Temper. of the air.	Depres. of M. B. Ther.	Wind.	Aspect of the sky.		
1	29,851	73,	0,8	n. e.	m.	,916	76,3	2,1	n. e.	cis.	,786	76,5	3,3	n. e.	cis.	,784	75,5	2,8	n. e.	cis.	,787	74,5	2,8	n. e.	cis.	,852	73,8	1,8	n. e.	rn.	1,46	1,38
2	,838	70,5	1,3	do.	do.	,905	76,3	2,8	do.	cu.	,784	78,	4,1	do.	cus.	,787	77,3	3,3	do.	do.	,788	76,	2,8	do.	do.	,858	77,1	3,4	n. w.	cis.		
3	,849	71,	3,8	do.	cl.	,911	77,7	7,	do.	do.	,810	84,	12,	n.	cl.	,810	82,5	11,	n.	cl.	,824	78,5	8,3	cm.	cl.	,907	75,8	6,8	do.	cl.		
4	,885	66,	0,8	cm.	do.	,935	77,7	7,5	w.	cl.	,840	85,3	13,8	do.	do.	,828	83,5	10,8	do.	do.	,843	79,5	6,8	do.	do.	,920	74,2	3,8	s. w.	do.		
5	,893	68,	1,3	n.	do.	,961	80,	6,1	n. w.	do.	,868	85,3	11,8	do.	do.	,868	83,5	11,3	do.	do.	,880	79,5	6,3	do.	do.	,986	76,3	5,3	n. w.	do.		
6	,938	70,	2,3	do.	do.	,026	79,5	7,	n.	do.	,933	83,5	12,3	n. w.	do.	,934	82,5	12,	n. w.	do.	,935	79,	7,8	do.	do.	,019	76,0	7,0	do.	do.		
7	,007	68,5	2,8	cm.	do.	,056	77,5	9,3	do.	do.	,941	83,5	14,	do.	do.	,939	82,	12,5	do.	do.	,958	77,	7,8	do.	do.	,036	74,0	7,5	do.	do.		
8	,010	67,	1,8	do.	do.	,052	78,	7,5	n. w.	do.	,950	82,8	12,6	w.	do.	,948	80,5	11,8	w.	do.	,952	76,	6,5	do.	do.	,023	74,3	9,7	do.	do.		
9	,009	66,7	1,7	do.	do.	,041	78,3	8,3	n.	do.	,924	82,	12,3	do.	cu.	,929	81,	11,	n.	do.	,938	77,7	7,5	do.	do.	,013	74,4	6,4	s. w.	do.		
10	,009	66,	2,3	do.	do.	,042	79,8	9,9	n. e.	do.	,956	83,	12,5	n. w.	do.	,955	81,7	11,2	n. w.	do.	,956	78,5	7,8	do.	do.	,021	73,8	5,4	w.	do.		
11	,021	65,5	1,6	do.	do.	,093	78,5	9,	n.	do.	,958	83,	11,8	n.	cl.	,970	82,	10,8	n.	do.	,980	77,	5,3	do.	do.	,058	76,8	6,3	cm.	do.		
12	,037	68,	2,1	do.	do.	,093	77,7	6,8	w.	do.	,980	84,5	10,3	do.	do.	,978	82,5	10,3	do.	ci.	,000	79,	6,3	do.	ci.	,055	72,2	2,2	s.	do.		
13	,045	67,5	1,3	do.	do.	,104	79,	5,8	s. w.	ci.	,013	82,3	7,8	n. w.	cu.	,008	81,8	7,6	n. w.	cu.	,013	78,3	4,1	do.	do.	,043	74,0	4,6	do.	do.		
14	,027	66,5	1,	do.	do.	,090	80,	2,1	n. e.	do.	,975	83,7	16,2	do.	cl.	,975	80,7	13,	do.	cl.	,982	76,	6,8	do.	cl.	,037	73,3	5,0	cm.	do.		
15	,031	64,5	2,8	do.	do.	,098	75,5	1,	do.	do.	,986	82,	13,5	do.	do.	,985	80,3	13,3	do.	do.	,993	76,5	10,8	do.	ci.	,071	71,3	4,9	do.	do.		
16	,041	61,	1,8	do.	do.	,091	73,5	8,8	n. w.	cl.	,986	79,5	11,6	do.	do.	,986	78,3	10,6	do.	do.	,993	74,5	8,3	n. w.	cl.	,044	69,4	5,0	n. w.	do.		
17	,030	59,7	1,2	do.	do.	,092	74,5	9,	n.	do.	,979	79,3	13,1	n.	do.	,979	78,	13,3	do.	do.	,992	74,7	10,2	do.	do.	,042	69,8	5,6	do.	do.		
18	,001	61,3	3,1	do.	do.	,074	72,5	7,8	do.	do.	,950	79,5	12,	n. e.	do.	,948	77,7	10,5	n. e.	do.	,955	74,3	7,3	cm.	do.	,023	71,0	6,6	n. e.	do.		
19	,011	61,5	2,8	do.	do.	,063	74,5	7,3	n. e.	do.	,969	79,5	9,8	w.	cu.	,969	77,5	7,8	do.	cu.	,970	73,5	4,	do.	do.	,064	72,0	3,9	n. w.	do.		
20	,054	61,7	2,	do.	do	,129	73,	7,8	do.	do.	,017	80,	12,8	n.	cl.	,008	79,	12,3	n.	cl.	,010	75,7	9,	do.	do.	,081	70,0	2,8	do.	do.		
21	,082	62,7	3,	do.	do.	,118	75,	7,5	do.	do.	,995	80,5	11,8	n. e.	do.	,990	78,7	10,5	n. e.	do.	,997	74,3	5,3	do.	do.	,063	70,8	2,4	do.	do.		
22	,043	61,7	1,5	do.	do.	,089	73,	4,8	do.	do.	,984	80,5	13,	do.	cu.	,970	78,7	11,8	do.	do.	,979	74,5	7,	do.	do.	,033	70,3	2,8	cm.	do.		
23	,022	62,3	1,4	do.	do.	,077	73,5	7,8	do.	do.	,983	80,	11,3	do.	do.	,981	78,3	10,1	n. e.	cu.	,995	73,3	4,4	do.	cis.	,080	71,8	2,0	do.	fog.		
24	,056	61,5	2,3	do.	do.	,124	73,7	7,	do.	do.	,016	79,7	12,2	n.	cis.	,015	78,3	10,8	do.	ci.	,024	75,7	8,2	do.	cl.	,058	70,0	1,3	n. w.	ci.		
25	,058	63,5	2,3	do.	do.	,105	72,	5,1	n. w.	do.	,985	80,5	12,6	n. w.	cl.	,985	79,	11,5	n. w.	cl.	,000	75,7	8,2	do.	do.	,047	71,5	1,0	n. e.	do.		
26	,038	62,	1,3	do.	do.	,097	74,7	6,8	do.	do.	,970	80,5	11,8	do.	cu.	,969	78,7	11,2	do.	do.	,970	75,3	7,4	do.	do.	,008	71,3	1,2	n.	do.		
27	,978	62,7	2,	do.	do.	,050	73,7	6,8	n.	do.	,927	79,5	11,6	n.	do.	,926	77,7	10,5	n.	do.	,927	74,5	6,	do.	do.	,008	72,1	1,5	n. e.	do.		
28	,988	62,3	1,6	do.	ci.	,049	74,	8,	w.	do.	,934	79,5	11,3	w.	cl.	,932	78,3	9,8	w.	do.						,022	72,6	2,5	s. w.	do.		
29	,023	62,	2,8	do.	cl.	,076	73,	5,3	n. w.	do.	,959	81,	9,3	n. w.	do.	,958	79,	8,	n. w.	do.	,965	74,5	3,8	do.	do.	,048	73,2	2,0	cm.	do.		
30	,028	63,	2,3	do.	do.	,078	73,	5,5	cm.	do.	,934	81,5	11,6	n.	do.	,933	80,	10,8	do.	do.	,948	75,3	5,8	do.	do.	,906	70,2	2,2	s. e.	do.		
Mean,	29,997	64,9	2,			,055	75,8	6,9			,943	81,3	11,5			,942	79,8	10,4			,950	76,2	6,6			,014	72,8	4,1			1,46	1,38

Abbreviations. In the column " wind," small letters have been used instead of capitals; *cm.* means *calm.* In the column " aspect of the sky," *cy.* is *cloudy; cl. clear; rn. rain; ci. cirrus; cu. cumulus; cs. cirro-stratus; cus. cumulo-stratus; cc. cirro-cumulus; n. nimbus.*

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I.—*Analysis of the Puránas. By* H. H. Wilson, *Sec. As. Soc.*

4. The Váyu Purána.

The *Váyu Purána* is so named from having been originally, it is said, communicated by Váyu, or the deity of the wind, to the assembled sages. It afterwards descended to Krishna Dwaipayana Vyása, by whom it was taught to his disciple Lomahershana, and at his desire it is repeated by his son Ugrasrava to the holy ascetics at *Naimisharanya*, agreeably to the form in which these works usually commence.

At starting however, a peculiarity occurs: the right of Su'ta to the possession of the *Vedas* is denied, and he admits that he is entitled to teach only the *Itihásas* and *Puránas*. This distinction is attributed to his equivocal origin which is very obscurely assigned to an error at a sacrifice held by Prithu, in which the *Ghí* appropriated to Vrihaspati, the teacher, was confounded with that set apart for Indra, the disciple, and from the oblation, termed *Sutya*, Su'ta was produced. He consequently held an intermediate station between the *Brahman* and *Kshetriya*, whom these gods, it may be inferred, severally represent; and whilst in one capacity he is a scholar of Vyása and a teacher of the secondary scriptures, he is excluded in the other from instructing in the *Vedas*, and restricted to such means of acquiring a livelihood as are compatible with the military profession.

The origin of Su'ta as well as of Magadha at the sacrifice of Prithu, is also related in the *Vishnu Purána;* they are there said to have sprung from the juice of the acid Asclepias, offered on that occasion. The same story opens the *Srishti Khan'da* of the *Padma Purána*, and is there more fully, if not more intelligibly detailed: the account being in fact the same as that of the *Váyu Purána*, and in the very same words, with the addition of some stanzas, and the partial alteration of others. The legend of the *Váyu Purána* is quoted in the commentary of Nilakantha on the Mahábhárat.

The mixed character of the Su'ta is, however, more rationally explained in the works of Law. He is the son of a *Kshetriya* father and *Brahmani* mother, and is consequently one of the *Verna Sankara*, or mixed castes. His occupations are properly of a martial character, as driving chariots and tending horses and elephants, but as partaking of the *Brahmanical* order, he is also the encomiast, the herald or bard of chieftains and princes; such duty being assigned to him and the Magadha, by Prithu, the son of Vena, and it is in this latter capacity that *the Súta* is the appropriate narrator of the *Puránas*.

The origin of the *Súta*, whether legendary or rational, the duties which are assigned to him, and the right conceded to him of teaching the *Puránas*, seem to throw some light on the early history of these works. In all probability, they were at first the traditionary tales of a race of family poets, who corresponded precisely in character with the scalds and bards of the north, and were at once the eulogists of the chief and chroniclers of the family. In this manner some historical traditions were preserved before they were formed into any systematic account, but of course imperfectly and rudely. With the genealogies the poets blended, no doubt, fanciful and mythological fictions, and these were the materials which later writers wove into a connected form, and from which they constructed the primitive *Puránas*. The character of the compilers, that of religious men, gave, however, a new complexion to the competition, and the mythological and marvellous portions came to usurp an undue importance, to the neglect of the historical records. The genealogies were, however, probably preserved with some more care, as they were connected with the worship of certain deities or deified princes, particularly Ráma and Krishna. To the mythology also systems of cosmogony, geography, and astronomy were added, and the five divisions of the *Puránas* were then complete. They were not long however suffered to continue in this condition. Contending sects arose, and each desirous of enlisting the *Puránas* on his side, foisted into them absurd and tasteless fictions, or metaphysical subtleties, calculated to inculcate the worship of some individual manifestation of the Supreme. This began, there is reason to think, about the 7th and 8th centuries with the *Yogis*. The followers of *Saiva* doctrines carried it to a great extent between the 8th and 10th centuries, and in the 11th and 12th, or after the date of Rámánuja and Madhwácharya the *Vaishnava Puránas* were, there is little doubt, re-made or re-modelled to a very considerable extent. By all classes, however, the historical traditions of the Su'tas, or bards, were treated with neglect. They disappeared altogether from most of the *Puránas*, and were in all much mutilated and compressed. Such fragments as remain are, however, probably genuine, and when separated from what is marvellous and unnatural, furnish some insight into the actual history of India, in periods remotely past.

To return from this digression, however, to the *Váyu Purána*, it may be observed, that as far as can be judged from the portion analysed, it is a work perhaps of the earliest date, amongst the existing *Puránas*, and clearly emanates from the *Yoga* school; it inculcates upon the whole the preferable worship of the forms of Siva, but its sectarial bias is less violently displayed than is usual in these works, the legends are fewer, the cosmological parts are much more detailed, and there is altogether a copiousness and consistency of system which is not common in the *Puránas*. It is impossible in going through this work not to feel an air of originality and antiquity about it, which is not perceptible in any of the others hitherto examined. As far as appears to be the case also, from the translated chapters, there is no allusion to works or systems of an indisputably modern date.

The opening chapters profess to give a summary of the contents of the work, but upon the first glance the detail is far from being applicable to the sections that follow, either in subject or arrangement; on a further examination, however, it appears that the summary is more than once repeated, with different degrees of precision, and withont any sufficient mark of distinction between the end of one series and the beginning of another; this want of method is not unfrequent in *Hindu* works, and the first books of the *Mahábhárat* and *Rámáyana* furnish specimens of the same defective mode of indexing. There appear to be three indexes in the first chapters of the *Váyu Purána*, of which the two first are partial and inappropriate; the third is more regular and entire, and corresponds with tolerable accuracy with the contents of the *Purána*, as far as they extend in our copy, or to the description of the *Manwantaras*. The index then proceeds to the families of the sages and kings, observing apparently very little order in the details, but comprising some curious particulars: as in the *Vishnu Purána*, the account is carried forward into futurity, and the kings of the present age are noticed. These historical sections are followed by cosmology, terminating with the destruction of the world at the end of a *Kalpa;* the *Purána* then gives the history of Vyása, and of the divisions of the *Vedas;* it comprises the legendary origin of Naimisháranya, and the occasion of the assemblage of the Rishis at that place, and concludes with an account of the incarnations of Siva, which, if we may judge from the way in which that subject is treated in the *Kurma Purána,* is the succession of teachers of the *Yoga* doctrines. All these chapters are wanting in the only copy of the *Váyu Purána* we have been yet able to meet with. They should form the latter half of the *Purána.*

In the fourth chapter, the deity who existed before creation is represented as eternal, without beginning or end, and the origin of all things, comprehending within himself the two substances or attributes by whose joint operation perceptible objects were formed, or *A'tmá,* Spirit, and *Padhána* or *Prakriti,* Matter: the mode in which elementary or primitive creation was evolved from the action of these two, is then described in technical language, conformable to the *Sánkhya* cosmogony. The seven principal elements are the *Mahatatwa, Ahankára, A'kás, Váyu, Teja, Ap,* and *Prithivi.* The first may perhaps be termed the principle of collective animated elementary existence, and the second the principle of individual animated elementary existence, although it must be confessed, that no very distinct and definite idea appears to be any where attached to them; they may be sometimes distinguished as mind, generally and individually, or elementary intellect free from passion or emotion in the first case, and joined with it in the second. The *Mahátatwa* again, might occasionally, be rendered the Divine Spirit connected with substance, but exempt from passion, and which upon addition of the *Gunas* or qualities, becomes *Ahankára:* the difficulty of explaining these terms satisfactorily is however, inseparable from the visionary character of the existence of the things which they denominate. The other five elements, if not more intelligible, are at least more familiar to us, and though as little susceptible of definition are, with one exception, cognisable by our senses, and therefore suggest positive notions. *A'kas* is ether, a subtile element thinner than air. The other four are air, fire, water, and earth. These partially combined into an egg which lay in water, the water was invested by fire, the fire by air, the air by *A'kas,* the *A'kas* by *Ahankára,* the *Ahankára* by the *Mahátatwa,* and the whole by the *Avyakta* or imperceptible, identified with *Prakriti* or Nature; from the egg, *Hiranyagerbha,* the four headed *Brahmá* was produced, the immediate agent of creation, the materials of which, as far as this universe consisting of fourteen *Lokas* or worlds, is concerned, lay concealed within the same recess from which he issued.

BRAHMA′ the Creator, is in fact, only an embodied portion of the *Raja Guna*, the quality of passion or desire, by which the world was called into being. RUDRA is the embodied *Tama Guna*, the attribute of darkness or wrath, and the destructive fire by which the universe is annihilated, and VISHNU is the embodied *Satwa Guna*, or property of mercy and goodness, by which the world is preserved ; the three exist in one, and one in three; as the *Veda* is divided into three and is yet but one, and they are all *A′srita*, or comprehended within that one being who is *Parama* or supreme, *Guhya* or secret, and *Servátmá* the soul of all things.

So far the theology of the *Váyu Purána* agrees with the deism of the *Vedánta*, but it presently deviates from this doctrine in the manner common to all the *Puránas*, and to a purport which may be supposed to have mainly influenced the present form of these compositions. Agreeably to the *Vedánta* school, the Supreme Being, though of one nature with his emanations, possesses a sort of separate existence, and is always *Nirguna* or void of attributes. According to the *Paurúnic* doctrines however, he is not merely *Nirguna*, but is occasionally *Saguna* or *Sakalyána guna*, possessed of attributes, or at least of all excellent attributes. In this latter case he becomes perceptible, and appears in the form either of VISHNU or SIVA, according to the sect to which the work that so describes him appertains : his appearances are regarded as his *Lílá* or pastime, and in this sense, the *Váyu Purána* observes, the *Paramatma*, or *Yogeswara*, has engaged in various sports and consequently assumed a variety of incarnations, and is known by different names.

The successive stages of the creation of the world, are enumerated as in the *Kúrma Purána*, and amount to nine. They are somewhat differently named in one or two instances, but the meaning is probably alike. The nine *Sargas* are the *Mahat*, *Bhûta*, *ind Aréyaka*, *Maukhya*, *Táryaksrotas*, *Urddhasrotas*, *Arváksrotas*, *Anugraha*, and *Kaumára*, or matter, the elements, the senses, the earth, animals, gods, men, goblins, and BRAHMA's sons, a list agreeing with that of the *Kúrma Purána*, except in the third, which is there called the *Tejasarga*, or creation of light or lustre. The two works also agree in calling the three first creations *Prákrita*, or elementary, and the six last *Vaikrita* or secondary, the elements being only made to assume *Vikriti* or change of form.

The subject of creation is continued through the 7th and 8th chapters, and the next sections are occupied with directions to practise abstract devotion, and obtain a knowledge of the Supreme Being, interpersed with an account of the origin and duties of various sages, and the attributes and power of some of the forms of Siva. In the eighteenth chapter commences an enumeration of the *Kalpas* which is continued through the 19th and 20th. Thirty-three *Kalpas* are mentioned, the last of which is called the *Viswarupa* or *Sweta*, from the prevailing form of Siva being of a white complexion. From this circumstance it appears to be the same with the *Váishnava Váráha kalpa*, in which Siva is incarnate on the mountain *Ch'hagala* as the *Muni Sweta;* having for his disciples *Swaita Swetasikha*, *Swetásya* and *Swetalohita*, the same who are mentioned in the *Kurma Purána;* the list of the *Kalpas* is followed by that of the *Maháyugas* in the present *Manwantara*, in each *Dwápara* of which, as well as a *Vedavyása*, there is an incarnation of Siva, who has four sons or disciples, all *Maháyogis* and portions of the divinity. Those of the present period are *Lakuli*, and his sons *Kusika, Gárgya*, *Mitraka*, and *Rushta ;* the scene of their *Yoga* is called the *Káyárohana Kshetra* on mount *Meru.*

The subject of creation is not yet dismissed, and blended with illustrations of Siva's supremacy continues through several other chapters. In the 23rd chapter, Brahma and Vishnu are introduced as propitiating Mahádeva and receiving boons from his favour. To Brahma he grants progeny ; to Vishnu praise ; admitting him to be along with himself the source of all things, though in an inferior degree, thus he says to Vishnu " I am *Agni* or fire, thou art *Soma* the moon ; thou art the night, I the day, thou art falsehood, I am truth : thou art sacrifice, I am the fruit of it ; thou art knowledge, I am that that is to be known," &c.

The origin of Rudra from Brahmá by virtue of the boon given to him, and the various appellations assigned by Brahmá to that form of Siva are next detailed, and this is followed by an account of the families of the seven *Rishis*, Bhrigu, Marichi, Angiras, Kardama or Pulaha, Pulastya, Kratu, and Vasishtha. Atri is not mentioned here, but his wife, Anásuyá is named as the mother of Sruti the wife of the son of Kerdama or Pulaha, named also Kerdama, from which alliance the patronimic *A'tréya* is applied in the text to the descendants of that sage. The place left by Atris' exclusion, is occupied by Bhrigu, who it appears, is considered as a form of Mahádeva. The descendants of Bhrigu are called Bhárgavas, and a branch of them sprung from the grandson of Bhrigu named Mrikanda are termed Markandeyas; the descendants of Maríchi are the Kas'yapas from Kasyapa his grand-son, the posterity of Angirá are the Angirasas; of Pulastya the Paulastyas, of Vasishtha the Vásishthas, and of Kratu the pigmy sages called Bálakhilyas. These denominations and genealogical classifications, as well as several other details to be found in the same chapter, differ materially from the notions more generally received. We are not yet prepared to say how far they are peculiar to this *Purána.*

Some curious, and as far as yet known, peculiar mythology, follows, describing the different kinds of *Agni* or fire, and particularising the *Pitris*, as the same with the *Ritus* or seasons of the year. A mythological description of the divisions of time then ensues; it is clearly an attempt to allegorise the year, and its divisions, in common with the worship of collective ancestors by fire ; hence the year is called *Agni*, the seasons the *Pitris*, and the five portions of animate and inanimate creation of men, birds, beasts, reptiles, and trees, &c. are the five *Artavas*, the sons of the seasons or progeny of time: the allegory however is rather perplexed, and the whole description mystified and obscure. The names given to the months and seasons here are double. One set being the usual terms, and the other being peculiar : the name of the months are the same as those cited by Sir William Jones from the *Vedas*, as the names of the solar months (A. R. III. 258.) The seasons as the *Pitris* are called *Kasa*, *Agni*, *Jiva*, *Sudháván*, *Manyamán* and *Ghora.*

The *Pitris* are distinguished into two classes, the *Várhishudas* and *Agniswáttas*; these are said to have had two daughters, *Mená* and *Dhárini ;* the former became the wife of *Himávat*, the latter wedded *Meru*, and from her was descended *Daksha*, the mention of whom gives occasion for the narration of his celebrated sacrifice, and for a number of stanzas in praise of Siva's supremacy.

The 30th chapter contains a very summary account of some royal dynasties,and then particularises the duration of the four ages as 12,000 years. This calculation implies that the years are years of the gods, such being the period of a *Maháyuga*, agreeably to *Pauranic* chronology, at thesame time the text does notspecify what years are intended*. As analogous to the divisions of time, the *Purána* itself is here stated to consist of 12,000 stanzas; a number different from that stated in

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* The proportion in which the years are divided are,

Krita	4800
Treta	3600
Dwapara	2400
Kali	1200
	12,000

the same is given in the *Paulisha Siddhanta,* as cited by *Bhattatpala.* (A R. XII. 249.)

the *Matsya* which assigns twice that amount or 24,000 *Slokas* to the *Váyu Purána.*

A number of chapters then follow, appropriated to *Pauranic* geography, the description of mount *Meru* and the residence of the gods, the seven continents and the divisions of the universe above and below the earth; considerable portions of these chapters have been translated by the late Colonel Wilford. The *Pauranic* system is here very fully, and upon the whole, distinctly detailed. The chief difficulties that occur being perhaps rather the fault of the transcript than of the original work.

The same remark applies to the chapters that follow, in which the astronomy of the *Puránas* is detailed with the same minuteness as the geography: on these two topics, therefore, the *Váyu Purána* is a valuable authority.

Some of this astronomy is rather unusual, the relative sizes and situations of the planets, their cars, their steeds, and other appurtenances, and their revolving round *Dhruva* or the pole, to which they are attached by cords of air, as the potter's wheel turns on its pivot, are in all the ordinary strain; but we have a statement regarding the length of a *Yuga*, and the commencement of the solar year, which are not conformable to received notions, or the actual state of things.

It is said, for instance, that a *Yuga* consists of five years; what kind of *Yuga* is intended is not specified. Bentley (A. R. VIII. 227), cites the *Graha Manjári* for a *Mahá Yuga* of five years, and in his last work on the ancient astronomy of the *Hindús* he refers the construction of a cycle of five years to what he considers, the first period of *Hindu* astronomy, or from B. C. 1181 to 961.

This cycle it is said begins when the sun is in *Sravana*, and it is again stated that *Sravana* is the first of the *Nakshatras*, and *Magha* the first of the months; according to the authority just cited,such could have been the case only between the years 204 B. C. and A. D. 44. when the year began with the month *Magha.* If Mr. Bentley is correct, this portion of the *Purána* at least, is of considerable antiquity whatever may be the date of the rest (Ancient Hindu Astronomy, p. 271.) Mr. Bentley also adds that, the mode of computation by which the commencement of the year was made to begin with a different month and asterism, was entirely laid aside by the *Hindú* astronomers subsequent to A. D. 538.

The same chapter contains a description of the *Sisumará*, which is interpreted by Mr. Davis to typify the celestial sphere (A.R. II. 402.) The description is to a similar effect with that which he has translated from the *Bhágavat*, but is shorter and less particular. There is also this rather unintelligible addition, that the stars of the sphere never set; but the passage may signify, that they are not annihilated at the usual periods of destruction. The text is in this place evidently incorrect, and the translation being made from a single copy, it is not safe to venture any emendation.

A legendary account of *Nilákanthá* or the blue-necked Siva follows, and the description of the classes of the *Pitris*, and their feeding upon the lunar nectar ensues. The introduction of obsequial ceremonies and the worship of the manes appears to have originated with Pururavas, a not unlikely circumstance, and one which explains the legend of his being descended both from the sun and moon; the worship of the manes being connected with the conjunction of these luminaries. The list of *Pitris* differs in some respect from that of *Menu*, and from that given in a manual used by the *Brahmans* of Bengal, in which a verse cited from the *Váyu Purána* enumerates the following as the seven classes, *Saumyas*, *Agniswattas*, *Várhishadas*, *Havishmantas*, *Ushmapas*, and *Ajyapas.* In the chapter now under consideration there are but four particularised. The *Saumyas* or *Somapas;* the *Kavyas* or *Ajyapas;* the *Verhishadas*, and *Agniswattas.* Three others are merely named, the *Ushmapas*, *Devakirttyas*, and apparently the *Lekhas* and *Bahwikasyas;* but these are unusual and probably inaccurate appellations. The whole of the section is obscure, incorrect, and often unintelligible. The same may be said of the two remaining chapters, which treat of the divisions of time and the influence of the four ages.

Without being in possession of the contents of the remaining portion, at least one-half of the *Váyu Purána*, it is impossible to offer any opinion on the date as derivable from internal testimony. As far as the portion analysed extends, it may be considered perhaps, as the oldest of the actually existing *Puránas*, and it has every appearance of being a genuine work, conforming more closely than any yet examined to the definition of a *Purána*, and admitting few of the unconnected digressions and legendary absurdities by which the course of these compilations is so commonly interrupted, and the established order widely disarranged or wholly obliterated.

The *Váyu Purána* is not unfrequently omitted in lists of the eighteen *Puránas*, but in that case it is considered to be the same with the *Saiva Purána*, which takes its place. As now met with, however, the two works are not identical.

II.—*Extracts from a Journal kept by Mr.* J. Emmott, *Master Attendant at Mergui, whilst visiting the Sapan Forests.*

[Communicated by G. Swinton, Esq. Chief Secretary to Govt.]

I quitted Mergui on the 22nd August, 1830, and proceeded up the Tenasserim river, with the view to inspect and report upon the forests of Sapan-wood.

After passing the old city of Tenasserim and numerous islands, sand-banks, rocks, and creeks, the names of which I have noted, and many of which are described, I reached the first sapan forest on the 8th September, and continued ascending the river till the 11th, when being taken ill, as also most of the boat's crew, we were obliged to return.

From that date to the 1st October, I returned to Tenasserim, and then re-ascended the river to the place I quitted on the 11th September.

I find, that there are no less than four ranges of the Tenasserim hills, instead of one, as is marked in all the maps of the country which I have seen.

From the 2nd October to the 17th, I was employed in examining the forests.

The forests of Sapan-wood are considerably exhausted; the wood-cutters no longer meet with it on the banks of the Tenasserim river, but are obliged to proceed about one day's march inland, before they can meet with it in any quantity. Many of them cross the boundary, and obtain it from the Siamese territory.

August 23rd, 1830.—At one P. M. arrived at the old city of Tenasserim. It is situated on the bank of the river, and was originally surrounded by a brick wall, which is now much dilapidated, and overgrown with jungle. The west side was strengthened by a ditch and breast-works. The town at present consists of two streets, running parallel with each other, east and west. The population amounts to about six hundred souls. A few miles beyond Tenasserim, the banks of the river become steep, with moderate soundings: frequent hills rise on the west, from five hundred to one thousand and three hundred feet high; in the middle of the river are turtle banks; along its side are seen extensive Karian and Durian plantations: the maps of this part of the country shew only one range of hills, but four distinct ranges were observed.

August 26th, 1830.—It is generally reported, that the Karian tribes usually reside on the mountains and hills; but what I have seen of these people, I find they invariably occupy table land, or the base of hills. They always select a rising ground on the brows of hills, to sow their grain—a practice quite contrary to that adopted by their neighbours, the Burmese, who invariably choose a low flat ground for this purpose. Their manners and habits are also different from the Burmese; their houses are generally neat and well built, standing as high as fifteen or eighteen feet from the ground, with a moveable ladder, which is drawn up at nights;—this is done to protect themselves from the nocturnal visits of tigers, elephants, and other wild beasts;—the inside of their houses and their simple rustic furniture are kept extremely clean. Accustomed always to migrative habits, a Karian is naturally indifferent to laying out his plantations with any judgment or taste, and consequently little labour is devoted to the rearing of trees, the fruit of which may be reaped after a lapse of time. The soil preferred by them is of a red kind, found near the base of the hills, and on this they plant vegetables, roots, and yams. Some of the stumps of the jungle trees answer them as supporters to their betel, yam, and other vines. Although in disposition they are far from resembling savages, yet in their way of living they may be identified with them; every animal or reptile, that comes in their way, serves them as an article of food. Met boats with Chinese and Burmese proceeding up the river for sapan-wood:—freshes strong:—shores covered with brush-wood:—passed another range of hills:—commenced tracking:—passed a Siamese fort:—river apparently not navigable in the dry season:—constant rain:—saw tracks of wild elephants and buffaloes:—passed several creeks, islands, and mountains:—nothing of interest occurred until

September 3*rd*, 1830, (near *Kotoung.*)—At noon we came to a creek called *Phia Hat-thwet;* the Burmese maintain, that their god came out of this creek, and took up his abode for some time in a cave, on a rising ground, a short distance from it. The rock under which the cave is may be about three hundred and eighty feet high. On its south side, it forms three squares;—the entrance is towards the westward. Its north-east angle slopes gradually down to the base of the hill;—the entrance to the cave is on a gradual ascent for about two hundred yards, when you come to an irregular arch, about fourteen feet in diameter. The inside is very spacious, and one is struck with wonder and amazement on beholding such a spacious cave. Its length from the entrance, east and west, is about one hundred and forty-six feet, and from north to south, two hundred and sixty-seven feet. The dome inside at its highest part is one hundred feet from the ground. The rock of the cave is of a porous nature. In former times, I am told, that the Siamese used to collect from this cave some tons of saltpetre annually. I must say, that the grandeur of this cave surpasses the celebrated one on the Isle of Elephanta, or any thing of the kind I ever saw in my life. Left this cave, and continued our course up the river, steering on a westerly direction. At 4 P. M. passed a high range of hills in a north north-west direction. Beyond this, the river deepens to seven fathoms, with rocky and muddy bed :—passed a creek, said to empty itself into the Tavoy river:—was deterred from investigation by the boatman's assurance, that no native ever frequented it :—a long reef of sunken rocks, with two to four and a half fathoms water :—freshes running *ten* and even *fourteen* miles an hour :—forty men could not track the boat :—banks of the river covered with jungle so thick as to be impenetrable.

September 11*th*, 1830.—Returned to Tenasserim, ill, and again ascended the river, to the same spot, by the 1st October.

October 2*nd*, 1830.—At 10 A. M. arrived at the second range of Sapan forests on the east bank of the river : the hills which surround this forest are about five hundred feet high. Saw a boat with twenty-six men, returning with six rafts of sapan-wood. Here I landed and visited the forest. The trees grow on hills, as well as on plains. The mountain-torrents had made such chasms through the forest to the river, that it was with difficulty I could cross them before I could well get at the place where the natives are employed cutting the wood. I suffered a great deal in this excursion from the bites of leeches and stings of musquitoes, which abound in the forests. The day was wet throughout. The leaves of the sapan tree are small, and resemble much that of the tamarind, of a dark-green. It bears small flowers, of deep orange-colour, which blossom during September and October. The tree is in full growth, and worth cutting when it attains the height of twelve or fourteen feet :—the bark is of a grey color, with notches, from each of which protrudes a sharp thorn, about a quarter of an inch long. These trees do not grow close to one another, and are not found near the banks of the river.

October 3*rd*, 1830.—At 7 A. M. proceeded up the river in a northerly course. Fell in with a boat at 9 A. M. from Mergui, with spirits and other comforts, for the purpose of selling to those employed in cutting sapan-wood. This boat was owned by a Chinaman.

October 4*th*, 1830.—At day light, wind easterly, arrived at Yebew Gheune, formerly an extensive place for sapan-wood, but now almost exhausted. Left a boat here belonging to some Chinese and Burmese proceeding up for sapan-wood. The river here is rocky. All the natives are now obliged to enter the Siamese ground to cut sapan-wood. The wood of this tree is so very hard, that a labourer thinks he has performed a good day's work if he has hewn three trees from sun rise to sun set ; and as the forests are always damp and swampy, nearly one-third of the people who proceed thither, are obliged after a few days labour, to return to Mergui from suffering under fever, or bowel complaints ; beside the musquitoes and leeches, the wood cutters have to contend with a species of green snake from two to ten feet long, and found among the leaves of the sapan tree. The bite of one of these reptiles is so very poisonous, that the sufferer seldom survives an hour. It preys upon birds, especially the peacock, which it chases from tree to tree with great swiftness and success.

October 5th to the 9th, 1830.—Continued our way up to the river.

October 10*th.*—Arrived at a very steep hill, and made an attempt to ascend it, but failed. I examined the sapan forest about it, but found it bare of trees; crossed the base of this mountain through a deep ravine, and found great difficulty. In some places I was obliged to be lowered down with ratans. We traversed round it, and came to the banks of the river on the north-west side. It was so very steep that we were obliged to make a bambu raft, and proceed on it to our boat. It rained throughout the day.

October 11*th*, 1830.—The head-man of my boat left me with six other Burmese, and proceeded into the sapan forest: towards the evening they returned on a bambu raft ; and brought some branches of the sapan tree, and reported to me that there were plenty of full grown trees where they had been.

October 12*th.*—Arrived at Meen wa Gheune, a famous place for procuring sapan wood. Continued our way in a northerly direction, passing at a distance immense sapan forests; passed a double range of hills called Ara Moung Toung. This range lays north-west and south-east; they are not very high.

October 13*th*, 1830.—Ordered the boat to be got ready, and started at 7-30 A. M. landed on a sandy beach and crossed a narrow neck of land, where we came to a creek of considerable breadth, called by the Burmese *Pah Goon*. It leads to Siam through a range of mountains. I proceeded up this creek for some distance, and found the forest here recently cut.—It is navigable for small boats.

During the night we had much rain, with thunder and lightning.

October 14*th.*—At day light continued our course up the river ; at 9 A. M. arrived near the falls of *Toung doung ka dain*, but the freshes being strong, we could make no use of our oars, and were obliged to track the boat along the eastern shore, which occupied more than four hours. At 1-30 p. m. arrived close to the falls; in the centre is a small island, and on each side of it, it is lined with a reef of rocks extending themselves to the main land. The falls are about thirteen feet above the level of the water; on the south side the water rushes with great impetuosity over a bed of sharp pointed rocks with a hollow sound. The depth of water here is about twenty fathoms: saw three or four boats about two hundred yards from the falls, these belong to the sapan wood cutters.

October 15*th*, 1830.—Crossed over to the western shore in a boat, with the whole of the boat's crew. Crossed a mountain, and found the river took a north-west direction and narrowed; from the top of this mountain I saw the whole of the sapan forest as far as my eye could reach; descended the mountain, and walked along the banks of the river until the evening, when I had a raft of bambus constructed, and came down the river and arrived at our boats.

October 16*th*.—After breakfast I ranged along the west banks of the river; I saw some natives cutting sapan wood. Here I saw several straggling sapan trees, each bearing the mark of a knife; and I found on enquiry that they were the property of another gang of wood-cutters. The people whom I met here told me that they intended to go more towards the southward to cut wood, and that the spot where they are now employed, appears to have been occupied by others. These men have, after some labour and time, cut only two rafts. The forests, generally speaking, are not literally covered with sapan trees, but only here and there a tree is to be found, so that the site which the wood-cutter may fix upon for his field, turns out a chance as to its abundance or scarcity. The natives of Mergui, who engage themselves in this enterprize, hold each a share in the produce of their labour.

October 17*th*, 1830.—During the day I employed myself in examining the heights of some of the mountains in the neighbourhood, viz. *Ka moun chat* is about nine hundred feet high: others on the north-west side of the river eight hundred and fifty feet high, and the "Two brothers" *(Area moung)* mountains are about one hundred and ten feet. Towards the evening, sent my boat to plant two flags on the western shore, as a base line; took the height of *Mecoun doung toung*, six hundred feet. This mountain lies to the south-west of *Area moun toung* hill, and further on, in the same direction, is a round hill about four hundred feet high.

Finding that I could not proceed further up the river, in consequence of the current being so very strong, and some of my boatmen being unwell with fever and bowel complaints, (myself also being troubled with the latter distemper,) and our stock of provisions almost exhausted, I thought it advisable to return to Mergui, which I did on the following morning."

III.—*Some additional Observations on the quantity of earthy matter brought down by the Ganges, its depth and velocity, made during the rainy season of* 1832, *at Ghazipur. By the Rev.* R. Everest.

The following are the results obtained during the present season in continuation of the experiments described on a former occasion. [Vide page 238.]

Insoluble matter :—	in a wine quart;		in a cubic foot.
July 3rd,	1	grain.	30 grs.
—— 7th,	8	„	240
—— 23rd,	10	„	300
Aug. 8th,	58	„	1740
—— 13th,	37	„	1110
—— 22nd,	26	„	780
Sept. 6th,	17	„	510
—— 24th,	8	„	240
Oct. 8th,	6	„	180

or 19 grains average for the 4 rainy months, from 15th June to 15th October; add for soluble matter, suppose 2 grains; the whole equal to 21 grains, or about 630 grains per cubic foot.

Velocity of the stream in ft. in an hour.

July 3rd,	6,810
—— 7th,	11,520
—— 23rd,	21,000
Aug. 8th,	42,000
—— 22nd,	34,560
Sept. 6th,	21,600
—— 24th,	13,320
Oct. 8th,	10,800

or 20,200 for the average of the four months, which is equivalent to about four miles per hour.

Depth of the river.

	ft.	in.
July 22d,	19	6
—— 30th,	22	6
July 7th,	25	6
—— 14th,	28	0
—— 23rd,	30	0
Aug. 1st,	35	6
—— 8th,	44	0
—— 13th,	47	6
—— 22nd,	42	0
—— 31st,	36	0
Sept. 6th,	38	0
—— 15th,	37	6
—— 24th,	28	6
Oct. 1st,	26	6

or an average of 33 ft. for the four months.

Note.—It will be observed, that the averages here given are considerably less than for the last year (1831), as stated in the Journal for June. But on comparing the fall of rain for that, and the present year, as stated in the Meteorological Registers, I am inclined to think that the previous estimate for 1831 is not excessive, but defective. The small branch, or stream, when the river was at the highest, would have a depth of about 12 ft. and a breadth of about 300 ft., an addition so trifling to the main stream, that I have made no allowance for it.

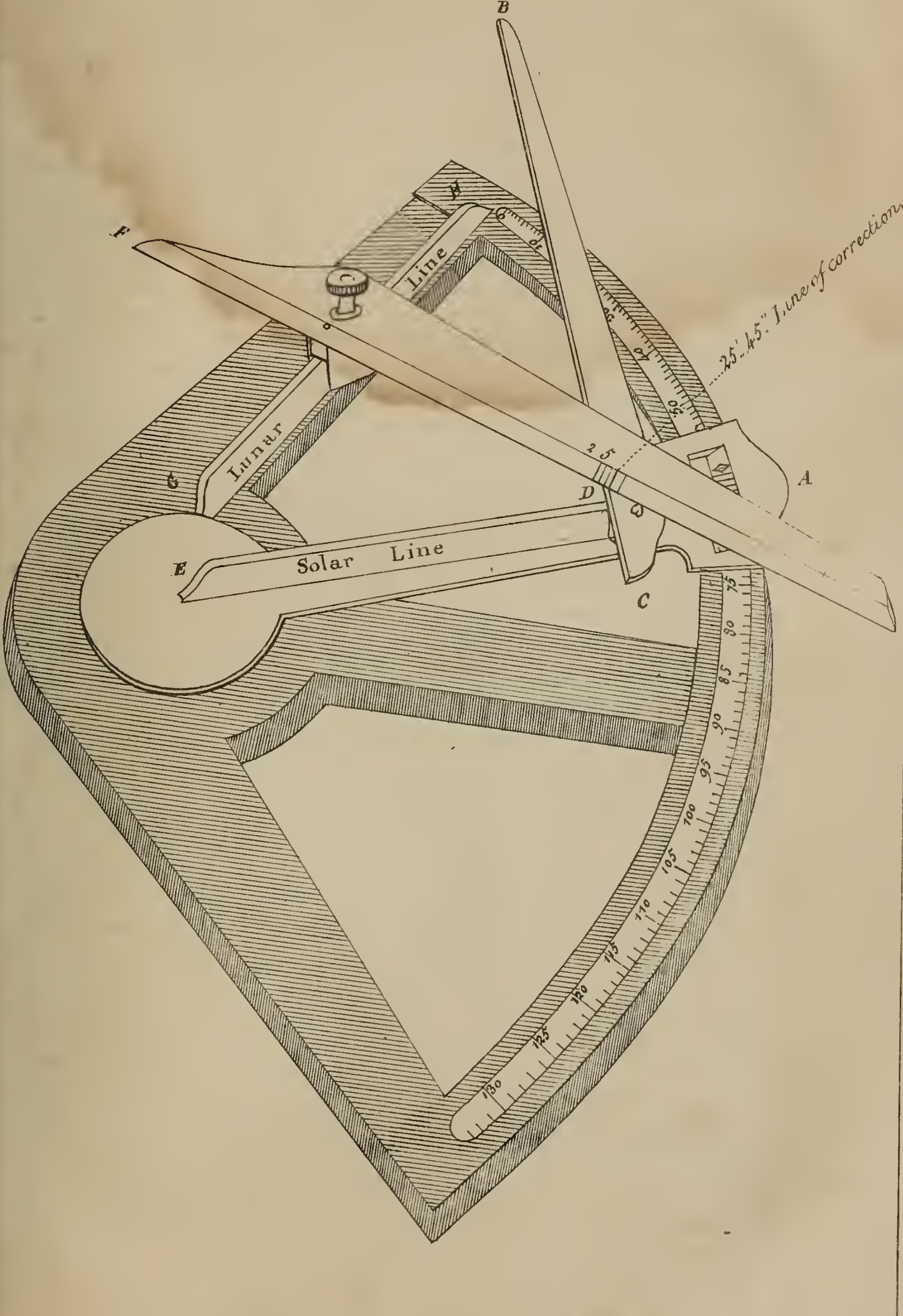
IV.—*Eclipses of Jupiter's Satellites.*

Observed by Mr. Walter Ewer. November, 1832.

	Mean time observed. h. m. s.	Diff. from Naut. Alm. h. m. s.	Diff. from Calcutta obs. h. m. s.	
Nov. 3. At Chaprah, with 5-feet achromatic, power 150.				
Emersion II Sat.	7 37 45	5 38 57	0 14 23	W.
Nov. 4. At Digwareh, on road to Hájipúr, 3½-ft. achrom. power 100.				
Emersion I Sat.	6 35 00	5 40 08	0 13 12	W.
Nov. 10. At Hájipúr, (Lat. 25° 41′ 11″ by sextant,) same telescope.				
Emersion III Sat.	7 41 51	5 41 19	0 12 14	W.
Nov. 11. Do. Emersion I Sat.	8 31 35	5 40 50	0 12 12	W.
Nov. 27. At Chaprah, 5-ft. achromatic, power 150, "capital observation."				
Emersion I Sat.	6 50 36	5 38 53	0 14 34	W.

The last column shews the difference as deduced from the Calcutta observation, made with a telescope of nearly the same power—(vide page 505-6.)

COWLES'S ANGLOMETER



C. Cowles del

J.B. Tassin lith.

V.—*Description of the Anglometer, an instrument for working Lunar Calculations. By Captain* C. Cowles.

The instrument represented in the accompanying drawing (Plate XIV.) was invented by me some years ago, with a view of reducing to easy practice one of the many methods laid down for solving the "Lunar Problem." The method I allude to will be found in Dr. Kelly's "Practical Introduction to Spherics and Nautical Astronomy." In speaking of it, he says in his preface to that work, (page 10.)

> "The manner of finding the longitude by the lunar observations is explained at some length in an easy familiar way, and the principles are illustrated by stereographic projections, whence rules are deduced for estimating the correction before hand. As this subject has not been attempted before, it required the more consideration, which has led to the discovery of a method of solving the problem by projection of four right lines from the plane scale; and although this method cannot be *insisted* on as perfectly correct, yet considering the complicated nature of the problem, and the great simplicity of the projection, the degree of accuracy must be matter of surprize rather than animadversion, as it will be found sufficiently correct for the general purposes of navigation. Where perfect accuracy is required, this method will be useful as a *guide* or check to calculation: and it is hoped, that the extreme facility of the operation may tend to render the practice of taking lunar distances more frequent among the generality of seamen."

Simple as the above method is, there are difficulties, which oppose themselves to its general adoption; for instance, to perform it with any degree of accuracy, it is necessary to have a tolerably smooth surface to work on, good compasses and scale, with a hard well-pointed pencil; on board ship one or other, and sometimes all these requisites are wanting, and when present, it must be recollected, that even amongst intelligent and well educated seamen, there are many who are not *aufait* at the pencil and scale. The object of this instrument is to remedy these inconveniences as far as may be, as it performs the work of paper, compass, scale, and pencil: it has been used by many persons, among whom I may mention Captain Laws, of H. M. S. Satellite, from whose concurrent reports on its merits, as well as from my own experience, I should say, that "its accuracy *is* matter of surprize;" that under all circumstances, it is a very desirable check on calculation; and, when the "distance" is not great, its accuracy may be depended on without calculation; and lastly, the certainty of being able to determine the longitude, in the course of a few minutes, is a strong inducement to take lunar distances when otherwise they would not be attempted.

Plate XIV. exhibits a perspective view of the instrument as made up by myself with the rude means at my command; the method of using it to clear the lunar distance is as follows:

Place the index A at the apparent distance on the arc of the instrument; then place the plain bar BC on the divided edge BE, or *solar line*, at the sun's altitude; and the chamfered bar DF, on the *lunar line* GH: mark at what division the plain bar intersects it, which note down, and call it the line of correction; and when this falls to the right of the lunar line, it is subtractive; but when to the left, it is additive.

Multiply* this line of correction by the given horizontal parallax; and divide the product by 62, when the correction is subtractive; but by 53, when additive, to find the "true correction."

To this description I will add a comparative example by the two methods.

By the usual Formula.

Given, ...	☽'s Apparent Altitude,	32° 30′ 00″	To find the true distance.
	*'s Ditto ditto,..	43 43 00	
	Apparent distance,	45 19 37	
	☽'s Horizontal Parallax,	0 60 09	

☽'s Apparent Altitude,	32° 30′				
*'s Ditto ditto,	43 43				
Sum,..	76 13 0	Half,......	38 6	Co. Tang.	10,1056
Difference, ...	11 13 0	Half,..	5 36	Tangent,	8,9915
Apparent distance,	45 19 37	Half,......	22 40	Co. Tang.	10,3792
First Correction, ..	+ 0 6	Arc, A. ..	16 40	Tangent,	9,4763
	45 19 43	Difference,	6 00	Co. Tang.	10,9784
Second Correction,	— 25 43	*'s Altitude,	43 43	Co. Tang.	10,0195
	44 54 00	*'s Correction,	0 59	P. Log.	2,2626
Third Correction,	+ 0 15	First Cor.	0 6	P. Log.	3,2605
True Distance, ..	44 54 15	Sum,......	39 20	Co. Tang.	10,0865
		☽'s Altitude,	32 30	Co. Tang.	10,1958
		☽'s Cor.....	49 15	P. Log.	0,5629
		2nd Cor.....	25 43	P. Log.	0,8452

Given as above. *By the Anglometer.*

Line of Correction,....	25′ 45″	P. Log.	8445
☽'s Horizontal Parallax,	60 9	P. Log.	4760
			1,3205
		Constant Log.	4629
			8576
Correction,........	0 24 59		
Apparent Distance,	45 19 37		
True Distance,....	44 54 38		

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* The use of proportional logarithms will simplify this operation.

VI.—*On the Indications of the Pulse according to the Hindús.*

[Translated from the 2nd Section of the *Oushudha-vali*, a Medical Treatise in the *Bhaka* language; by Rájá Kálíkishen Behádur.]

The treatise, from which the following extract is made as a specimen of oriental notions on medical subjects, professes to be a compilation from the *A'yur Veda*, *Abadhouta*, *Párvati*, *Sakuni*, *Devággya*, *Bhoja-Shastra*, *Tantra Purána*, and other works, arranged in the *Bhaka* tongue for the use of practitioners. It was printed in Calcutta in 1826, and its doctrines are of course prevalent at the present day among all those who have not had the advantage of a medical education after the European system. I have thought its publication might be interesting as a matter of curiosity.

Much consideration is required to judge of a man's constitution, by the pulse; and in some cases it is requisite to feel the pulse of both his arms; for when the pulsation is found to be the same in either arm, the inference is the existence of bodily equanimity: that part of the arm which is just above the joint of the hand is the place where the pulse is to be felt by the application of four fingers.

The following are the names by which the four navel strings are distinguished; namely, phlegmatic, bilious, flatulent, and sanguineous. The fingers to be applied are the fore fingers, and the others arranged in due order. If the motion of the pulse felt by the fore fingers be serpentine, and directed upwards, it must be inferred, that the patient's bile, blood, and interior are in a good state. If the pulse rise in a horny form, above the semi-knuckle, it will then be a sure sign of flatulency in the stomach, occasioning pain and giddiness of the head; but if it throb in the manner a wood-pecker picks grains, the indication will be a bilious disease.

If it be swelled, and rise up, phlegm and bile are to be understood as predominant, and should its motion in this condition be very quick, it will be a sign of fever; but if, in a swelled state, the pulsation should descend towards the other semi-knuckle, phlegmatic fever will appear to have ensued. If the pulse be faint, a superabundance of heat in the bowels will be indicated; if it be nearly impalpable, or if it should vibrate at one time upwards, and down at another, this will signify costiveness; when it becomes cold and weak, phlegm will prevail; if it run up and down frequently, flatulence and obstructed excretion; if the motion be like that of a lapwing, it will show the rise of a morbid state of the humours; and if the pulse become thick from being very hurried, it will quickly languish, and cause death.

When the pulse felt by the middle finger ascends in a thin faint form, or beats the upper semi-knuckle, like a wood-pecker, a bilious disorder will have taken place, which will also be indicated by the pulse running violently upwards, from the tip of the finger, and in this last case, it is probable, that vomiting and evacuation will ensue, if not already prevalent; phlegm is known when the pulse rises upwards frequently, and fever when strongly; when the pulse spreads, or becomes broad on one side, from the tip of the finger, at the time of rising, this will evince flatulence. If it get up, becoming thick in the lower semi-knuckle, and thin in the upper, the symptoms of virility will be understood to be deficient. Descending down the lower semi-knuckle, it will shew a latent and morbid state of the humours, and the approach of fever; and even in a feverish state, the pulsation will be the same.

If the pulse move upwards weakly or strongly, this will indicate fever; if such movement be not continual, it will imply a want of digestion. If the motion, resembling that of a lapwing, and attended by an almost imperceptible morbid state, becomes thick at once, the pulse will languish instantly, and be a forerunner of death. If the pulsation be at intervals, and confused, death is likely to happen, either after a lapse of four or five days, or within a day or two. When the pulsation is felt by the ring-finger, as drawing straight upwards, bodily, air will appear to be prevalent; but when, being weak, it runs in the same direction, and turns suddenly downward, flatulence will be apparent; besides, when the motion is slow or violent, and something like a knot is felt, it may be taken as the sign of pain in the stomach.

Should the pulse come down the semi-knuckle, phlegmatic fever will become manifest; and should this occur during a fever, attended with violent motion, and descending directly, rheumatism will prevail. If it move up in a triangular form, being broad in the lower and thin in the upper semi-knuckle, phlegm will be discerned. If the pulse, felt by the little finger, is straightly drawn up, the blood will be found in a clarified state; but a knot being perceived in the middle, it will indicate cold.

When the pulse comes down, it will appear that the blood has undergone some deterioration, and if not so already, that it will soon be discharged naturally, or even flow through the ears or eyes.

VII.—*Notes in Natural History. By Lieut.* T. Hutton, *37th N. I.*

I have now the pleasure to furnish an additional instance, in which I have observed the surprising increase of some species of insects during the rainy season.

About the 20th August, I accompanied some friends on an excursion to the falls of Tarah, which are situated in the hills about 9 or 10 miles from Mirzapúr;

owing, however, to the bad state of the weather, I made very few additions to my collection of insects, and being unable from the continued rain to venture far from the tents, I was amusing myself with watching the camels feeding among the trees under which we had encamped, when I espied a large tick slowly crawling on the ground; it was much swollen, and had probably recently fallen from one of the camels. I secured it in a small box which I carried with me for such purposes, and afterwards in the hurry of returning to cantonments, forgot all about it, by which means it was left imprisoned until the 17th of September, nearly a month afterwards, when on opening the box, I found the insect not only alive, but literally buried in a mass of minute ova, of a brown colour.

I proceeded forthwith to ascertain the number of eggs, which it had deposited during its long and solitary confinement, but owing to their minuteness and my wish to be accurate in counting them, I found I had assigned myself no easy task :—

Remembering, however, the old saying of "faint heart never won, &c." I persevered, and at the end of more than *four* hours, by which time I was completely tired, I found that I had waded through the almost incredible number of 5,283 ova.

These I kept for six days longer in a small glass phial, at which time the parent died, and the young were hatched, when I destroyed the whole family for fear of their infesting the house.

In a former note, I mentioned the great number of young produced by spiders, and having since discovered one of the means by which they are kept within due limits, I shall proceed to give a slight sketch of their enemy and the purpose to which it applies them.

During the rainy season, but more especially at its close, a beautiful species of Sphex, may be observed continually entering the room and searching for a convenient spot whereon to build its cell, sometimes selecting the leg of a table or chair, but more generally the wall or door-posts.

This done, it next brings in its mouth small portions of wet clay, with which it plasters the spot and forms a foundation upon which it builds its cell, rounding it into a cylindric form*, and always commencing at the bottom and working upwards to the mouth of it.

Having thus prepared the cell for the reception of its offspring, the sphex flies off in search of a spider, which it deposits at the bottom of the cell and upon which it fastens its egg.

It then again proceeds in search of more spiders, which are all placed in the cell for the purpose of nourishing the young grub when hatched from the egg.

The cell is then carefully closed with wet clay, and the sphex leaves it.

The grub when hatched, lives upon the store of food previously provided for it, and when it has consumed this, becomes a pupa, in which state it remains for some little time, and when ready to assume its imago or perfect form, it bores a hole through its prison walls and makes its escape.

Several of these cells were formed in different parts of my Bungalow, sometimes singly, sometimes in pairs closely joined side by side; when in pairs they are generally plastered over with a coat of clay which conceals their real form.

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* These cells when fixed to a wall or other flat surface, have the one side flat, and the other rounded or cylindriform.

The following list will serve to shew clearly why, in spite of the vast increase of the spiders, they do not cause that annoyance which the number would at first lead one to expect.

A single cell contained, ... 4 spiders.

A nest of two cells contained,	1st cell, ...	21	=53 spiders.
	2nd cell, ...	32	
A do. do. do.	1st cell, ...	23	=53 spiders.
	2nd cell, ...	30	
A do. do. do.	1st cell, ...	13	=30 spiders.
	2nd cell, ...	17	
		Total,	140

Again, another insect of a fine blue colour builds a nest of 4 or more cells, one of which I also give as an example, viz.

A nest of 4 cells contained,	1st cell, ...	23	=38 spiders.
	2nd cell, ...	15	
	3rd cell, ...	Pupa	
	4th cell, ...	Pupa	

The form of this last nest is the same as the foregoing, but I do not think the insect is of the same genus†.

Thus, however, we have more than 178 spiders killed by 5 insects alone; consequently, the *increase* of the species will be little more than equal to *the consumption.*

Of the insect itself I shall give you a description in some future paper, together with that of several others which I have collected.

I may add, however, that the cell is often built and stored with spiders in less than an hour.

I shall now proceed to make a few observations on the difference in several scorpions which I have examined.

In all the authors that I have hitherto had an opportunity of consulting, I find the number of teeth, in the pectinated plates on the abdomen of these animals, taken as one of the distinguishing marks of species.

This has confused me not a little, as I have lately examined upwards of 30 scorpions of different sizes, scarcely one of which agreed in the number of these teeth, and yet, setting this aside, they are the same in colour, in the number of eyes, and are often found together in the same holes.

In many instances I found *one tooth less* on one side of the pecten, than on the other side, but this deficiency was generally (though not always) supplied by a knob or rudiment of a tooth, which if counted as such made the plates correspond. The deficiency was almost always at the *inner* end of the plate.

The following catalogue will perhaps shew the differences, better than I can describe them.

No. 1. A scorpion with 15 teeth in the right pecten, 14 in the left pecten, and a rudiment of a tooth on the left plate. Eyes 8 in number. Colour dark livid-green; tail and forceps brownish; legs and poison-sack brownish straw-colour. Length 3¼ inches. *Scorpio afer ?*

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† Probably a species of *pompilus,* or some other genus of *pompilidæ.* I. T. P.

No. 2. A scorpion with 14 right, 15 left teeth in the pecten; eyes 8; colour of the preceding; length 3½ ins. No rudiment of a tooth on the right plate. *S. afer ?*

No. 3. Pecten with 15 *r.*, 15 *l.* teeth; eyes 8; colour of last; length 3½ ins. *S. afer ?*

No. 4. Pecten with 15 *r.*, 15 *l.* teeth; eyes 8; colour of last; length 3¾ ins. *S. afer ?*

These 4 appear to be the same, differing only in size, as the tooth, which in No. 1 is supplied by a knob, and in No. 2 is wanting, may have been broken off.

No. 5. Pecten with 16 *r.*, 15 *l.* teeth; eyes 8; colour the same as above; a knob on the left plate; length *nearly* 1½ *ins. !*

No. 5, which is not so much as half the size of Nos. 1, 2, 3 and 4, has nevertheless more teeth on the pectinated plates. Would not this argue, that the number of teeth does not increase with the age of the animal, since the least in size has often most teeth on the pecten?

No. 6. Pecten with 14 *r.*, 14 *l.* teeth; eyes 8; length 3½ ins.
Pecten with 14 *r.*, 14 *l.* teeth; eyes 8; length 2 ins.
Pecten with 14 *r.*, 14 *l.* teeth; eyes 8; length 3 ins.
Pecten with 13 *r.*, 14 *l.* teeth; eyes 8; length 3¼ ins. A knob on the right plate.

No. 7. Pecten with 13 *r.*, 13 *l.* teeth; eyes 8; length 1¾ ins.
Pecten with 13 *r.*, 13 *l.* teeth; eyes 8; length 3½ ins.
Pecten with 13 *r.*, 12 *l.* teeth; eyes 8; length 1¾ ins.

No. 8. Pecten with 12 *r.*, 12 *l.* teeth; eyes 8; length 2½ ins.

The natives say these scorpions inflict very painful wounds, attended sometimes with danger. They are found in holes in the ground.

The next species is much smaller and of a rusty brown colour, differing altogether in the shape of its forceps, which are more lengthened, and slender than in the former species; its general appearance also is much less forbidding. Its sting is not dangerous, but attended with pain, and inflammation of the wounded part; a servant however of mine, who was stung in the foot by one of this last species, was laid up for nearly two months in consequence.

No. 1. Pecten with 28 *r.*, 28 *l.* teeth; eyes 8; colour reddish or rusty brown; forceps long and slender, and very little bulging; length 2½ ins. of which the tail is 1½ ins. *Scorpio Americanus ?*

These are found on trees, underwood, &c.

No. 2. Pecten with 29 *r.*, 29 *l.* teeth; eyes 8; length 2½ ins.

No. 3. Pecten with 30 *r.*, 30 *l.* teeth; eyes 8; length 2½ ins.

No. 4. Pecten with 32 *r.*, 32 *l.* teeth; eyes 8; length 2 ins.

No. 5. Pecten with 33 *r.*, 33 *l.* teeth; eyes 8; length 2 ins.

At first I was much inclined to think, that these scorpions constituted only 2 species, the first of which, the dark livid-green species, I looked upon as the "*Scorpio afer*" in different stages of growth, and the second, or rusty brown species, as the "*Scorpio Americanus*." But on examining more closely I found that the smaller ones had often more teeth than the large ones; as for instance, No. 5, which has 16 *r.*, 15 *l.* teeth, is only 1½ ins. in length; while No. 8, which is one inch longer, has only 12 *r.*, 12 *l.* teeth. And again in the second species, Nos. 4 and 5, which are only 2 ins. in length, have more teeth than Nos. 1, 2 and 3, which are ½ an inch longer.

I therefore came to the conclusion, that, as the *larger* animals, which might reasonably be supposed to be the *oldest*, had fewer teeth on the pecten than the smaller ones, these teeth do not increase in number as the animal advances in age from infancy to maturity, and consequently that the difference in the number, must either indicate distinct species, or that the pecten cannot be regarded as affording any distinguishing mark of species.

But there again a question occurs, which I confess myself unable to answer, viz. how, if only one species, to account for the difference in the number of teeth?

Moreover, having procured a scorpion with several young ones clinging about it, I found that the number of teeth in both parent and offspring were exactly the same, the first having 15-15 teeth and being 3¾ ins. in length, and the last having 15-15 teeth, and being only ¼ ins. in length.

This, I think, goes far to prove those above described to be of distinct species.

The stories of these animals committing suicide, when surrounded by fire, are I believe now looked upon by naturalists as mere idle tales, unworthy of credit. Arguing one day upon this subject and not being able to convince my adversary, I procured two scorpions, one of each of the species mentioned above, for the purpose of testing the truth of his statement, and found the result to be as I had anticipated.

The poor animals after twice or thrice running *over* the glowing charcoal with which they were encompassed, and being as often put back again, were in a minute or two completely *roasted* by the heat, and expired without making the least attempt to sting themselves.

The animal, when in pain, lashes its tail about very quickly, which might possibly have given rise to the opinion, that it was stinging itself.

I consider it as next to impossible for them to commit suicide, as independent of the hardness of their covering, it is a known fact, that the scorpion when endeavouring to sting *strikes backwards* with much force, whereas in stinging itself it must *push* forwards, which I think it unable to do: but even if it could, I should question its ability to pierce the armour with which nature has clothed it.

It has been said that scorpions are so *fierce* and voracious, that when confined together they invariably fight until but one remains, which devours the carcases of his fallen enemies. This I can affirm is not always the case, as 8 or 10 of both kinds, which I confined in a large glass-jar, lived very peaceably for 4 or 5 days, although deprived of food; on putting in some beetles however they were speedily devoured. They appear to be very tenacious of life, as three, which I put into a jar of water, lived for four days.

If kept together for any length of time without food, it is more than probable that they would devour each other; but it is scarcely fair to stamp the poor scorpion as a fierce assassin, merely because it does that which, in like cases, every animal, from the Lord of the creation downwards, would be tempted to do, rather than perish of hunger.

I had intended noticing two species of land shells, which I found at Mirzapúr; but having much extended the present communication, I shall make them the subject of my next.

Mirzapúr, Oct. 26, 1832.

VIII.—*Proceedings of the Asiatic Society.*

Wednesday, 12th December, 1832.

The Honorable Sir Edward Ryan, President, in the Chair.

Read the Proceedings of the last Meeting.

The Right Reverend the Lord Bishop of Calcutta, Colonel Thomas C. Watson, and Charles Ray Martin, Esq. proposed at the last Meeting, balloted for, and unanimously elected.

A letter was read, addressed by Babú Ramkomal Sèn, to the Committee of Papers, stating the circumstances of his connection with the Society since the year 1803-4; he then acted as Registrar and Accountant under Dr. Gilchrist, Mr. Home, Drs. Hunter and Leyden, on a salary of 30 rupees: in 1820, this was increased by Lord Hastings, then President, to 50 rupees, and the duties of Collector were added, with an allowance of 20 Rupees for establishment. In 1829, the Babú was elected a Member, but continued his services as before, giving the emoluments to his son. Seeing the present state of the Society's funds, and the necessity of retrenchment in its expences, he now begged to relinquish his salary, and proposed a new scale of establishment, with a reduced total from Rs. 222 to Rs. 150 a month, making a saving of 72 Rupees.

Resolved, upon the recommendation of the Committee, that the thanks of the Society be presented to Babú Ramkomal Sèn, for his long and valuable services, and his disinterested offer of continuing their gratuitous performance, and that in testimony of its satisfaction, he be elected Native Secretary to the Asiatic Society.

Resolved, that Babú Ramkomal Sen be authorised to retain such establishment as is necessary for the collection of the subscriptions, in communication with the General Secretary.

The Secretary reported the completion of the 17th volume of the Asiatic Researches, and that application had been made to Government for freight for 100 copies for Europe.

Museum.

Ornaments worn by Ooriah women. Presented by Babú Ramkomal Sen, with a note.

Library.

The following Books were presented by Mr. H. H. Wilson ;

Assemani Catalogo de Codici Manoscritti Naniana, 1 vol.
Belt's Historia Antipodum, 1 vol.
Biot's Traité de Physique Experimentale et Mathematique, 4 vols. in 2.
Georgii Agricolæ de Re Metallicâ, 1 vol.
Histoire General des Voyages, 25 vols.
Picart's Ceremonies and Religious Customs, 6 vols.
Vaillant's Numismata Imperatorum, 1 vol.
Vocabulario de la Linga Tagala, 1 vol.
Inscriptiones Antiquæ á Comite Carolo Vidua, 1 vol.
Stewart's Principles of Money, 1 vol.

D'Olivet's Langue Hebraique Restituée, 1 vol.
Tochon d'Anncey, Recherches sur les Medailles, 1 vol.
Astley's Voyages, 4 vols.
Dictionary, Sanscrit and English, MSS. 4 vols.

The following Books presented by Messrs. Dondey, Dupré and Sons, of Paris.

Chezy, Reconnaissance de Sacountala, Drame de Calidasa, 1 vol.
Roger, Recherches Philosophiques sur la langue Onolofe, 1 vol.
Carolo Vidua, Inscriptiones Antiquæ in Turcico Itinere collectæ, 1 vol.
Klaproth, Table Alphabetique du Journal Asiatique, 1 vol.
Klaproth, Memoires relatives à l'Asie, 3 vols. in 1.
Refaba, la Lyre brisée, 1 vol.
Letronne, Analyse Critique du Recueil D' Inscriptions de M. Le Comte De Vidua,
De Fonscolme, Memoire sur le preambule d'un edit de Diocletien, 1 vol.
Greppo, Essai sur le systeme Heroglyphique de Champollion le jeune, 1 vol.
Blin Dictionnaire Francaise, Tamul, et vice versa, 1 vol.
Heber, Voyage de Calcutta à Bombay, &c. 2 vols.
Remusat, Nouveaux Melanges Asiatiques, 2 vols.
Trebutien, Contes Inedits des Mille et une Nuits, 3 vols.
Pongerville, les Amours Mythologiques, 1 vol.
Ditto, Lucrece de la Nature des Choses, 2 vols.
Marcel, les Dix Soirées Malheureuses, 3 vols.

The following Works from various Societies, &c.

The 1st and 2nd parts for 1831, of the Transactions of the Royal Society,
List of the Portraits in possession of the Royal Society, and
Ditto of Instruments and Apparatus belonging to the Royal Society. Presented by the Royal Society of London.

Nos. 50 and 51 of the Journal Asiatique. Presented by the Asiatic Society of Paris.

A Selection of Anecdotes, moral and entertaining, by Mahá Raja Kalíkishen.
The Memoirs of Ameer Khan, translated by H. T. Prinsep, Esq.—from the author.

Resolved, that the thanks of the Society be presented to the Donors of the above.

The following Books received from the Booksellers.

Lardner's Cabinet Cyclopedia, Spain and Portugal, 3 vols ; Switzerland, 1 vol.
Hardwicke's Illustrations of Indian Zoology, parts 10th and 11th.
Tod's Rajasthan, 2nd vol.

The Secretary submitted to the Meeting, the Journals and Papers of the late Mr. Moorcroft, placed by Government with the Society.

Resolved, that they be referred to the Committee of Papers, to determine in what manner they may most advantageously be made public.

PHYSICAL BRANCH.

Correspondence.

1. A letter was read from the Right Honorable Sir R. W. Horton, Governor of Ceylon, acknowledging, on the part of the Ceylon Improvement Society, the receipt of the first eight numbers of the Journal of the Asiatic Society, and communicating a resolution passed unanimously at their Meet-

ing of the 21th October, " to enter into correspondence with the Asiatic Society."

2. A letter from the Baron de Ferussac, dated Paris, the 10th April, acknowledged the receipt of a copy of GLEANINGS IN SCIENCE, and expressed a desire on the part of the " Société du Bulletin Universel" to enter into relations with the Asiatic Society, and to introduce to its Members M. Richy, Juge de la Kacherié à Chandernagore (now a Member of our Society.)

The Baron de Ferussac brings to the notice of Naturalists in India, his work on the Mollusca, now in the course of publication, [of which a prospectus was printed on the cover of our last number.]

3. A letter from Mr H. Piddington was read, presenting in the name of Dr. Harlan, of Philadelphia, the following works:

1. Andubon's Ornithological Biography.
2. Nos. 2, 3, and 5 of Featherstonhaugh's Monthly American Journal of Geology and Natural Science.
3. Description of a fossil Fucus and fossil bones, by R. Harlan, M. D.
4. Description of the Arvicola Nuttali, by ditto.

Museum.

A letter was read from Dr. Spry, announcing, that he has transmitted to the Society a magnificent specimen of a silicified palmyra tree from Ságar: also four specimens of the strata observed in digging a well in the jail at that station.

" Ságar is nearly surrounded by a chain of basalt hills; not in one continuous range, but with here and there a break. About a mile and half N. E. of Ságar on the Jabalpúr road, a bed of limestone partly in mass and partly crystallized, juts out at the foot of a range of these hills, and in the bed of a little stream, which is dry, except in the rains, and which runs over this limestone bed, these fossil trees are found. Captain Sleeman was the first to observe them. Three or four specimens as large as the one now sent have been removed. They are seen protruding through the soil, which on being removed, exposes the entire root. Masses of the truuk are observed lying about, but an entire trunk has not yet been discovered.

Specimens of rocks and minerals from Mr. W. Cracroft, to complete his series of the geology of Chíra Punjí.

Among these are several specimens of sandstone, with vegetable impressions of twigs and wood; some of the Chíra and Pandua limestones, with their distinct shells: finely crystalline fibrous actinolite; some very pure white porcelain clay, and some gold dust, with magnetic iron sand, as washed from the sand of the Brahmaputra river. Also, through Mr. G. Swinton, some of the auriferous pyrites from Dr. Lamb.

The Secretary presented specimens of zeolites, received from Mr. B. Noton of Bombay; among them a fine transparent greenish prismatic apophyllite.

Dr. Strong communicated a report on the progress of the boring in Fort William.

A third shaft has been opened to the depth of 82 feet, with a very large auger, and appearances are hitherto promising. No well was sunk above the shaft.

Dr. S. presented a list of works on the subject of artesian springs, which was referred to the Committee of Papers.

A letter was read from Captain P. Gerard, dated Simla, 21st October, forwarding the first part of his brother, Dr. J. G. Gerard's, paper on the valley, and section of the Spítí, in illustration of the fossils discovered by him in his visit to that elevated part of the Himalaya mountains.

This paper formed the subject of the evening's lecture.

Proceedings of a Special Meeting of the Asiatic Society,

Convened on Wednesday morning, the 19*th December,* 1832.

The Honorable Sir E. Ryan, President in the chair.

The President opened the business of the Meeting, by adverting to the circumstance of their being assembled to consider on the most appropriate mode of expressing their sentiments upon the approaching departure of their Secretary, Mr. H. H. Wilson. After expatiating upon the severe loss which the Society would sustain in this distinguished Orientalist, and the great debt of gratitude it owed to him as a Member and as Secretary—as indeed the chief support of the Institution for so many years—he proposed, that a Deputation should wait upon Mr. Wilson, at his Residence, on the 31st instant, at 10 A. M. with an Address expressive of their feelings on the occasion. He proposed that this Address should be prepared rather by a Committee of competent Oriental Scholars than by himself, as he could not pretend to do justice to the great merits of Mr. Wilson in a field of Literature entirely foreign to his own studies—he wished therefore to unite with himself Dr. Mill and Mr. J. Tytler, as Members of the Committee.

He proposed also, that it should form a part of this Address, that Mr. Wilson should be requested to allow the Society to have his Bust taken by Chantrey, or by one of the most distinguished Sculptors in England—" that it may be placed in this room as a durable monument of his name, and a testimony of the esteem and respect with which his memory will ever be cherished by the Members of the Asiatic Society."

Mr. J. Thomason seconded this proposition, which was unanimously adopted.

Dr. Tytler expressed his ready concurrence in the measure proposed, and begged to add Captain Troyer's name to the Committee, which was agreed to.

Mr. J. Prinsep informed the Meeting, that the expence of a Marble Bust, executed by a superior Artist, was estimated at £200, including the conveyance from England.

Mr. C. R. Prinsep hoped that all Members of the Society " would be invited to accompany the Deputation on the presentation of their Address :" upon which the Secretary of the Physical Class was directed to circulate a copy of the Proceedings to all Members of the Society, and to announce the day and hour of attendance to such as are resident in Calcutta.

In pursuance of the resolution passed on the 19th, the Deputation of the Society, accompanied by most of the members, proceeded in a body to the residence of Mr. Wilson on the 31st, where after the usual ceremonials of courtesy, the Honorable *President Sir Edward Ryan* read the following Address, which had been prepared by the Committee nominated at the special meeting.

ADDRESS.

THE ASIATIC SOCIETY TO H. H. WILSON, ESQ. THEIR SECRETARY.

"When other Societies in this Presidency, which, either in science or the lighter walks of literature, have shared the benefit of your counsel and assistance, are now anxious to associate their expressions of gratitude and regret with your approaching departure from India, it would ill become that one with which your connection is the oldest and most important of all, to suffer the most distinguished of its members to leave these shores, without giving some public utterance to the sentiments which must on such an occasion animate every individual member.

From the time, now nearly 50 years since, when the ASIATIC SOCIETY was instituted, "for inquiring into the History and Antiquities; the Arts, Sciences and Literature of Asia"—none, Sir, has with greater assiduity, or more splendid success, contributed to the advancement of that object, than yourself. In more than one department of their varied inquiries, your services are eminently conspicuous: but in that one, which must on every account claim precedence among the subjects of this Society's research, they are pre-eminent and unrivalled.

The ancient learning of India, which from the days of Pythagoras downward, had been the object of distant admiration, but never of clear definite knowledge, to the whole of civilized Europe, had indeed, at the period of your first arrival here, begun to emerge from the obscurity which had for ages encompassed it. The labours, as we are proud to declare, of some of the earliest members of this Society, had led the way in unlocking the sacred treasures of Brahmanical literature: through the ardent inquiring mind of our illustrious Founder and President, partly preceded, partly accompanied and followed, by the profound erudition of Colebrooke, the philological diligence of Wilkins, and some others; specimens of Indian genius and science had been given to the world in an English dress; and the matchless language in which all these treasures were contained, unknown before and unstudied by Europeans, except a few who keeping it from all others would have made it an instrument of their own interested views, was now partially exhibited to the more inquiring of the students of the West. But fully to throw open this remote and difficult walk of learned research, to make what was hitherto necessarily confined to a few amongst ourselves intimately conversant with the Pandits of India, accessible in some degree to others destitute of this advantage—to render the study of Sanscrit, as that of Arabic and Persian had long been, possibel, if not easy to persons confined to the libraries of Europe—and thus create that general diffusion of the study which, already reaching beyond our countrymen, is stimulating to exertion the laborious students of France and Germany, this, Sir, is a merit, which belongs, above every other individual, to you.

For the grounds of this judgment, we need point only to your Sanscrit and English Dictionary: a work, which, while facilitating and accelerating the progress of all subsequent students, can hardly be appreciated justly by any who has not some experience of this gigantic species of labour: a labour so immense, that, even when applied to the long-studied classical idioms of Greece and Rome, it has been characterized by one of the most eminent restorers of learning as comprising within itself alone every variety of literary toil. In the *present* instance, when we consider the multifarious sources from which the compilation was to be made (none of which, with one brilliant exception, had been before subjected to the severe accuracy of European criticism),—the boundless extent of the language itself—the quantity of research often necessary for ascertaining the precise import of even inconsiderable vocables among the thousands here enumerated and explained;—this work, so lucid in its arrangement, its interpretations and etymologies, must ever be regarded as a magnificent monument of philological skill and industry. The edition of 1819, setting aside the consideration of those additions just now published, with which your subsequent labors have enriched and nearly doubled its value—that first edition alone would amply deserve this character. Under any circumstances, it would be an excellent and valuable Sanscrit lexicon. Considered as the *first* in any European language, it is admirable, and beyond all ordinary praise.

But we feel, Sir, that it would be unjust to your high merits in this department of learning, were we to dwell too much on this one production, great as it is, indeed pre-eminently valuable in its kind, and sufficient of itself to establish the reputation of any oriental scholar. The several translations of classical Indian compositions, which, before and after the publication of your great work, you have given to the world, have shewn how well you could yourself tread those remote and arduous paths of literature which your labours had made free to the approach of others: they have added to the character of deep recondite erudition—the more desirable, if less distinguished, praise of a highly cultivated mind, and poetic taste and feeling. These qualities, not common in their separate excellence, but in their union truly extraordinary, are visible in your first published work, the version of the Cloud-Messenger of Cálídása, as well as in what is among the latest, your selections of the Dramatic Literature of the Hindús: and while the Sanscrit scholar wonders at the graceful ease and delicacy with which the peculiar character of Indian composition is most faithfully represented to English readers, the English general reader—he at least who has taste to discern the forms of beauty in the most unwonted combinations, and the philosophy to sympathize with man, however diversified by climate and institutions—cannot fail to be both delighted and instructed with the perusal.

It were really impossible to particularize in this address, the many elegant and useful editions of Sanscrit works that you have prepared, or the still more numerous dissertations on Hindú literature and antiquities, on the religious sects of this peninsula, and other kindred subjects, with which your indefatigable research has enriched the memoirs of this Society, as well as some other literary repositories of India and England. One of these, however, which heads the 15th volume of our own Transactions, is of too important a nature to be passed over without distinct mention. In the intricate labyrinth of Indian history and chronology, where the erudite labours of Jones, of Hamilton, and of Wilford, seemed only to render the darkness visible, and the confusion more hopelessly inextricable, furnishing too just ground for the idea that, in India, mythology and pantheistic mysticism had swallowed up history altogether—you have discovered one point at least, where order could be educed from the chaos of existing materials—where conclusions satisfactory to sound historical criticism could be attained—from which, as way-marks, the future investigator might safely proceed in exploring what is elsewhere most doubtful in this vast undiscovered region of Asiatic antiquity. That this is a correct judgment of your "Essay on the Hindú History of Cashmír," the voice of continental critics, some of them most conversant with the philology of Central Asia, will unite with ours in attesting. And, after the casual mention of one eminent deceased scholar of this Society, whose life was spent in scanning the contents of the Mahábhárata and Puránas, and comparing them, often hastily and fancifully, with the results of an uncommonly extensive and recondite western reading, we cannot fail to notice the far more useful as well as more critical, labour, which you have bestowed on those huge treasures of Hindú mythology and tradition. Of the first and most classical of these poems, you are about to give a splendid Sanscrit edition to the public. But your analysis of the contents of this, of the 18 Puránas, and several Upapuránas, with translations interspersed of the most curious and interesting portions of each, is a work of which the literary merit, and importance to all future inquirers into Hindú fable or history, can scarely be estimated too highly. It is indeed unpublished : but the 20 folio MS. volumes containing it, hold a most distinguished place among the many valuable gifts for which the library of this Society is indebted to you. We cannot but indulge the hope, that the older and far more difficult monuments of Hindú antiquity, the Védas, may hereafter receive that illustration from you which no other scholar, with the exception perhaps of Mr. Colebrooke, is fully competent to afford them.

Hitherto it is in reference to Sanscrit studies only, or the dialects immediately connected with it, that we have considered your unrivalled claims to our gratitude, and that of the literary world : but it will not have escaped the attention of any one acquainted with the works alluded to, the History of Cashmír especially, how well you have availed yourself of the collateral assistance, which the accurate knowledge of *other* Eastern languages has supplied. In the great work which you gratuitously undertook of arranging and describing the very large unformed collections of that indefatigable traveller and antiquary, the late Colonel Colin Mackenzie, you had to apply that knowledge to a variety of interesting objects *separately*. And, in the full description of the result of this six years' labour, which you published in Calcutta in two octavo volumes in 1828, a work in which Sanscrit books and monuments hold the chief, but by no means the only place, every reader must admire the happy critical attention which your active mind could bestow on so many objects, each sufficient to engross the attention of an ordinary scholar, collected from such various quarters, and comprised in so many difficult languages.

It cannot but enhance greatly the admiration with which we view these illustrious contributions to the stock of Asiatic learning, when we consider, that your time, from your first arrival in the country, has been occupied in official duties of an important and difficult character, totally unconnected with literature : and that the severe scientific studies of your own profession also (in which your merits have been recently acknowledged by those most competent to estimate them) have not, amidst this double distraction, been neglected. Nor can we but be greatly struck with the fact, that amidst occupations so various, so arduous, and so honourable, you could undertake the province (which inferior minds might have been delegated to perform, though they could not have performed so well,) of preparing elementary works in English for the instruction of Hindú youth, and even devoting a large portion of your time to the active superintendance of their yet infant seminaries of education. Still more, when we find, that from a complication of employments sufficient to distract or overwhelm the mass even of clever men, your mind could not only unbend itself in the lighter departments of elegant literature and art, but find ease and diversion in the hardness of statistical inquiries, and the details of recent political history. Your work on the Commerce of Bengal, lately published, and your History of the Burmese war, must remain signal monuments of the rare vigour of your enlightened and accomplished understanding.

But we must return finally to your relation to the Asiatic Society, and that not merely as a member, and unequalled contributor to its stores, but as its Secretary. From the time when you succeeded the late Dr. Hunter in that important capacity in 1810, not only have your main services been thus identified with the progress of oriental learning, and conspicuous to the whole literary world, but have been displayed in matters of which we alone are witnesses, and which we only can acknowledge: the arrangement of our papers, the preparation of the Transactions for the press, the compilation of a useful index to the whole, the conduct of all the details of the Society's business—in all which your attention and devotion to our interests has been most constant and exemplary. Nor must we omit to mention the masterly manner in which you have conducted the extensive correspondence, domestic and foreign, of this Society; nor the characteristic amenity of manners with which you have been ever ready to assist with your valuable aid and counsel the President and other individual members. None, after Sir W. Jones, if even he is to be excepted, has stronger claims on our grateful recollection; none certainly more long continued ones. During the last 23 years, you have never quitted your place amongst us, except only that year (1820), when you were absent on Government duty at Benares—an absence which, while it enabled you to fulfil more perfectly many of your learned undertakings, could not fail to reflect the greater honour on the Society.

For these eminent and unequalled services, we feel that the best thanks we can offer are but an insignificant recompense. We can only add to this tribute of mere justice to your past merits, our warmest hopes and wishes for the future, that you may fill, with increased honour and happiness, the distinguished station which a munificent founder has established in one of our ancient universities. We trust that you may succeed in awaking in many of the British youth, destined to important stations here, a desire to acquire that knowledge of the Sanscrit language and literature by which you are yourself so immortally distinguished, and thus become the means of extending to this land the blessings of increased civilization and Christianity.

But one wish remains for ourselves. We wish not to be without some durable monument of the great talents which have, for nearly a quarter of a century, given strength, and activity, and honour to our meetings in this place. We therefore request, that you will add to your former favours this one, of permitting your bust to be taken by the most eminent sculptor in England, at the charge of this Society: that it may stand in our room as an enduring testimony of the high esteem and respect with which your memory will be ever cherished by the Asiatic Society.

Edward Ryan,
Dec. 31*st*, 1832. *President.*"

At the conclusion of this address, Mr. Wilson, having requested the President and Members to be seated, replied in the following terms :

" When I recollect, that Mr. Colebrooke, on leaving India, received from the Asiatic Society, of which he had for many years been the chief ornament and support, no other tribute than an official letter from myself, the tenor of which was left very much to my own discretion, I cannot but feel ashamed of the vastly inferior claims which have been this day honoured by you with such highly favourable notice. If he received less, I have reaped more than I am entitled to, and I have to thank you not only for the commendations which I might in fairness claim, but for your kindness and partiality, the not unnatural growth of many years of association, which have suggested this overflowing measure of reward for any service I may have rendered to the Society.

" I shall not pretend to disclaim the warm interest which I have taken in the credit and prosperity of the Asiatic Society, from the period of my first arrival in this country, or in the researches which it was instituted to promote. After I became a Member, the Secretary of the Society, to do so was no more than my duty ; but it was equally my pleasure and pride to be a member of a body established for such honourable and useful purposes as the investigation of man and nature in the East, the development of the past history and present condition of these vast and important regions, and the maintenance of the British character for enlightened and liberal research, and the disinterested cultivation of intellectual pursuits. The share that I may have borne in the accomplishment of these purposes has made many hours of my leisure in this country glide happily away ; to have been associated in them with so many excellent and talented individuals, has always been, and must always be, a subject of self-congratulation ; to have earned such an estimation amongst them, as they have this day expressed, must ever be a source of proud and grateful recollection.

" In consenting to the request with which you have been pleased to conclude the flattering enumeration which you have made of my services to Oriental Literature and to the Society, you will acquit me, I am sure, of being influenced by merely personal feeling. If I can judge of your sentiments by my own, I can fully appreciate the motives which induce you to seek to preserve memorials of those who have taken an active part in the labours of the Society. One of the most interesting decorations of the room in which we are accustomed to assemble is to me, to all, the portrait of our illustrious founder; and I am sure you will agree with me, that the apartment would possess a still dearer interest were such decorations multiplied—did the countenances of Colebrooke, Wilford, Wilkins, and other distinguished members look down complacently upon the labours of their successors. I need not add, how irresistible are such influences upon the human mind, and how well calculated are such memorials to give a wholesome stimulus to youthful energies. It is not from a merely selfish motive, therefore, that I accede to your request, but in the hope, that even in this way I may contribute, however feebly, to the great ends of our Institution. At the same time I am not insensible of the kindness which has prompted the proposal, and if I do feel vain, it is that you should have thought me worthy of the honour of being perpetually, as far as any thing human is perpetual, present amongst you.

" Gentlemen, I have only further to bid you farewell, and offer you my most fervent hopes for the continued activity of the Asiatic Society, confident, that that alone is necessary to insure it continued and increasing utility and reputation."

Proceedings of the Indian Committee of the British Association for the Promotion of Science.

In virtue of a resolution of the General Committee of the British Association on the 3rd March, 1832, the Rev. W. V. Harcourt, Vice-President, in the Chair, the following gentlemen were appointed a Local Committee in India, to co-operate in the objects of the Institution—Sir Edward Ryan, Mr. George Swinton, Mr. James Calder, Major Benson, Captain J. D. Herbert, Dr. Turnbull Christie, (since dead,) and Mr. James Prinsep.

A first meeting of the resident members of this Committee was held at the house of Mr. Swinton, on the 3rd October, when Sir Edward Ryan kindly undertook the office of President, and Mr. J. Prinsep that of Secretary. Mr. Swinton signified the assent of Major Everest, Surveyor General of India, to become a member of the Committee, and stated that he had addressed circulars to the members absent from Calcutta, together with printed copies of the first report received from the Rev. Mr. Harcourt. On the 14th Nov. a second meeting was held at the house of Sir Edward Ryan, when it was resolved to submit an application to the Government, for permission to borrow from the Surveyor General's office such Barometers and other Meteorological instruments as he might be able to spare, for distribution to those gentlemen who may volunteer to prosecute the inquiry into atmospherical phenomena on this continent, so urgently recommended to the attention of the Indian Committee by the Association. With reference to this subject, a letter from Dr. T. Christie* acquainted the meeting, that the Madras Government had strenuously taken up the subject of meteorology, and had at his recommendation sent to England for twenty complete sets of the best instruments, to be distributed among observers on the peninsula; and had caused to be printed, at the Government Lithographic Press, a note of instructions, with tables and forms of registers, prepared by himself.

Captain Herbert's reply to the circular from Mr. Swinton pointed out, that he had been for some time engaged in investigating the theory of the wet bulb thermometer, and that he hoped soon to be able to throw some light on that simple form of hygrometric instrument.

Mr. Prinsep stated, that he was already in possession of one or two good series of meteorological observations, and had every expectation of soon possessing a valuable mass of such information.

IX.—EUROPEAN SCIENTIFIC INTELLIGENCE.

1.—*New Nautical Almanac.*

The Report of the Nautical Almanac Committee is printed in the 2d part, vol. IV. of the Memoirs of the Astronomical Society. Their suggestions have been adopted throughout by the Admiralty, and are ordered to take effect from 1834. We extract the appendix to the report, which gives a clear view of important im-

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* Whose lamented death we reported in our last.

provements to be introduced, sufficiently intelligible to all engaged in astronomical pursuits without further explanation.

Those articles which are now introduced for the first time, are printed in *italics;* and the same mode is adopted to denote the alterations which have been made in the *extension of the computations* of the other articles.

" The use of *apparent* time to be abolished in all the computations, except in those immediately connected with the sun's transit.

The day of the week, repeated as often as convenient.
———— month, on every page.
———— year, (or days elapsed since Jan. 1st) in numerical order.
The fractional part of the year, for every such day.
Equinoctial time for every day in the year.
Mean time of the transit of the first point of Aries to two places, for every day.

SUN'S {
R. A. in time (with *hourly motion*) to 2 places,
Declination (ditto ————) to *one* place,
Siderial time of ½ diam. passing mer. to 2 places,
} At the time of Sun's transit.

Equation of time (with hourly differences) to 2 places.

SUN'S {
Right ascension, to two places.
Declination, to one place.
Longitude, to *one* place.
Latitude, to two places.
Semidiameter, to one place.
Siderial time, to two places.
}
Equation of time, to two places.
Logarithm of radius vector, to seven places.
} At mean noon.

MOON'S {
Longitude, to *one* place.
Latitude, to *one* place.
Horizontal parallax, to *one* place.
Semidiameter, to one place.
} For noon and midnight.
Mean time of transit, to the *tenth* of a minute.
Age to the *tenth* of a day for noon.
AR. in time, to two places,
Declination to *one* place,
} For *every* hour.
———— *with differences for five minutes.*
Phases, to the *tenth* of a minute,
Perigee and apogee for the nearest hour,
} For each lunation.
}

PLANETS, viz. Mercury, Venus, Mars, Jupiter, Saturn, Herschell, {
Heliocentric Longitude, to *one* place,
———— Latitude, to *one* place,
Logarithm of radius vector to seven places,
Geocentric AR. in time, to two places,
———— Declination, to *one* place,
Long. distant from the Earth, to *seven* places,
Mean time of transit, to the tenth of a minute,
} For *every day* at noon.
Horizontal parallax, to two places,
Polar semidiameter to two places,
} For every *fifth* day.
}

PLANETS, viz. *Vesta, Juno, Pallas, Ceres.*

Heliocentric Longitude,
——— *Latitude,* } *To the nearest minute,*
Geocentric AR. *in time, to the tenth of a minute,*
——— *declination to the nearest minute,*
Radius vector, to four places,
Long. distance from the earth, to four places,
Mean time of transit, to the tenth of a minute, } *For every fourth day at noon.*

Geocentric AR. *in time, to two places,*
——— *Declination, to one place,*
Radius vector, to five places,
Long. distance from the Earth, to five places, } *For one month before and after opposition at midnight.*

The co-efficients A B C D, for every day, at midnight.

JUPITER'S SATELLITES
Eclipses of { in mean and *siderial* time, to *one* place.
diagrams for shewing the place at that time.
Contact with the planet, in siderial time,
Contact of shadows with the planet, in do. } *To the nearest minute.*
Configurations.

LUNAR DISTANCES
From the Sun and the nine principal Fixed Stars, and from *Venus, Mars, Jupiter* and *Saturn*, for every third hour.
With the proportional logarithm of the differences, annexed.

Apparent obliquity of the ecliptic, to two places,
Parallax of the Sun, to two places,
Aberration of the Sun, to two places,
Equation of equinoctial points, in Longitude, to *two* places,
——— *in* R A *to two places,*
Mean longitude of the moon's node, to the tenth of a minute, } For every day.

ECLIPSES
Solar, *with the line of the moon's umbra, diagrams, &c.*
Lunar.

Predicted occultations (visible at Greenwich) of planets and fixed stars to the sixth magnitude inclusive, in mean and siderial time, to the nearest minute; with the angle from the vertex, and also from the most northern point of the moon's disc.

Elements for predicting such occultations of the *planets* and fixed stars to the fifth magnitude inclusive, as may be visible in any habitable part of the globe, *with the limits of latitude annexed.*

The apparent places of the stars on the days of occultation to be given in both cases.

Apparent places of the fixed stars (100 in *number*) for their time of transit: *α* and δ Ursæ minoris for *every* day, the remainder for every tenth day, *with differences annexed:*

Mean places of the same at the beginning of the year in a separate list.

A list of moon-culminating stars, continued within *four* days of new moon: the *apparent* AR. of the stars to *two* places, and the mean declination to the nearest minute; also the

MOON'S
AR. in time, of her bright limb, to two places,
Variation in ditto for one hour of longitude,
Siderial time of semidiameter passing meridian, to two places, } For upper and lower culmination.
Declination, to nearest minute, for upper culmination.

A LIST OF PHENOMENA, containing,

- Conjunctions (in of AR.) the planets with
  - the moon.
  - certain fixed stars.
  - each other.

  with difference of declination to the nearest minute.
- time when the planets are
  - in quadrature.
  - in conjunction.
  - in opposition.
  - in their perihelion.
  - in their aphelion.
  - *in their nodes.*
  - *stationary.*
  - *at their greatest heliocentric latitude.*
  - at their greatest elongation (*with amount*).
- *time when the sun is in*
  - *Perigee.*
  - *Apogee.*
- *time of the greatest brilliancy of Venus.*
- *time of the maximum and minimum of the light of variable stars.*
- *time of the maxima of the moon's libration.*

Notice of
- transits of Mercury.
- *predicted comets.*
- any other remarkable phenomena.

Elements for finding
- *the geocentric appearance of Saturn's ring.*
- *the illuminated portions of the discs of Venus and Mars.*

TABLES
- *for the correction of 2nd differences in lunar distances.*
- *for determining the latitude by the pole star out of the meridian.*
- *of the longitude and latitude of the principal observatories.*
- *of the time of high water at London bridge.*
- *for finding the time of high water at the principal ports.*
- *of Errata discovered in logarithms and other tables of repute.*

Notice of newly determined positions, magnetic variations, &c. &c.

Preface, to contain an account of *all* the tables used in *every computation*; and a notice of *any equations* omitted, or *new corrections* applied.

Cycles, remarkable days, moveable feasts, law terms, &c. to be prefixed.

Table of Contents.

(Signed) J. SOUTH, *President.*

2.—*Heated Air and Uncoked Coal for smelting Iron Ore.*

The journals have lately announced the discovery in France of a method of smelting iron ore with billets of wood uncoked, from which a great saving of expense is anticipated. This discovery will prove of high utility to the iron smelters in foreign countries, especially in the north of Europe: but to the British smelters, it is vastly inferior in importance to the process now employed at the Clyde Iron Works, by which iron of an excellent quality is obtained at once and in much larger quantity than formerly, by the employment of raw uncoked coal. The agent in this remarkable amelioration of the smelting process is *heated air*, with which the blast in the furnace is kept up, instead of the cold air hitherto propelled into the furnace; the iron when withdrawn is much more fluid than when smelted by the old process, and in this respect has much resemblance to the Silesian iron of the first fusion. The value of this happy application in an economical point of view may be seen from the following circular drawn up by the patentee.

"Comparative view of the quantity of materials required at Clyde Iron Works to smelt a ton of foundery pig-iron, and of the quantity of foundery pig-iron smelted from each furnace weekly:

	Coals. tons.	Iron-stone. cwts.	Lime-stone. cwts.	Weekly produce in pig-iron. tons.
1, with air not heated and coke,..	7	3¼	15	45
2, with air heated and coke, ...	4¾	3¼	10	60
3, with air heated and coals,....................	2¼	3¼	7½	65

Note. 1. To the 2nd and 3rd lines there must be added five cwts. of small coals required to heat the air, in iron pipes, carried several times through the oven, so that the air may arrive at the furnace at a heat of between 600 and 700 ; it should melt lead at three inches from the orifice.

2. The expence of the apparatus is from £200 to £300 for each furnace.

No coals are now used at the Clyde works : and we learn that Messrs. Jessop and Co. at the Butterly works, have successfully adopted the same plan. The furnaces are blown by a double-powered steam-engine, with a steam cylinder 40 inches in diameter, and a blowing cylinder of 80 inches, which compresses the air so as to carry 2½ lbs. per square inch. The muzzles are 3⅛ inch in diameter. EDIN. JOUR. XII.

3.—*Price as measured by Money.*

Political economists have been reproached with two small a use of facts, and too large an employment of theory. If facts are wanting, let it be remembered, that the closet-philosopher is unfortunately too little acquainted with the admirable arrangements of the factory ; and that no class of persons can supply so readily, and with so little sacrifice of time, the data on which all the reasonings of political economists are founded, as the merchant and manufacturer : and unquestionably, to no class are the deductions to which they give rise so important. Nor let it be feared, that erroneous deductions may be made from such recorded facts : the errors which arise from the absence of facts are far more numerous and more durable than those which result from unsound reasoning respecting true data.

The great diminution in price of all articles within these few years may have arisen from several causes :

1*st. The alteration in the value of the currency.* 2*nd. The increased value of gold, in consequence of the increased demand for coin.* The first of these causes may have had some influence : and the second may have had a very small effect upon the two first quotations of prices, but none at all upon the two latter ones. 3*rd. The diminished rate of profit produced by capital however employed.* This may be estimated by the average price of three per cents. at the periods stated. 4*th. The diminished price of the raw materials, out of which these articles were manufactured.* The raw material is principally brass and iron, and the reduction upon it may, in some measure, be estimated by the diminished price of iron and brass wire, in the cost of which articles the labour bears a less proportion than it does in many of the others 5*th. The smaller quantity of raw material employed, and perhaps, in some instances,* *an inferior quality of workmanship.* 6*th. The improved means by which the same effect was produced by diminished labour.*

In order to afford the means of estimating the influence of these several causes, the following table is subjoined :—

Average Price of	1812	1818	1824	1828	1830	1832
	£ *s.* *d.*	£ *s.* *d.*	£ *s.* *d*	£ *s.* *d.*	£ *s.* *d.*	£ .
Gold per oz..	4 15 6	4 0 0	3 17 6½	3 17 7	3 17 9½	3 17 10½
Value of currency per cent........	79 5 3	97 6 10	100	100	100	100
Price of 3 per cent. consols......	59¾	78¼	93⅝	86	89¾	82½
Wheat, per quarter....	6 5 0	4 1 0	3 2 1	3 11 10	3 14 6	2 19 3
English pig iron at Birmingham......	7 10 0	6 7 6	6 10 0	5 10 0	4 10 0	,,
English bar iron at do. .	,,	10 10 0	9 10 0	7 15 0	6 0 0	5 0 0
Swedish bar iron in London, excluding duty of from £4 to £6 10*s.* per ton....	16 10 0	17 10 0	14 0 0	14 0 0	13 15 0	13 2 0
Hard-ware manufactured..	100	on an	average	reduced	to	40
	s. *d*	*s.* *d*	*s.* *d.*	*s.* *d.*	*s.* *d.*	
Anvils per cwt........	25 0	20 0	20 0	16 0	13 0	
Locks for doors, 6-inch,	per doz.	38 0	32 0	15 0	13 6	
Iron wire, No. 6..	bund.	16 0	13 0	9 0	7 0	
Brass wire....	lb.	1 10	1 4	1 0	0 9	

The most influential of these causes has undoubtedly been the invention of cheaper modes of manufacturing. The extent to which this can be carried, and yet a profit be realized at the reduced prices, is truly astonishing, as the following fact, which rests on good authority, will prove. Twenty years since a brass knob for the locks of doors was made at Birmingham, the price, at the time being 13*s.* 4*d.* per dozen. The same article is now manufactured, having the same weight of metal, and an equal or in fact a slightly superior finish, at 1*s*. 9¼*d.* per dozen. One circumstance which has produced this economy in the manufacture is, that the lathe on which these knobs are finished is now turned by a steam engine ; so that the workman, relieved from that labour, can make them twenty times as fast as he did formerly.—*Babbage's Economy of Manufactures.*

Death of M. Jacquemont.

We regret to learn from the newspapers, that Monsieur Victor Jacquemont, the distinguished Naturalist, who was travelling through India on the part of the Académie of Paris, died at Bombay on the 7th instant. He commenced his tour through India at Calcutta in 1829 : he proceeded through the Jungle Mehals to Benares ; thence to Rewah and Bundelkhand ; and through the Doáb to the Hills ; whence, after obtaining permission, through the intervention of the Governor General, from Maharája Ranjít Sinh, he pursued his journey into Kashmír, and even penetrated a short distance within the limits of the Chinese territory. He returned across the continent to Bombay, where a lingering affection of the liver, brought on by constant exposure to severities of climate, put a period to his existence. Mon. Jacquemont had never communicated the results of his researches to any one of his many friends in India, but we know that he had been most actively employed, and we shall look anxiously for an account of all he has done, in the French scientific journals.

Meteorological Register, kept at the Surveyor General's Office, Calcutta, for the Month of December, 1832.

Days of the Month.	Minimum Temperature observed at sunrise.					Maximum Pressure observed at 9h. 50m.					Max. Temp. and Dryness observed at 2h. 40m.					Minimum Pressure observed at 4h. 0m.					Observations made at Sunset.					Observations at 10½. P. M. in Calcutta.				
	Barometer reduced to 32°.	Temper. of the air.	Depres. of M. B. Ther.	Wind.	Aspect of the sky.	Barom. red. to 32°.	Temper. of the air.	Depres. of M. B. Ther.	Wind.	Aspect of the sky.	Barom. red. to 32°	Temper. of the air.	Depres. of M. B. Ther.	Wind.	Aspect of the sky.	Barom. red. to 32°.	Temper. of the air.	Depres. of M. B. Ther.	Wind.	Aspect of the sky.	Barom. red. to 32°.	Temper. of the air.	Depres. of M. B. Ther.	Wind.	Aspect of the sky.	Barom. red. to 32°.	Temper. of the air.	Depres. of M. B. Ther.	Wind.	Aspect of the sky.
1	30,004	61,5	1,0	cm.	cl.	,051	73,3	5,5	n. e.	cl.	,929	82,	11,7	n. e.	cl.	,928	80,5	11,5	n.	ci.	,929	77,	7,0	cm.	cl.	,987	72,2	7,5	cm.	fog.
2	,973	61,5	0,5	do.	do.	,027	74,	5,5	s. w.	do.	,908	83,3	11,8	s. w.	do.	,898	82,	11,2	s. w.	cl.	,907	76,7	6,2	do.	do.	,887	72,2	7,6	s. w.	cir.
3	,963	65,5	0,5	do.	do.	,020	77,	7,0	n.	do.	,920	84,5	11,0	n.	do.	,913	82,7	11,7	n.	do.	,919	77,3	6,0	do.	do.	,986	73,0	7,0	n.	cl.
4	,991	62,	0,5	do.	do.	,047	76,	6,3	cm.	do.	,950	83,3	13,6	n. w.	do.	,932	82,	12,0	n. w.	do.	,945	77,	7,5	do.	do.	,991	73,0	7,6	do.	do.
5	,002	65,3	2,6	do.	do.	,071	74,3	6,8	n.	do.	,960	80,3	12,6	do.	cis.	,954	79,	11,5	do.	ci.	,971	75,	6,7	do.	do.	,040	68,3	8,0	do.	cir.
6	,041	60,5	1,5	do.	do.	,087	71,7	7,4	do.	do.	,990	77,7	12,0	n.	cl.	,986	76,3	11,5	n.	cl.	,991	75,7	10,7	do.	do.	,053	69,0	7,1	n. w.	cl.
7	,008	58,5	1,5	do.	do.	,063	70,3	4,6	n. w.	do.	,932	77,7	13,4	n. w.	do.	,933	75,7	11,4	n. w.	do.	,933	72,	4,7	n. w.	do.	,981	67,0	7,0	cm.	do.
8	,957	58,3	1,8	do.	do.	,030	73,2	8,7	do.	do.	,916	76,	11,0	do.	do.	,913	75,7	11,2	n.	do.	,918	72,	6,4	cm.	do.	,991	68,5	5,1	n. w.	fog.
9	,972	58,	1,0	do.	do.	,043	70,3	6,3	n.	do.	,906	77,7	11,7	n.	do.	,903	75,7	15,2	do.	do.	,917	69,	3,0	.do.	do.	,000	68,4	6,6	do.	cl.
10	,980	59,	0,7	do.	do.	,053	71,5	6,2	n.	do.	,931	78,5	10.0	n. w.	cis.	,930	76,	10,0	do.	ci.						,984	67,2	5,2	cm.	cir.
11	,992	59,	1,0	do.	do.	,029	73,8	6,8	n. w.	do.	,969	79,5	10,5	do.	cl.	,960	77,	10,0	n. w.	cl.						,006	71,3	7,5	n. e.	do.
12	,991	61,7	0,7	do.	do.	,045	70,7	5,1	do.	do.	,940	79,	9,0	do.	do.	,939	78,7	9,0	do.	do.	,967	65,7	1,0	n.w.	do.	,962	69,5	7,4	e.	cis.
13	,996	61,5	3,5	do.	cis.	,071	72,	5,8	n.	do.	,971	72,5	11,5	do.	do.	,962	71,8	11,1	n.	do.	,965	66,7	5,7	cm.	do.	,026	64,5	9,7	n. w.	cl.
14	,987	54,	1,0	do.	cl.	,031	68,	9,0	n. e.	do.	,932	74,	10,5	n.	do.	,919	73,	10,0	n. w.	do.	,951	70,	7,0	do.	do.	,973	65,2	6,3	w.	do.
15	,985	57,	2,0	do.	do.	,044	71,3	7,3	cm.	do.	,922	76,	9,0	s. w.	do.	,913	75,2	7,2	n.	do.						,992	68,0	5,3	s. e.	do.
16																										,030	69,2	4,4	var.	do.
17	,035	65,	0,3	e.	cus.	,073	75,	6,0	e.	cu.	,953	80,	10,	n. w.	cus.	,952	78,	7,0	cm.	cus.	,951	75,5	5,5	n. e.	do.	,024	69,6	5,4	e.	do.
18	,029	61,5	0,5	n. w.	cis.	,060	70,5	4,5	n. w.	cl.	,928	78,	9,3	do.	cis.	,911	77,	10,0	n. w.	ci.	,913	75,	8,3	n. w.	do.	,953	68,5	7,5	n. e.	do.
19	,951	60,	2,5	n. e.	cl.	,003	69,	9,0	n. e.	cus.	,902	73,	4,0	n. e.	cus.	,894	73,5	9,0	n. e.	do.	,886	72,	8,0	n.	cus.	,979	66,3	5,7	do.	do.
20	,026	56,	2,0	do.	do.	,070	68,5	9,8	do.	cl.	,941	74,	12,5	n.	cl.	,935	71,	11,5	n.	cl.	,944	70,	11,0	n. w.	ci.	,003	63,4	10,2	do.	do.
21	,003	53,	2,0	n.	do.	,030	66,	10,3	do.	do.	,920	73,	15,0	n. w.	do.	,907	71,5	13,8	do.	do.	,908	70,5	12,5	n.	do.	,968	63,3	8,7	n.	do.
22	,961	52,	1,5	s. e.	cis.	,978	64,	7,5	n.	do.	,853	72,	12,3	n.	do.	,858	71,	11,0	do.	do.	,855	69,	9,5	do.	do.	,891	62,6	7,4	do.	do.
23	,035	55,5	3,0	n. w.	do.	,025	64,	6,0	do.	do.	,944	64,	11,3	n. w.	cis.	,936	73,	11,5	n. w.	do.	,939	70,	10,0	n. w.	do.	,891	64,8	7,4	n. w.	do.
24	,888	54,	2,0	n.	ci.	,946	67,	5,0	do.	cus.	,834	76,	13,0	do.	cl.	,831	71,	9,0	do.	ci.	,854	72,5	10,0	n.	do.	,864	64,2	8,0	do.	do.
25	,892	55,	2,5	do.	cl.	,942	62,5	2,0	do.	cl.	,843	78,7	14,7	n.		,846	72,	7,5	n.	cl.	,841	75,	10,0	do.	do.	,906	67,1	8,4	do.	do.
26	,953	58,5	2,5	do.	do	,021	70,	11,5	do.	do.	,913	75,7	10,7	do.		,813	75,	11,5	do.	do.	,910	72,	10,0	do.	do.	,974	64,8	10,8	do.	do.
27	,047	53,	4,5	do.	do.	,108	61,	9,5	do.	do.	,978	70,	14,3	n. w.	cl.	,968	69,7	14,2	n. w.	do.	,949	67,3	12,3	do.	do.	,021	57,0	8,0	do.	do.
28	,062	51,5	5,5	do.	do.	,085	61,	7,3	do.	do.	,011	71,	12,5	do.	do.	,985	70,	12,0	n.	do.	,983	69,	11,3	do.	do.	,057	62,0	8,4	do.	do.
29	,032	54,	4,5	n. w.	do.	,065	63,5	8,5	do.	do.	,003	69,7	11,2	do.	cis.	,989	71,5	13,0	do.	ci.	,978	69,	11,0	do.	do.	,044	60,2	8,7	do.	do.
30	,075	50,	1,5	n.	cis.	,153	64,	9,0	n. w.	do.	,059	73,	14,5	n.	cl.	,033	71,5	13,5	do.	cl.	,044	66,	7,0	do.	do.	,075	61,8	6,4	do.	do.
31	,119	53,	4,5	do.	cl.	,102	62,5	12,5	n.	do.	,006	69,5	15,0	do.	do.	,092	69,5	14,5	do.	do.	,090	67,	12,3	do.	do.	,030	62,0	6,5	do.	do.
Mean,	,998	55,8	1,6			,045	69,2	7,1			,939	76,3	11,6			,931	74,9	11,1			,939	71,6	8,1			,986	65,9	7,3		

Abbreviations. In the column " wind," small letters have been used instead of capitals; *cm.* means *calm.* In the column " aspect of the sky," *cy.* is *cloudy; cl. clear; rn. rain; ci. cirrus; cu. cumulus; cs. cirro-stratus; cus. cumulo-stratus; cc. cirro-cumulus; n. nimbus.*

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