

SUPPLEMENTAL VOLUMES SOCIETY,
POONA.

TO THE

WORKS

OF

SIR WILLIAM JONES.

CONTAINING THE WHOLE OF THE

ASIATICK RESEARCHES 1
Z

HITHERTO PUBLISHED,

EXCEPTING THOSE PAPERS ALREADY INSERTED IN HIS WORKS.

VOL. I.

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AND R. H. EVANS, PALLMALL.

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ADVERTISEMENT.

THE consideration of Sir WILLIAM JONES, as a man of Genius, his uncommon proficiencie in general learning, and his unrivalled attainments in the learning of the East, having unitedly called for an Edition of his Works, these Volumes are added to make them complete.

The PUBLICK need not be told, that to him the ASIATICK SOCIETY owes its existence; and, as it was constituted under his auspices, so, to his superintendance it is indebted for the celebrity it now enjoys, and the incalculable advantages it cannot fail to confer. Exclusively of the Papers which were delivered by the PRESIDENT in it, there is more than reason to suppose, many others were indebted to his pen; and as the greatest part of these papers were produced whilst he continued to preside, they in a special manner are appropriate to him. At least, thus far they certainly are, as ascertaining the extent which he witnessed of his own institution, and what it drew from his influence and personal exertions, in conjunction with the Members who placed him at their head.

Under this impression, the Purchasers of the Works of this inestimable Man, will consider the subsequent Volumes as a necessary Addition.

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INTRODUCTION.

IF this first Publication of the ASIATICK SOCIETY should not answer those expectations which may have been hastily formed by the learned in Europe, they will be candid enough to consider the disadvantages which must naturally have attended its institution, and retarded its progress. A mere man of letters, retired from the world, and allotting his whole time to philosophical or literary pursuits, is a character unknown among Europeans resident in India, where every individual is a man of business in the civil or military state, and constantly occupied either in the affairs of government, in the administration of justice, in some department of revenue or commerce, or in one of the liberal professions. Very few hours, therefore, in the day or night, can be reserved for any study, that has no immediate connection with business, even by those who are most habituated to mental application: and it is impossible to preserve health in Bengal without regular exercise and seasonable relaxation of mind; not to insist that, in the opinion of an illustrious Roman, "No one can be said to enjoy liberty, who has not sometimes the privilege of doing nothing." All employments, however, in all countries, afford some intervals of leisure; and there is an active spirit in European minds, which no climate, or situation in life, can wholly repress, which justifies the ancient notion, that a change of toil is a species of repose; and which seems to consider nothing done or learned, while any thing remains unperformed or unknown. Several Englishmen, therefore, who resided in a country, every part of which abounds in objects of curious and useful speculation, concurred in opinion, that a Society instituted at Calcutta, on the plan of those established in the principal cities of Europe, might possibly be the means of concentrating all the valuable

knowledge which might occasionally be attained in Asia; or of preserving at least many little tracts and essays, the writers of which might not think them of sufficient importance for separate publication. The ASIATICK SOCIETY was accordingly formed on the 15th of January, 1784, by those Gentlemen whose names are distinguished by asterisks in the List of Members at the end of this Book; and ample materials have already been collected for two large volumes on a variety of new and interesting subjects. By this Publication the Institution may be considered as having taken root: but the plant will flourish or fade, according as the activity or remissness of the Members and their correspondents shall promote or obstruct its growth. It will flourish, if naturalists, chymists, antiquaries, philologers, and men of science, in different parts of Asia, will commit their observations to writing, and send them to the President or the Secretary at Calcutta; it will languish, if such communications shall be long intermitted; and it will die away, if they shall entirely cease: for it is morally impossible that a few men, whatever be their zeal, who have great publick duties to discharge, and difficult private studies connected with those duties, can support such an establishment without the most assiduous and eager auxiliaries.

Before we proceed to give a short history of the institution, it may be proper to declare, that the Society will pass no decision, in their collective capacity, on any point of literature or philosophy; but that the writers of such dissertations, as they shall think worthy to be published from time to time, must hold themselves individually responsible for their own opinions; a declaration which is conformable, we believe, to the practice of similar Societies in Europe.

It having been resolved to follow, as nearly as possible, the plan of the Royal Society at London, of which the King is Patron, it was agreed, at the first regular meeting, that the Letter here exhibited should be sent to the Governor General and Council, as the Executive Power in the Company's territories: and their answer, which is also subjoined, was received in the course of the next month.

TO THE
HONOURABLE WARREN HASTINGS, ESQUIRE,
Governor General, President;
EDWARD WHELER, JOHN MACPHERSON,
AND JOHN STABLES, ESQUIRES,
Members of the Council of FORT WILLIAM in BENGAL.

HONOURABLE SIR AND GENTLEMEN,

A SOCIETY, of which we are members, having been instituted for the purpose of enquiring into the History, civil and natural, the Antiquities, Arts, Sciences, and Literature of *Asia*, we are desirous that you will honour us with accepting the title of our *Patrons*, and request you to consider this application as a token of the great respect with which we are,

Honourable Sir and Gentlemen,

Your most obedient,

And most humble servants,

JOHN HYDE,
WILLIAM JONES,
JOHN CARNAC,
DAVID ANDERSON,
WILLIAM CHAMBERS,
FRANCIS GLADWIN,
JONATHAN DUNCAN,
THOMAS LAW,
CHARLES WILKINS,
JOHN DAVID PATERSON,
CHARLES CHAPMAN,
CHARLES HAMILTON,
GEORGE HILARO BARLOW.

Calcutta, Jan. 22, 1784.

THE ANSWER.

GENTLEMEN,

WE very much approve and applaud your endeavours to promote the extension of knowledge by the means which your local advantages afford you in a degree, perhaps, exceeding those of any part of the *globe*; and we derive great hopes of your attainment of so important an end, from our personal knowledge of the abilities and talents of the Gentlemen whose names we read in the subscription to your address.

We accept the title you have been desirous of conferring upon us of *Patrons* to your Society, and shall be happy to avail ourselves of any occasion that may occur of contributing to its success.

We are, Gentlemen,

Your most obedient humble servants,

WARREN HASTINGS,
EDWARD WHEELER,
JOHN MACPHERSON,
JOHN STABLES.

MR. HASTINGS *therefore appeared, as Governor General, among the Patrons of the new Society; but he seemed, in his private station, as the first liberal promoter of useful knowledge in Bengal, and, especially as the great encourager*

courager of Persian and Sanscrit literature, to deserve a particular mark of distinction; and he was accordingly requested, in a short letter, to accept the title of President. It was, indeed, much doubted whether he would accept any office, the duties of which he could not have leisure to fulfil; but an offer of the honorary title was intended as a tribute of respect, which the occasion seemed to demand, and which could not have been omitted without an appearance of inattention to his distinguished merit. His answer is also annexed.

GENTLEMEN,

I AM highly sensible of the honour which you have been pleased to confer upon me, in nominating me to be the President of your Society; and I hope you will both admit and approve the motives which impel me to decline it.

From an early conviction of the utility of the institution, it was my anxious wish that I might be, by whatever means, instrumental in promoting the success of it; but not in the mode which you have proposed, which, I fear, would rather prove, if of any effect, an incumbrance on it.

I have not the leisure requisite to discharge the functions of such a station: nor, if I did possess it, would it be consistent with the pride which every man may be allowed to avow in the pursuit or support of the objects of his personal credit, to accept the first station in a department, in which the superior talents of my immediate followers in it would shine with a lustre, from which mine must suffer much in the comparison; and to stand in so conspicuous a point of view the only ineffective member of a body which is yet in its infancy, and composed of members with whose abilities I am, and have long been, in the habits of intimate communication, and know them to be all eminently qualified to fill their respective parts in it.

On

On these grounds I request your permission to decline the offer which you have done me the honour to make to me, and to yield my pretensions to the Gentleman whose genius planned the institution, and is most capable of conducting it to the attainment of the great and splendid purposes of its formation.

I, at the same time, earnestly solicit your acceptance of services in any way in which they can be, and I hope that they may be, rendered useful to your researches.

I have the honour to be, Gentlemen,

Your most obedient,

And most humble servant,

Fort William,
Jan. 30, 1784.

WARREN HASTINGS.

On the receipt of this letter, SIR WILLIAM JONES was nominated President of the Society; and, at their next meeting, he delivered the following Discourse:

A DISCOURSE ON THE INSTITUTION OF A SOCIETY FOR INQUIRING INTO THE HISTORY, CIVIL AND NATURAL, THE ANTIQUITIES, ARTS, SCIENCES, AND LITERATURE OF ASIA. *See the Works of Sir William Jones, Vol. I. p. 1.*

I.
A DISSERTATION ON THE ORTHOGRAPHY OF ASIATICK WORDS
IN ROMAN LETTERS, See the Works of Sir William Jones, Vol. I. p. 175.

II.
ASTRONOMICAL OBSERVATIONS IN FORT WILLIAM, AND BETWEEN
MADRAS AND CALCUTTA;

By COLONEL THOMAS D. PEARSE,

Commandant of the Artillery, and Second in Command of the Bengal Army.

I BEG leave to communicate to the Society some astronomical observations which I made at different times in *Fort William*.

The clock I used from December, 1775, was made by Ellicot: it beats dead seconds; there is one hand for minutes, and the hours revolve with the plate fixed to the hour wheel.

The pendulum can be lengthened, without stopping the clock, by means of a screw, which supports the spring by which the pendulum hangs. And the pendulum is described in the 47th volume of the *Philosophical Transactions*, p. 479. The clock-case is firmly screwed to the wall. The transit instrument was made by Sisson; it is four feet long, and has a double object glass. This is supported by two iron bars, which are joined to a square frame, that lies two feet under the floor, buried in brick work.

The upright bars are protected by a case of wood, which is fixed to the house, without touching them in any part.

At first I used the cornice of the Commandant's house to adjust by; but afterwards a slider, with a slit in it, was put up in the area of the fort, near the same place, behind which I could place a light to adjust with by night. There was another object also to the south, about 1500 yards off, which I could use by day; and both these were fixed when the transits by telescope, and equal altitudes agreed, and were examined from time to time.

I had

I had only a tolerably good HADLEY'S quadrant and quicksilver, till December, 1776, when I was lucky enough to get an 18 inch land quadrant, made by RAMSDEN, with a micrometer, to subdivide the nonius. This inverts, and is capable of the nicest adjustments. My first telescope was an 18 inch reflector, made by GREGORY.

In August, 1777, I obtained MR. SMITH'S refractor, made by DOLLAND, with a triple object glass, and a double object glass micrometer. And I made a polar axis for it of brass with rack work, and a declination circle not divided, which also is racked; to which, when the micrometer was used, the telescope was fixed.

I likewise communicate observations made by myself chiefly, and by Lieutenant COLEBROKE for me, to ascertain the longitudes and latitudes of places between *Madras* and *Calcutta*.

Going to *Madras* in 1782, I used an HADLEY'S octant and quicksilver, which I shall here describe.

The octant had a wooden index. I separated the part which carries the speculum from the arm; then fixed it into a lathe, and turned it on its own centre: it was three-tenths of an inch thick; the thickness was divided into three parts, and then the edge was turned away on each side; so that the whole piece of wood became like three wheels of different diameters joined together on their flat surfaces, and the middle one was the biggest; that below was the next in size; and the upper one was the least, and only equal to the brass plate on which the speculum was screwed.

A plate of brass, nearly one-tenth thick, broad enough to admit of a hole as big as the under circular part of the turned wood, and to afford a rim of half an inch broad, was then fixed into the lathe, and had a hole turned in it of that size; on one side it had an arm as broad as the wooden index was.

A second plate of the same kind was also prepared; but the hole was larger, though less than the middle part of the turned wood.

The turned piece was then fixed to the octant by its pin, and the plate with the smaller hole beneath it. As they fitted very nicely, the brass plate turned upon the wood round the centre of the octant, if that were held fast; and both turned on the centre pin if they were pressed together.

The plate with the large hole was then laid above the turned wood, its centre coinciding with the common centre: the wooden arm of the index had the end nearest the centre cut away, above and below, equal to the thickness of the plates
of

of brass: it was there fixed to the octant in the same manner as before it was cut off from the centre, and the brass plates were drilled and rivetted to it.

When these plates were pressed together, they held the turned piece as it were in a vice; when they were forced asunder, the turned piece might be moved independently; and there were in the direction of the radius two screws, one beyond the speculum, and one between it and the nonius, for the purpose: they had button heads, and their shanks were as high as the top of the index speculum.

On the back of the octant there was a screw with a button head; the thread entered the centre pin, and the shoulder pressed upon the plate which keeps that pin in its place.

The back screw and vice screws being slacked, the index speculum was brought parallel to the horizon glass; then the vice screws were turned to join the speculum to the index, as before the alteration was made.

To extend the power of the octant occasionally, it was nicely adjusted: then the index was carried to 90° , and there screwed to the limb. Next the back screw of the centre pin was forced, till by its pressure the speculum piece was held fast: after that, the vice screws being slacked, the index was carried back to 0° , and there screwed to the limb. Whilst it was in this position, the vice screws were again turned, which fixed the speculum piece to the index, and then the back screw being slacked, the speculum followed its motions. When it was used, the index shewed the angle which was to be added to 90° for the angular distance.

By this contrivance, with an octant, I could take angles of 150° ; and consequently meridian altitudes as far as 75° : and if the horizon glass and telescope could have been made to slide nearer towards the centre, it would have been increased still further.

In RAMSDEN'S new quadrant there is a screw to adjust the horizon glass, and bring it parallel to the other: provided the index speculum is perpendicular to the limb, this is all well; but if that be inclined, as soon as the index quits 0° , there will be an error in the angles observed. I found it so experimentally, and corrected my quadrants accordingly, by turning the horizon glass round its own axis; then, having adjusted as usual, the error side-ways was corrected by moving both glasses, by means of their adjusting screws, and dividing the error between them. If, when the horizon glass was restored to its proper position, there still was a lateral error, the operation was repeated. I do not find any mention of this in any of the instructions for using HADLEY'S instruments that I have seen.

The horizon was artificial, invented for the occasion, and consisted of a wooden

trough about half inch deep (or rather more), filled nearly with quicksilver, which served to float a plate of thick glass, the under surface of which had been unpolished and blacked, that only one image might appear. This needs not any adjustment: the only requisite is, that the glass be equally thick all over, and smooth: that which was used was a part of a very large looking glass, that had been broken by accident.

The watch was a time-keeper, by BROOKBANK, which goes whilst it is wound up, and is tolerably good, considered as a false watch sent to *India*.

The telescope had a double object glass, with a brass stand, and was made by GREGORY: it magnifies 80 times, but, like all of this construction, that I have seen, it had a dark speck in the middle, and was not equally good in the whole field.

In the way back, we had a land quadrant, of 15 inches radius, made by B. MARTIN, and sent out by the *India* Company. It was used by Mr. HURST in the transit of *Venus*. This could not be inverted. But, to destroy the effects of collimation, and error of level, the latitudes are all determined by stars taken north and south of each place, as the observations will shew.

JUPITER'S FIRST SATELLITE.

IMMERSIONS.

Date.	Apparent time	Time by	Longitude.	
	Correct.	Ephemeris.		
	H. M. S.	H. M. S.	H. M. S.	
1774, 14th Oct.	12.32.25	6.39.00	5.53.25	<i>Jupiter</i> very nearly vertical, and the glass shook much.
23d do.	8.57.15	3.03.17	5.53.58	
1776, 13th Nov.	13.58.56,3	8.04.46	5.54.10,3	
29th	12.09.39	6.15.53	5.53.46	
6th Dec.	14.00.32,6	8.06.38	5.53.54,6	
13th.	15.50.59,3	9.57.02	5.53.57,3	
15th.	10.18.31	4.24.35	5.53.56	
22d.	12.08.47,6	6.14.50	5.53.57,6	
31st.	8.26.54,1	2.32.49	5.54.05,1	
1777, 16th Jan.	8.51.19,6	2.57.11	5.54.08,6	
27th Dec.	9.38.58,8	3.45.01	5.53.57,8	
EMERSIONS.				
1774, 29th Dec.	11.25.47	5.31.52	5.53.45	<i>Dollond's</i> triple object glass. Ditto. Ditto. Ditto.
1777, 30th Jan.	12.36.11,8	6.42.30	5.53.41,8	
1778, 15th March.	8.40.49,6	2.47.41	5.53.08,6	
7th April.	9.00.02,2	3.07.00	5.53.02,2	
14th.	10.56.35,1	5.03.30	5.53.05,1	
1779, 3d May.	12.07.38,8	6.14.37	5.53.01,8	

SECOND SATELLITE.
IMMERSIONS.

Date.	Apparent time	Time by	Longitude.	
	Correct.	Ephemeris.		
	H. M. S.	H. M. S.	H. M. S.	
1776, 4th Dec.	10.53.23,5	4.58.08	5.55.21,5	Emerged from behind the body 9.27.04,3, and was quite clear of the body at 9.28.55,3. <i>Dollond's</i> triple object glafs.
11th.	13.25.50,4	7.30.42	5.55.08,4	
18th.	15.58.21	10.03.14	5.55.07,0	
29th.	7.48.01,4	1.52.27	5.55.34,4	
1780, 11th July.	9.34.17,3	3.41.33		

EMERSIONS.

1775, 29th Dec.	8.47.41,7	2.53.18	5.54.23,7	Here the tables seem to have been corrected. <i>Dollond's</i> triple object glafs.
1777, 23d Jan.	7.32.44,3	1.37.41	5.55.03,3	
29th April.	7.20.34,1	1.25.43	5.54.51,1	
6th May.	9.59.28,9	4.04.11	5.55.17,9	
1779, 8th May.	11.45.53,5	5.52.13	5.53.40,5	

THIRD SATELLITE.

1774, 10th Nov.	13.12.30	7.18.17	Emerfion.	But I thought I faw it about a minute before; however, it was fo very dim that I cannot be certain.
1775, 28th Jan.	7.28.58,5	1.33.45	Immerfion.	
	9.04.20	3.07.49	Emerfion.	
1776, 3d Nov.	10.55.20,2	5.00.14	Emerfion.	I think I might have feen it earlier if I had expected it to emerge at a greater diftance than one Satellite appeared, which was the cafe. <i>Dollond's</i> triple object glafs. Rather doubtful. I thought I faw it, but <i>Jupiter</i> was fo very bright it dazzled my eyes.
17th.	15.31.51,3	9.42.37	Immerfion.	
23d Dec.	11.10.33,6	5.19.58	Immerfion.	
1777, 28th Jan.	10.13.13,2	4.22.53	Emerfion.	
1778, 3d April.	9.21.24,9	3.33.12	Do.	
1779, 2d May.	8.44.37,5	2.54.27	Immerfion.	
	45.26,5			
	11.32.80,6	5.44.27	Emerfion.	

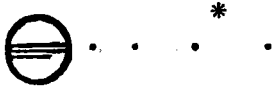
FOURTH SATELLITE.

1776, 2d Nov.	13.23.14,0		Emerfion.	At the time of this obfervation, there was a very fmall ftar a very little to the weft of the weftern Satellite. <i>Dollond's</i> triple object glafs.
1777, 8th Jan.	9.28.49,5		Immerfion.	
25th.	7.23.02,0		Emerfion.	
1778, 9th May.	8.25.13,0		Emerfion.	

Other

Other Observations of Jupiter and his Satellites.

1776, 22d November, between 9 and 10, I saw a very small star, not bigger than a Satellite, very near to *Jupiter*. The configuration thus,



At 12^h.9'.39" the configuration was thus,



that is, the two outermost Satellites had gone forward, and *Jupiter* back, in right ascension, visibly.

30th November, the configuration was thus,



that is, the star was north; distant from the limb in declination about the quantity of the lesser axis. In right ascension the star was advanced further than *Jupiter's* centre, about a fifth of the axis. Some time after I found that the little Satellite, which was below the limb, had immersed into the disk; and soon after I saw the shadow of that Satellite upon the Great Belt. I observed the shadow go off the disk; and about an hour after that, the Satellite emerged a little to the north of the Great Belt. The times were noted, but the book was destroyed by accident. When *Jupiter* passed the meridian, I could not see the star in the transit telescope; but about 4' afterwards the configuration was thus,



that is, a line drawn from the star to *Jupiter's* centre, made an angle with the Great Belt, which I judged to be about 41°; and in that direction it was about the quantity of the lesser axis distant from the limb; so that *Jupiter* had moved back about $\frac{3}{4}$ of his diameter from the time I first saw him to-night till he passed the meridian.

1776, 8th December, my clock was stopped by an earthquake, which spoilt the observation of the immersion of *Jupiter's* first Satellite.

1776, 23d December, an Emerfion of the firft Satellite from the Disk.

	<i>Apparent Time correct.</i>
	<i>b i n</i>
The shadow touched the middle of the edge of the Great Belt, and made a vifible notch in it	11.26.00
It was ftill vifible	28.05
It vanished	30.50
Satellite at the edge of the limb	53.25
In contact emerged	58.53

1777, 25th January, 7^h.23'.00";6, I faw a fmall ftar a little to the weft of the weftermoft Satellite, not fo bright as either of them; it was hardly vifible through the reflector.

Configuration thus,



26th, I could not find the ftar at 7^h.11'.

29th May, *Jupiter's* fecond Sätellite immerged behind the difk - 7^h.25'.18",7

1779, 2d May, an Immerfion of *Jupiter's* firft Satellite into the Disk.

	<i>Apparent Time correct.</i>
	<i>b i n</i>
In contact	11.31.37,6
Immerfion doubtful	35.19,6
certain	35.50,6

If the immerfions and emerfions of this nature were calculated fo as to fet aftronomers to look out for them, *Jupiter's* Sätellites might be rendered more ufeul than they now are in regard to longitudes by land; and that too, whether the calculations are accurate or erroneouf.

For I mean to ufe an immerfion or emerfion of any kind, only to note an infant for taking the altitude of *Jupiter* at the place of obfervation.

If the inftruments be of equal powers, and the eyes of equal ftrength, then certainly the altitudes will be taken by every perfon, who fhall obferve the fame phenomenon at one and the fame infant of time; and thence the diftance of *Jupiter* from

from the meridian of each will be known to seconds, if we suppose the latitudes known beforehand.

And if the telescopes of quadrants could be made sufficiently powerful to observe the Satellites, then a single observer, at any place, could perform the whole without trouble or difficulty, and would only need a common watch, and a little more patience than would be requisite if the watch were perfect, and calculation true.

But supposing the telescopes and quadrants as they are, and two observers at each place, one employed with the Satellite, and the other with the quadrant, then the latter must carefully keep the body of *Jupiter* on the line of altitude till the other tells him to stop, which is to be done at the instant of observing the expected phenomenon.

By this mode a degree of longitude may be measured with as much accuracy as a degree of latitude; and it is what I have in contemplation to perform, as soon as I can get the requisite instruments.

Remarks on some erroneous Observations of Jupiter's first Satellite.

In 1778 I took notice, that when *Jupiter* is very near the opposition, the observations are not to be depended on, and that the Satellite vanished without changing colour. The same happened in 1779, 1780, and again in 1784, at *Beemulwilsa*; therefore I have put down the times of such observations, as they are reduced to apparent time, from the known deviation of the clock from mean time. The transit instrument was examined by stars that pass over the zenith, and by others north and south, and by equal altitudes; all which shewed it was as nicely in the meridian as it well could be.

In 1779, on the 3d of March, I observed α and μ Geminorum, and the deviation was the same as that derived from the transits of the sun on the 23d February, and 5th March. In the observation of the moon 23d November following, the accuracy of its position was ascertained, so that the times were correct; and the errors depend on something at the satellite and planet. Perhaps *Jupiter's* atmosphere may be so dense as to prevent the free passage of the diminished light soon after the beginning of an eclipse, or even before it. If so, these observations may tend to clear up that point, and to measure the extent of that atmosphere.

Date.

Date.	Apparent time	Ephemeris.	
	Correct. H. M. S.	H. M. S.	
1778, 4th Feb.	7.51.10,3	1.58.08	These two were observed at <i>Dumdum</i> , but the time was taken from the transit instrument by a watch, carried out before and back after, and compared with the clock.
1779, 23d do.	9.02.51,0	3.10.01	
2d March.	10.58.15	5.05.17	
9th do.	12.53.08	7.01.07	
11th do.	7.20.35,3	1.30.10	
1780, 13th March.	10.10.47,7	4.20.23	

All these observations were made with *Dollond's* triple object glass.

Observations of Venus.

1776, 2d January, at 7^h.55', in the morning, I measured the distance between *Venus* and the *Sun* 46^o.32'.

I was informed the natives were viewing it with astonishment, but I did not see it with the naked eye. Through the little telescope of my *HADLEY's* quadrant it appeared as bright as *Capilla*.

Apparent time correct.

1777, 1st July, <i>Venus</i> passed the meridian	- - - - -	21.30.41,5
14th, <i>Venus</i> visible to the naked eye, and has been so three days		
Passed the meridian	- - - - -	21.01.02,0

Distances from the Sun, measured with an HADLEY's Quadrant.

West limb 41 ^o 57'	- - - - -	21.21.58,5
East do. 42 ^o 29'	- - - - -	25.08,5
15th, Passed the Meridian	- - - - -	20.59.29
16th, do.	- - - - -	58.08,5
17th, Still visible.		

Distances measured as before.

From nearest limb 42 ^o 31'	- - - - -	0.08.10
From furthest do. 43 ^o 05'	- - - - -	0.12.14

1780,

1780, 18th March, an Appulse of Venus to Mars.

Inch.	Non.	Distances.		Apparent Time correct.	
		'	"	h	"
2,45	3	=	15.17,2	-	7.39.33,9
2,45	8	=	15.20,9	-	44.33,9
2,45	5	=	15.18,7	-	49.33,9

N.B. The scale of the micrometer is divided into twentieth parts of an inch, and the nonius subdivides these into twenty-five parts each.

The next morning the Sun's diameters were measured.

	Inch.	Non.
Horizontal	5,15	17,25
Vertical	5,10	21
Mean	5,15	06,625
Error of micrometer		+ 4

5,15 " 10,625

Sun's diameter by Ephemeris 32' 11",6, from which the distances were calculated.

19th March, Difference of Declinations, and right Ascension.

Inch.	Non.	Distances.		Apparent Time correct.	
		'	"	h	"
4,20	00	=	26.08,7	-	7.41.51,4
Mars passed the vertical wire					
Venus do.					
Mars was south of Venus.					

Observations of Mars.

An Appulse of Mars to α Libræ.

Distances.				Apparent Time correct.	
Inch.	Non.	'	"	h	"
1,00	19	=	6.18,5	-	10.50.05
1,00	17	=	6.17,0	-	10.58.05
The star was west of Mars.					

Observations

Observations of the Moon.

1775, 12th January, An Occultation of Aldeberan.

Immersion,

8.54.55

I believe the watch was set by equal altitudes, but I have lost the book in which the entry was made, and have only a copy of my observations as a register of this and the next that follows.

15th February, an Eclipse of the Moon.

End 10.15.00,5, apparent time correct.

1776, 3d March, an Occultation of Regulus.

Not having an ephemeris at the time, the observation was accidental, and consequently not prepared for. The transit instrument was but lately put up, and had not been much used, but it was the only resource for time; accordingly, it was adjusted truly as to level and wires, but it was not in the meridian accurately. Therefore, the transits of several stars were taken to determine the position of the instrument, and the error of that being known, the times could be corrected by a very easy rule, which I subjoin. Let x be the error in seconds at the horizon, a and b the sines of the zenith distances of two stars, A and B the sines of the polar distances, d the difference of the errors of the clock, as found from the observed and the calculated transit of those two stars. Then $\frac{x \cdot a}{A}$ will be the space at the equator for the equation to correct one, and $\frac{x \cdot b}{B}$ the same for the other, and the sum of these two will be equal to $d \times 15$; or, which is the same thing, $\frac{x \cdot a}{15 \cdot A} + \frac{x \cdot b}{15 \cdot B} = d$. Whence for all small angles $x = \frac{15 \times d \times A \cdot B}{a \cdot B + b \cdot A}$

ζ and γ Leonis were the two stars that were relied on for time and position, because they pass so nearly at equal distances from the zenith, that the mean of their errors of the clock would be so near to the true one, that any clock yet invented could not shew the difference actually.

The difference of their errors was 5".6, and thence the error of the transit instrument was only 1246".16 at the horizon, and the distance of the wires of the telescope is 1478".

ASTRONOMICAL OBSERVATIONS

	Times of passing the middle wire.	Equation for the error of the instrument.	Passage by calculation.	Error of clock.
3d March.				
♃ West Limb.	10.58.19,5	- 15,08		
η Leonis.	11.01.45,0	- 7,16	10.54.56,8	6.41,04
α Leonis.	03.11	- 14,07	56.15,9	6.41,03
ζ The Northern.	10.33			
ζ The Southern.	10.39	+ 3,01	11.04.00,6	6.41,41
γ The Southern.	14.04			
γ The Northern.	14.08	- 2,59	07.24	6.41,41
♁ Urfæ Majoris.	13.08.48	+ 92,27	13.03.43,9	6.36,37
ε Urfæ Majoris.	48.40	+ 92,01	43.34	6.38,00
Immersion.	14.02.39,5			
It was emerged, but I did not see the Emerfion.	52.30			

6th March, Equal Altitudes, by an HADLEY'S Quadrant and Quicksilver.

Quadrant.

30.00	rising, -	^h 20.29.41	
	falling, -	27.42.30	6.05,5
30.30	rising, -	20.32.14	
	falling, -	27.39.56	6.05,0
	Mean, -		6.05,25
	Equation of equal altitudes, -		- 7,10
			5.58,15

This compared with the error of the clock by ζ and γ, shews that it was losing 17,"06 daily; at which rate, to the time that ε Urfæ Majoris passed the meridian, it must have lost 1,"95, and the error by ε ought to have been 6.'39,"4. The difference is only 1,"4, which is not greater than the errors of observation may sometimes be in stars of great declination.

Result.

	Apparent time correct.
♃ West limb passed the meridian	^h 10.51,23
Regulus,	56.15,5
Immersion,	13.56.00,15
And emerged in less than 50'.	

1776, 30th July, An Eclipse of the Moon.

Beginning of total darkness.

						<i>Apparent time correct.</i>
						<i>h</i>
By eye,	-	-	-	-	-	17.00.49
By telescope,	-	-	-	-	-	01.16
Clouds prevented any other observations.						

1777, 20th January, An Occultation of ζ Geminorum by the Moon.

						<i>Apparent time correct.</i>
						<i>h</i>
Immersion,	-	-	-	-	-	13.37.38,6

23d January, An Eclipse of the Moon.

						<i>Apparent time correct.</i>
						<i>h</i>
Eclipse began,	-	-	-	-	-	8.41.21,7
Shadow well defined,	-	-	-	-	-	44.33,7
Mare Humorum touched,	-	-	-	-	-	49.13,7
Grimaldus, do.	-	-	-	-	-	50.43,7
Grimaldus passed,	-	-	-	-	-	53.18,7
Mare Humorum, do.	-	-	-	-	-	53.33,7
Tycho's dark circle touched,	-	-	-	-	-	56.13,7
Tycho's body, do.	-	-	-	-	-	56.40,7
Copernicus, do.	-	-	-	-	-	9.26.28,7
Do. passed,	-	-	-	-	-	33.23,7
Going off again.						
Copernicus passed,	-	-	-	-	-	10.12.58,5
Grimaldus, do.	-	-	-	-	-	21.23,5
Mare Humorum touched,	-	-	-	-	-	36.17,5
Aristæus passed,	-	-	-	-	-	37.33,5
Mare Humorum, do.	-	-	-	-	-	47.23,5
Regiomontanus, do.	-	-	-	-	-	11.00.08,5
Tycho's body,	-	-	-	-	-	02.33,5
Tycho's dark circle passed,	-	-	-	-	-	05.38,5
						Vendelin,

	<i>h</i>	<i>m</i>	<i>s</i>
Vendelin, ϕ o. - - - - -	12	23	5
Faint Penumbra remained, - - - - -	32	25	5
Limb clear. End, - - - - -	33	33	5
» West limb passed the meridian, - - - - -	12	03	22,7
East do. do. - - - - -	05	38	2

The times are those of the shadow's edge, unless it be otherwise expressed.

1777, 13th February, An Occultation of μ Ceti.

Apparent time correct.

	<i>h</i>	<i>m</i>	<i>s</i>
Immersion, - - - - -	7	53	46,7

I was very certain of the time of the immersion. Five seconds before it, the star began to change colour and to lose light sensibly; one second before the immersion, it was considerably broader and redder than at first; and the light was not so strong as before.

This supports the supposition of an atmosphere round the moon, though it does not extend to any great distance. It has been doubted, and is I believe not yet absolutely admitted. But our atmosphere may be doubted by an inhabitant of the moon, for if to its greatest extent, supposed 45 miles, it were of the same density as at the surface of the earth, which is not the case, it would not subtend a minute, as the earth is 8000 miles in diameter, and the greatest parallax only 62'.

1777, 16th May, An Appulse of the Moon to ν Scorpii.

Apparent time correct.

	<i>h</i>	<i>m</i>	<i>s</i>
» West limb passed the meridian, - - - - -	7	59	50,1
ν Scorpii do. - - - - -	8	00	02,1

By the arch of the transit instrument, the star was 10' from the limb.

1779, 1st May, An Appulse of the Moon to Mars and Saturn.

Having brought the Moon's limb to run along a wire of declination,

Apparent time correct.

	<i>h</i>	<i>m</i>	<i>s</i>
The eastern limb passed the vertical wire, - - - - -	10	23	09,5
Saturn passed the same, - - - - -	10	23	21,5

Saturn did not come within the scale of the micrometer.

For

For the right Ascensions.

				<i>Apparent time correct.</i>
<i>Mars</i>	}	Passed the meridian at		$\begin{matrix} b & ' & '' \\ 12.55.42 \\ 56.34 \\ 57.36 \end{matrix}$
<i>Saturn</i>				
» Eastern limb				

Distances of the Moon and Mars.

<i>Inch.</i>	<i>Non.</i>	=			<i>Apparent time correct.</i>
4.70	08,5	=	28.40,3	_____	13.18 42,5
4.65	21,	=	28.31,1	_____	26.34,5
4.65	15	=	28.26,7	{ Mean of the three times and the same measure, }	31.53,5
4.65	21	=	28.31,1		36.49,5
4.70	05	=	28.37,7	_____	41.06,5

1779, 3d May, An Appulse of the Moon to β Ophiuchi.

Difference of Declination.

<i>Inch.</i>	<i>Non.</i>	=		<i>Apparent time correct.</i>	
4.70	17	=	28.09,9	_____	10.22.58,1

The star was to the west of the *Moon's* horn from which the distance was measured, because the micrometer could not take in the limb.

<i>Inch.</i>	<i>Non.</i>	=		<i>Apparent time correct.</i>	
4.60	17	=	28.09,9	_____	10.22.51,1

Examination of the Micrometer.

	<i>b</i>				<i>Inch.</i>	<i>Non.</i>
1st May,	19.	29.	lesser diameter of the <i>Sun</i> ,	-	5,2	13
			Again,	-	5,2	15
			Greater diameter,	-	5,2	23
			Again,	-	5,2	24

Hence mean diameter - 5,2 . 17,5

There are twenty-five nonius to divide one twentieth of an inch.

When the limbs coincided, the Zero's agreed.

The ephemeris gives 15'.54'',6 for the semi-diameter, therefore one nonius is equal to 0'',7294.

1779, 23d November, *An Eclipse of the Moon.*

					<i>Apparent time correct.</i>
					<i>h ' "</i>
Beginning,	-	-	-	-	12.02.33,0
Shadow well defined,	-	-	-	-	03.36,0
Aristarchus,	-	-	-	-	10.37,9
Infula Ventorum	-	-	-	-	12.14.32,9
Copernicus,	-	-	-	-	21.18,9
Mare Vaporum,	-	-	-	-	32.07,8
Bright spot in Mare Vaporum,	-	-	-	-	34.27,7
Tycho's body touched,	-	-	-	-	35.29,7
Mare Serenitatis, (do. the border,	-	-	-	-	35.47,7
Tycho passed,	-	-	-	-	36.52,7
Mare Tranquilitatis touched,	-	-	-	-	40.17,6
Ariadæus,	-	-	-	-	41.37,6
Mare Serenitatis passed,	-	-	-	-	44.07,6
Meerob,	-	-	-	-	51.37,5
Mare Crisium touched,	-	-	-	-	52.37,5
Do. passed,	-	-	-	-	56.40,4
Total Darkness by eye,	-	-	-	-	13.00.37,5
By telescope,	-	-	-	-	01.41,3
Do. end by telescope,	-	-	-	-	14.40.13,3
By eye,	-	-	-	-	41.16,3
Grimaldus passed,	-	-	-	-	43.06,3
Aristarchus,	-	-	-	-	50.42,2
Infula Ventorum touched,	-	-	-	-	53.46,2
Passed,	-	-	-	-	54.20,2
Copernicus,	-	-	-	-	15.02.44,1
Tycho's body touched,	-	-	-	-	04.56,0
Passed,	-	-	-	-	06.23,0
Mare Crisium touched,	-	-	-	-	32.22,7
Passed,	-	-	-	-	35.55,7
Mare Fœcunditatis passed,	-	-	-	-	37.23,6
End by telescope, doubtful,	-	-	-	-	39.45,6
Certain	-	-	-	-	42.00,6

The

The apparent times here noted in these observations were derived from the mean times. The difference between the clock and mean time being applied to the hours shewn by the clock. And as the difference or equation was derived from the transit instrument, here follows an examination of its position.

	Transits over the middle wire by clock.	Difference between the clock and mean time.
22d November.	<i>b</i> " "	
☉ West Limb.	23-42-34	
East do.	44-53	
Center.	23-43-43,5	
Eqtn. time.	0.13,19,5	
23d November.		- 2.57 " to be added to all the transit hours.
α Arietis.	9-42-02	
☽ West Limb.	11-38-28	
☽ East do.	40-51	
Rigel.	12-50-41	
Bellatrix.	13-00-01	
Castor.	15-06-51	
Procyon.	14-05	
1st December.		
☉ West limb.	23-45-26	
East do.	47-47	
Center.	23-46-36,5	
Eqtn. of time.	10.17,7	- 3.05,8

Equal Altitudes with the Quadrant which has only one Wire.

	N.B. Before and after this last transit.	Another altitude not moved.
	<i>b</i> " "	<i>b</i> " "
Rising U limb.	20-16-41	20-23-47
L limb.	20-19-38,5	20-26-46,5
Falling L limb.	27-13-27	27-06-17
U limb.	27-16-23	27-09-19
Center.	23-46-32,4	23-46-32,4
Equation of equal altitudes,		+ 4,37
		23-46-36,77

Apparent time correct.

1780, 18th February, ☽ East limb passed the meridian - - 10-39-31,6
 15th April, ☽ West limb passed the meridian - - 9-17-34

5th August, an Appulse of the Moon to Jupiter.

» West limb passed a circle of the meridian,	-	-	-	-	-	7.14.44
<i>Jupiter's</i> western limb,	-	-	-	-	-	14.48
Eastern do.	-	-	-	-	-	14.58
Center,	-	-	-	-	-	18.49
» West limb,	-	-	-	-	-	00.53
<i>Jupiter's</i> center,	-	-	-	-	-	25.06
» - - - - -	-	-	-	-	-	25.19
<i>Jupiter's</i> center,	-	-	-	-	-	42.31
» - - - - -	-	-	-	-	-	43.08
<i>Jupiter,</i>	-	-	-	-	-	51.21
» - - - - -	-	-	-	-	-	52.15
<i>Jupiter,</i>	-	-	-	-	-	8.42.22
» - - - - -	-	-	-	-	-	44.42
The difference of declination of <i>Jupiter,</i> and the nearest horn of the						
<i>Moon,</i> was	-	9'.01".4	at	-	-	7.28.40

Distances of Limbs.

14.33,2	-	-	-	-	-	7.32.12
15.01,5	-	-	-	-	-	35.36
15.32,7	-	-	-	-	-	38.53
16.25,9	-	-	-	-	-	44.31
17.06,5	-	-	-	-	-	48.16
30.58,6	-	-	-	-	-	8.35.49

OBSERVATIONS at large for determining the Latitude of the TREASURY GATE in FORT WILLIAM in BENGAL.

	Face East.	Face West.	Mean or observed altitude.	EQUATIONS.			Altitude correct.	Declination.	Latitude.	
				Refraction.	Absorption.	Parallax.				
γ Tauri.	80.57.37.3	89.58.16	89.57.56.6	0	2.34	0.43	89.57.54.7	22.30.56.4	22.33.01.7	N. B. Face east, 15th Jan. 1779, when the barometer was 30.50, and the thermometer 63.5.
ν Tauri.	88.41.47	88.42.28	88.42.07.5	1.2	0.82	0.63	88.42.06.5	21.15.26.2	19.7	
ο Tauri.	89.09.49.7	89.11.04	89.10.26.9	0.7	0.95	0.39	89.10.25.1	21.43.46.5	21.4	
ξ Tauri.	88.25.48.8	88.26.45.0	88.26.16.9	1.4	0.7	0.7	88.26.16.9	20.59.23	06.1	
132 Tauri.	88.05.07.9	88.04.17	88.04.42.5	2.9	1.11	1.05	88.04.41.8	24.28.25.9	07.7	
π Geminorum.	89.18.11.7	89.17.08	89.17.39.8	0.6	0.16	1.49	89.17.39.8	23.15.25.3	05.1	
μ Geminorum.	89.57.17.3	89.55.58.0	89.56.37.6	0	0.44	2.03	89.56.40.4	22.36.32.7	13.1	
ρ Geminorum.	87.46.28.2	87.47.17	87.46.52.6	2.2	0.84	2.6	87.46.53.8	20.20.00.3	06.2	
								Mean -	22.33.09.4	
Aldeberam.	83.29.09.7			6.7	0.82	0.63	83.29.03.2	16.02.58 N.	22.33.54.8	
Rigel.	58.57.52.2			33.7	5.1	0.12	58.57.13.8	8.28.15.9 S.	34.30.3	
α Orion.	74.47.00			15.3	2.2	1.28	74.46.43.8	7.20.57 N.	34.13.8	
γ Geminorum.	84.00.29.9			6.0	2.5	2.00	84.00.28.4	16.34.11 N.	33.47.6	
Syrius.	51.00.43.5			45.5	4.6	2.75	51.00.00	16.25.04.3 S.	34.15.7	
								Mean -	22.34.07.4	
Capella.		66.47.18		23.5	6.8	0.06	66.47.00.3	45.45.12.5	22.32.12.8	
β Tauri.		84.08.43		5.6	2.4	0.37	84.08.40.2	28.24.08	48.2	
136 Tauri.		84.59.37.1		4.8	1.2	1.2	84.59.34.7	27.32.27.1	01.8	
θ Aurigæ.		75.21.42.8		15.0	2.4	1.2	75.21.31.4	37.10.34	05.4	
ρ Geminorum.		87.12.30		2.9	0.4	2.6	87.12.29.3	25.19.52.4	11.7	
								Mean -	22.32.16	
								Mean of the last two sets,	22.33.11.7	
								Double collimation or difference of the last two sets,	1.51.4	
								Latitude by the whole,	22.33.10.55	

ASTRONOMICAL OBSERVATIONS

TRIVATOORE.

Observations by T. D. P. 1783.

	Day.		
☉	On the meridian, December 5,	- -	23.33.52,5, flow, 26.07,5
☉	On the meridian, December 6,	- -	23.35.53,1, flow, 24.06,9
	Daily gain	- -	2.00,6

The equation of equal altitudes was applied.

An emerfion of Jupiter's first Satellite.

6th December, by watch emerged,	- -	6.31.53	
Too flow at noon,	- -	+26.07,3	
Gain till observation,	- -	- 34,4	
		<hr/>	
Emerfion,	- -	6.57.25,9	
Ephemeris,	- -	1.36.52,0	
		<hr/>	
Longitude in time,	- -	5.20.33,9	
In degrees	- -	80.08.28,5	
		<hr/>	
☉	On the meridian, December 28,	- -	23.26.37
Equation of E. A.	- - - -	- -	- 1,9
			<hr/>
			23.26.35,1, flow, 33.24,9
☉	On the meridian, December 30,	- -	23.23.40,3
Equation of E. A.	- - - -	- -	- 1,9
			<hr/>
			23.23.38,4, flow, 36.21,6
	Daily lofs,	- -	88,4

An emerfion of Jupiter's first Satellite. b . .

29th December, by watch emerged,	- -	6.27.07
Too flow at noon	- -	33.24,9
Lofs till observation at 88,4	- -	25,8
		<hr/>
Emerfion	- -	7.00.57,7
Ephemeris,	- -	1.40.44,0
		<hr/>
Longitude in time,	- -	5.20.13,7

In

In degrees,	-	80.03.24,6
The mean of the two Longitudes,	-	80.05.56,5

The distance between the flag in the fort, and the place of observation at *Trivatoore*, was determined by a long base measured in the sands, and by taking angles for trigonometrical calculations.

<i>Madras</i> flag, distance,	-	-	-	2787,1 feet.
Bearing,	-	-	-	S. 10.33.50 W.

Which give difference of Longitude, 50",5.
Latitude, 4.30",7.

VIPEREE.

Having borrowed the quadrant that Mr. HURST used in the transit of *Venus*, I was desired not to alter its line of collimation till I had determined the quantity of error: those observations are in the tables of latitude. It was used in the survey to *Calcutta*.

As I intended to observe at this place, I determined its distance from the fort, as accurately as I could by trigonometry. The result is:

<i>Madras</i> flag, distance,	-	-	-	8072,2 feet.
Bearing,	-	-	-	S. 23,15,00 E.

Which give difference of Latitude 31",5

MADRAS.

Latitude of <i>Trivatoore</i> , see table,	-	-	-	13.09.00,4
<i>Madras</i> south of it,	-	-	-	— 4.30,7

				Latitude	-	13. 4.29,7
Latitude of <i>Viperree</i> , see table,	-	-	-		-	13.05.05,4
<i>Madras</i> south of it,	-	-	-		-	— 31,5

				Latitude,	-	13.04.33,9
Mean 13.04.31,8.						
Longitude of <i>Trivatoore</i> , Mean,	-	-	-		-	80.05.56,5
<i>Madras</i> west of it,	-	-	-		-	— 00.50,5

				Longitude,	-	80.05.06,0
--	--	--	--	------------	---	------------

WUNGOLE,

ASTRONOMICAL OBSERVATIONS

WUNGOLE, 1782, commonly called ONGOLE.

Observations by T. D. P.

14th November, double altitudes of the pole, with the small sextant made by RAMSDEN, and the artificial horizon.

<i>Watch.</i>	<i>Angles.</i>	
9.16.12	34.45.30	} these were with the small sextant.
21.00	47.30	
31.00	45.30	
<hr/>	<hr/>	
49.00	46.30	this was with the large sextant.
<hr/>	<hr/>	
9.29.18	34.46.15	
	17.23.08	
	+ 2.40	* beneath meridian.
	- 2.58	refraction.
	<hr/>	
	17.22.50	meridian altitude.
	1.51.13	polar distance.
	<hr/>	
	15.31.37	Latitude.

16th November, with the octant double altitudes of the Sun.

	<i>Upper L.</i>	<i>Lower L.</i>
12.00.28	111.51.00	" " "
2.24	54.00	" " "
4.14		110.48.20 M. A.
5.41	111.56.00 M. A.	" " "
6.36		110.47.00

Observed

Observed altitude,	-	55.41.05
Ref. and par.	-	- 34
<hr/>		
Meridian altitude correct,	-	55.40.31
Declination,	-	S. 18.49.05
<hr/>		
Co. Latitude,	-	74.29.36
<hr/>		
Latitude,	-	15.30.24

1784, The Latitude observed by T. D. P. (see observations at large) was,

15.29.16

This is inserted only to bring to test the accuracy of the octant, which is mentioned (page 8) in the introduction: and it appears, that by a single observation made with it, the Latitude was determined within 1'.8".

It serves also to shew that, though it is very difficult to take double altitudes of so faint a star, in low latitudes, even the polar star may be used to great advantage: and in these hot climates, the stars only can be employed, for the *Sun's* heat at noon, after a long march, is really not to be borne by any constitution.

MASULIPATAM, 1782. By T. D. P.

27th October, ☉ diameter forward 33, } then set the speculum to 90°, and
Backward 32, } shifted the index back.

Double altitudes of the *Sun's* lower limbs taken with the HADLEY's octant and the artificial horizon.

<i>Watch.</i>	<i>Angles.</i>
b . . .	° . . .
12.19.21	120.52.20
20.32	120.55.20
28.17	121.21.00
30.40	121.23.30
31.38	121.24.00
32.34	121.25.40 Meridian.
34.23	121.23.20

Observed

Observed meridian altitude,	-	-	-	L. L. 60.42.50
Error of quadrant,	-	-	-	- 30
Semi-diameter,	-	-	-	+ 16.10
Ref. and par.	-	-	-	- 27

Altitude,	-	60.58.03
Declination,	-	S. 12.51.09
Co. Latitude,	-	73.49.12
Latitude,	-	16.10.48

28th October, quadrant the same as above.

The mode the same, double altitude,	-	-	120.45.00
Meridian altitude correct,	-	-	60.37.42
Declination,	-	-	S. 13.11.55
Co. Latitude,	-	-	73.49.37
Latitude,	-	-	16.10.23

1st November, ☉ diameter, 34 forwards, } then set the speculum to
 33 backwards, } 90°.

Time.	Upper L.	Lower L.
12.14.56	119.13.10	
15.33		118.04.30 M. A.
16.11	119.14.50 M. A.	

Observed meridian altitude,	-	-	-	59.19.50
Ref. and par.	-	-	-	- 30
Error of quadrant,	-	-	-	- 30

Meridian altitude,	-	59.18.50
Declination,	-	S. 14.30.45
Co. Latitude,	-	73.49.35
Latitude,	-	16.10.52

The

The same day Lieutenant HUMPHRYS observed a sextant made by RAMSDEN, about four inches radius; he made the angles of the lower limb $118^{\circ}.09'.00''$, and the error of his quadrant was $-2'$, which gave the latitude $16^{\circ}.11'.05''$. This was intended as a kind of test of the instruments, but it was not a fair one, and yet the result is closer than could be expected, considering the difficulty of reading the small one.

Mean of three latitudes with octant - $16^{\circ}.10'.32''$

o On Meridian, October 29th,	{	00.04.56	too fast	-	-	4.56
By the small watch, ——— 30th,		00.08.36,5	-	-	-	8.36,5
————— 31st,		00.12.37	-	-	-	12.37
November 1st,		00.16.36,5	-	-	-	16.36,5

Examination of the large watch used at the observation of *Jupiter's* Satellite.

29th October, altered the spring and set it a-going at one o'clock.

	<i>Small watch.</i>		<i>Large watch.</i>		
	<i>b . . .</i>				
October 29th,	-	-	22.37.00		
Too fast,	-	-	8.23,2		
<hr/>					
Solar time,	-	-	22.28.36,8	<i>b . . .</i>	22.34.42 too fast, - 6.05,2
<hr/>					
November 1st,	-	-	1.46.00		
Too fast,	-	-	0.16.54		
<hr/>					
Solar time,	-	-	1.29.06	1.35.57,5	too fast, - 6.51,5

Therefore in 51 hours solar time, the large watch gained $46',3$.

An emerfion of Jupiter's first Satellite.

1st November, by watch emerged,	-	-	-	<i>b . . .</i>	7.27.20
At last observation, too fast,	-	-	-	-	— 06.51,5
Gained afterwards at $46',3$	-	-	-	-	— 05,3
<hr/>					
			Emerfion,	-	7.20.23,2
			Ephemeris,	-	1.56.15
<hr/>					
			Longitude in time,	-	5.24.08,2
			In degrees,	-	$81^{\circ}.02'.03''$
The					

The observations before written were made at the Chief's garden. The Fort flag was distant 2,5' in a strait line, and bore S. by E. which give difference of

Longitude,	-	-	-	-	+ 30"
Latitude,	-	-	-	-	- 2.28"
Longitude of Gardens,	-	-	-	81.2.03	+ 30"
					<hr/>
Longitude of Flag,	-	-	-	81.2.33	
Latitude of Gardens,	-	-	-	16.10.32	- 2.28"
					<hr/>
Latitude of the Flag,	-	-	-	16.08.04	

PEDDAPPOORE, 1784.

Observations by T. D. P.

α <i>Serpentis</i> , on the meridian, June 18th	-	-	-	^b 9.36.45
Do.	-	-	19	<u>9.28.57,5</u>
				7.47,5
Acceleration for the time,	-	-	-	<u>4.09,4</u>
				3.38,1
				^b 23.51.47,75
o On the meridian, June 18,	-	-	-	flow, - 8.12,25

An immersion of Jupiter's First Satellite.

The planet was extremely bright, and the Belts distinct and clear; the glass perfectly steady.

19th June, by watch changed colour,	-	-	-	^b 15.16.22
				<hr/>
Immerged,	-	-	-	15.18.38
Too slow at noon,	-	-	-	+ 8.12,25
Loss to observation at 219,	-	-	-	+ 2.21
				<hr/>
Immersion,	-	-	-	15.29.11.25
Ephemeris,	-	-	-	10.00.13
				<hr/>
Longitude in time,	-	-	-	5.28.58,25
In degrees,	-	-	-	82.14.34
				From

From the observations at *Calcutta*, it appears that there is a difference between the Longitudes derived from observations of immersions and emersions.

The mean of Longitudes, 10 in number, derived from observations of immersions, with an 18-inch reflector, was,	-	b . . "	5.53.53,77
Of emersions (2) with the same instrument,	-	-	5.53.43, 4
The single immersion with <i>Dollond's</i> triple object glass, is,	-	-	5.53.57, 8
The mean of 4 emersions with the same,	-	-	5.53. 3, 9
Difference by the reflector,	-	-	0. 0.10,77
By <i>Dollond's</i> refractor,	-	-	00.00.54,90
The mean of all the immersions, (11)	-	-	5.53.54,13
Emersions, (6)	-	-	5.53.17, 4
			<hr/>
Difference,	-		36,73

As the glass with which the observation was made, differed from both, the difference derived from the whole is to be preferred, and so 9'.25" are to be subtracted from this, to compare it with the other places, which were all emersions, and then the Longitudes of *Peddapore*, by emersions, will be 82°.05'.19".

KOSSIM KOTTA, 1782.

Observations by T. D. P.

9th October, Double altitudes of *Jupiter* from the artificial horizon.

b . . "	° . ' . "		
7.47.00	—	55.10.00	
48.36	—	54.28.50	<i>Jupiter's</i> R. A. at the time, - 17.32.06,7
49.57	—	54.01.20	Declination, do. - - S. 23.12.10
50.58	—	53.37.10	☉ R. A. at do. - - 13.00.24,8
52.02	—	53.13.10	Latitude, - - - 17.42.30
53.05	—	52.50.00	Derived from the observed Latitudes of <i>Elmulbillie</i>
			and <i>Sobaurum</i> .

7.50.16 Mean, 26.56.43 Apparent altitude.

— 1.51 Ref.

26.54.52

From the above data the planet had passed the meridian,	-	-	^b 3.16.37,3
Jupiter's R. A.	-	-	17.32.06,7
			<hr/>
			20.48.44
☉ R. A.	-	-	13.00.25
			<hr/>
Time,	-	-	7.48.19
Watch,	-	-	7.50.16
			<hr/>
Too fast,	-	-	1.57

The watch gained 12" daily by the meridian of *Vizacpatam*.

An Emerfion of Jupiter's first Satellite.

9th October, By clock emerged,	-	-	^b 7.11.45
Too fast at the observation,	-	-	— 1.57
			<hr/>
Emerfion,	-	-	7.09.48
Ephemeris,	-	-	1,38.00
			<hr/>
Longitude in time,	-	-	5.31.48
In degrees,	-	-	82.57.00

VIZACPATAM, 1782.

Observations by T. D. P.

An Emerfion of Jupiter's second Satellite.

3d October, emerged,	-	-	^b 8.30.58
Ephemeris,	-	-	2.57.20
			<hr/>
Longitude,	-	-	5.33.38
			83.24.30

An

An Immerfion of Jupiter's third Satellite.

7th October, immerfion, - - - - - ^{b ' "} 8. 9.57
 The time was fhewn by Mr. RUSSELL's time-keeper, which was made by
 ARNOLD, and was regulated by the meridian line in his hall.

7th September, An Emerfion of Jupiter's firft Satellite.

By T. D. P. 1784.

7th September, by watch emerged, - - - - - ^{b ' "} 8.23.38
 Sky remarkably clear and glafs steady. Full fplendor, - - - - - 25.40

Observations for time.

Zenith diftance.

7th September, ☉ U. L.	^{b ' "} 22.22.25	} By arch of 90,	-	^{° ' "} 41.29.20
	24.48		} 96,	-
Latitude by 2 northern ftars,	} See obfervations at large	}	}	^{° ' "} 17.44.33,4
2 fouthern ftars,				} under <i>Vizacpatam.</i>
N. B. Refraction, + 50"	True Latitude,	-	-	17.41.45
	Error of Collimation,	-	-	+ 02.58
☉ Declination for the time and place,	-	-	-	N. 5.30.39
From the above data, the time was,	-	-	-	^{b ' "} 21.17.15,5
	By the watch,	-	-	20.23.36,5

The watch too flow, - - - - - 53.39

<i>Day.</i>	<i>Middle wire.</i>		<i>Upper wire.</i>		
	^{b ' "}		^{b ' "}		
8th September, α <i>Aquilla</i> rifing,	-	7.01.13	-	7.03.16	
Falling,	-	8.07.35	-	8.05.30	
On the meridian,	-	7.34.24	-	7.34.23	= ^{b ' "} 7.34.23,5
Paſſage by calculation,	-	-	-	-	8.29.55,5
Watch too flow,	-	-	-	-	55.32

8tb

ASTRONOMICAL OBSERVATIONS

8th September, ☉ zenith distance.

Zenith distance.

	<i>b</i> , <i>''</i>		<i>D. S. D. Non.</i>		<i>Zenith distance.</i>
☉ L.	19.13.55	} 90	_____		56.59.20
☉ U.	16.06	} 96	60.03.05	_____	56.59.23
U.	16.49	} 90	_____		56.18.20
L.	19.00	} 96	60.00.07	_____	56.18.04,6
U.	21.57	} 90	_____		55.05.00
L.	24.09	} 96	58.03.00	_____	55.04.41,2
U.	25.18	} 90	_____		54.18.00
L.	27.28	} 96	57.03.20	_____	54.17.12,7

19.20.20

Mean,

55.40.00,3

☉ Declination,
Latitude,

- N. 5.09.42
- 17.41.45

From the above data, time,

- *b* , *''*
20.17.30

Watch,

- 19.20.20

Watch flow,

- 57.10

Therefore the watch lost in 22.57

- *b* , *''*
211,0

And consequently daily,

- - 221,0

Day.

8 at 7.34.23,5
7 at 8.23.38

watch too flow, 55.27.9
the emerfion happened

b , *''*
- 0.55.32,0

Difference, 23.10.45,5

lofs in this time, at 221,

- 3.33

Therefore flow at emerfion,

- 51.59

Emerfion by watch,

- 8.23.38

Time of emerfion,

- 9.15.37

Ephemeris,

- 3.42,56

Longitude in time,

- 5.32.41

In degrees,

- 83.10.15

October 23d, An Observation of Jupiter's first Satellite, by Mr. MAXTON.

The glass the same as mine: and the watch corrected by Mr. RUSSELL's meridian line.

		<i>b</i> . . .
Emerfion by watch,	-	10.5.30
Watch fast,	-	6.05
		<hr/>
Emerfion,	-	9.59.25
Ephemeris,	-	4.26.08
		<hr/>
Longitude in time,	-	5.33.17
In degrees,	-	83°.19'.15".

This was the instant of first appearance, as well as Lieut. COLEBROOKE's, who observed the same at *Vizianagarum* palace.

Longitude by T. D. P.	-	83°.10'.15"
by M.	-	83.19.15
		<hr/>
Mean,	-	83.14.45

Mr. RUSSELL also made an observation, which I do not use, because he noted the time of full splendor, which is uncertain; it follows:

16th October, Watch fast at noon,	-	<i>b</i> . . . 1.43,5
Gained daily,	-	56',5
Add its gain to the observation,	-	18,5
		<hr/>
Watch fast,	-	— 2.02
Time of full splendor,	-	8. 4.39
		<hr/>
Time of observation,	-	8. 2.37
Ephemeris,	-	2.29.17
		<hr/>
Longitude in time,	-	5.33.20
In degrees,	-	83°.20'.00"

*BEEMULWILSA, 1784.**Observations by Lieutenant COLEBROOKE.*

○ On meridian, August 7th,	-	<i>b . .</i> 23.40.23,15		
Equation of E. A.	-	+ ,60		
		<hr/>		
		23.40.23,75	flow,	- 19.36,25
○ On meridian, August 12th,	-	23.22.30, 5		
Equation of E. A.	-	+ 0,75		
		<hr/>		
		23.22.31,25	flow,	- 37.28,75
				<hr/>
		Lofs in 5 days,	-	17.52.50
		Daily lofs,	-	3.34. 5

An Immersion of Jupiter's second Satellite.

This was with his first observation.

8th August, by watch immersed,	-	<i>b . .</i> 12.33.20		
Too slow at noon,	-	19.36,25		
Lofs to the observation, at 214',5	-	1.55, 2		
		<hr/>		
Immersion,	-	12.54.51,45		
Ephemeris,	-	7.20.50		
		<hr/>		
Longitude in time,	-	5.34.01.45		
In degrees,	-	83.30.15,00		

August 13th, by T. D. P.

Jupiter's first Satellite vanished by the watch, - - *b . .* 11.32.28
6 or 8 seconds before the time noted, it had not changed colour: a cloud came on and hid it for about 8 seconds, and when it was gone, the Satellite had vanished.

August 20th, by T. D. P.

Jupiter's first Satellite vanished by the watch, - - *b . .* 14.2.30
The

The sky was clear, the glass steady: here I expected what happened, and was on my guard. The Satellite vanished at a small distance from the body, *i. e.* before the contact, and without changing colour.

	<i>Day.</i>		<i>b . . .</i>		
☉ On meridian, August 19th,	-	-	23.57.13,25	-	
Equation of E. A.	-	-	+ 1, 5	-	
<hr style="width: 50%; margin: auto;"/>					
19th,	-	-	23.57.14,75	flow,	- 2'.45",25

Immediately before this observation, the watch was set forward one hour without stopping it. By comparing this with the observation of the 12th, the watch lost daily, 3'.36',6.

The foregoing observation of time, is only of use for the erroneous immerfions of the 13th and 20th.

	<i>Day</i>		<i>b . . .</i>		
☉ On meridian, August 27th,	-	-	23.41.26,5	-	
Equation of E. A.	-	-	+ 2,1	-	
<hr style="width: 50%; margin: auto;"/>					
27th,	-	-	23.41.28,6	flow,	- 18'.31',4

	<i>Day.</i>		<i>b . . .</i>		
☉ On meridian, August 29th,	-	-	23.35.17,5	-	
Equation of E. A.	-	-	+ 2,4	-	
<hr style="width: 50%; margin: auto;"/>					
			23.35.19,9	flow,	- 24'.40",1

Daily loss, - 3'.04',4

An Emerfion of Jupiter's first Satellite, by Lieutenant COLEBROOKE.

			<i>b . . .</i>		
29th August, by watch emerged,	-	-	12.27.00	-	
Too flow at noon, after the observation,	-	-	+ 24.40,1	-	
Loss after the observation,	-	-	- 1.25,5	-	
<hr style="width: 50%; margin: auto;"/>					
			Emerfion,	-	12.50.14,6
			Ephemeris,	-	7.16.33
<hr style="width: 50%; margin: auto;"/>					
			Longitude in time,	-	5.33.41,6
			In degrees,	-	83.25.16
					<i>Observations</i>

Observations by T. D. P.

☉ On the meridian, September 2,	-	$23^{\circ} 20' 47''$	
Equation of E. A.	-	+ 02,5	
		<hr/>	
		23.20.49,5	flow, - 39'.10",5
☉ Altitude, 5th September,	-	$21^{\circ} 53' 55,5''$	$67^{\circ} 31' 35''$
Refraction and parallax,	-		- 20
Collimation,	-		+ 51
		<hr/>	
		67.32.06	
☉ Declination at the time and place,	-		6.14.26
Latitude,	-		17.53.32
			<hr/>
From which data, the time was,	-	$22^{\circ} 41' 10,0''$	
By the watch,	-		21.53.55,5 flow, - 47'.20",5
Whence the daily loss was,	-	167',7	

An Emerfion of Jupiter's first Satellite.

The fky clear of clouds, and the glafs steady, but the vapours had a perceptible motion through the telescope: the Belts were very diftinct.

5th September, by watch emerged,	-			$14^{\circ} 00' 35''$
N. B. Full fplendor, $14^{\circ} 2' 15''$.		Too flow at the altitude of the ☉ taken		
		after the obfervation,		+ 47.20,5
		Loss after the obfervation, at 167',7	-	- 54,4
				<hr/>
		Emerfion,	-	14.47.01,1
		Ephemeris,	-	9.13.36
				<hr/>
		Longitude in time,	-	5.33.25,1
		In degrees,	-	$83^{\circ} 21' 18''$
				☉ Observations

Observations by Lieutenant COLEBROOKE.

⊙ On the meridian, September 29th,	-	^b 23.38.27,6		
Equation of E. A.	-	+ 5,4		
		<hr/>		
Equation of time,	-	23.38.33,0	flow,	- 21.27,0
		23.49.46,4		
		<hr/>	flow,	- 11.13,4
⊙ On the meridian, October 1st,	-	^b 23.32.17,3		
Equation of E. A.	-	+ 5,7		
		<hr/>		
Equation of time,	-	23.32.23,0	flow,	- 27.37,0
		23.49.08,6		
		<hr/>	flow,	- 16.45,6
Daily loss on solar time,	-	3'.05",1		

An Emerfion of Jupiter's first Satellite.

30th September, by watch emerged,	-	-	-	^b 9.15.10
Too flow at noon,	-		-	+ 21.27
Loss till observation, at 185",1,	-		-	+ 1.15
				<hr/>
Emerfion,	-		-	9.37.52
Ephemeris,	-		-	4.05.02
				<hr/>
Longitude in time,	-		-	5.32.50
In degrees,	-		-	83°.12'.30"

I suspect that a mistake was committed in writing down the time, and that it ought to have been 9^b.16'.10." But this is as it is entered in the original book.

13th October, at 1'.48" set the watch forward one hour without stopping it.

⊙ On the meridian, October 15th,	-	^b 23.51.53,5		
Equation of E. A.	-	+ 6,8		
		<hr/>		
Equation of time,	-	23.52.00,3	flow,	- 7'.59',7
		23.45.31,7	fast,	- 6.28,6

ASTRONOMICAL OBSERVATIONS

The observation of the \odot passage over the meridian was not taken on the next day after the emerfion as usual, and between the 17th and 18th the watch ran down. Therefore the rate is afcertained from the mean time, compared with the 29th September, and 1st October.

And the watch loft by the 1st,	-	173,6 daily.
By the 2d,	-	174,7
		<hr/>
Mean,	-	174,2
Daily variation,	-	+ 11,5
		<hr/>
Daily lofs on solar time,	-	185,7

An Emerfion of Jupiter's firft Satellite.

16th October, by watch emerged,	-	7.53.35
Too flow at noon,	-	+ 7.59,7
Lofs till observation, at 185,7,	-	+ 1.01,9
		<hr/>
Emerfion,	-	8.02.36,6
Ephemeris,	-	2.29.17,0
		<hr/>
Longitude in time,	-	5.33.19,6
In degrees,	-	83.19.54

Result of the Observation of Longitude.

29th Auguft,	COLEBROOKE,	-	83.25.16	83.25.16
5th September,	PEARSE,	-	83.21.18	83.21.18
30th do.	COLEBROOKE,	-	82.12.30	rejected.
16th October,	COLEBROOKE,	-	83.19.54	83.19.54
	Mean,	-	83.19.44,5	83.22.09,3

VIZIANAGARUM PALACE.

An Observation of Jupiter's second Satellite, by T. D. P.

22d October, by watch emerged - - - - - ^b 7.16.06
 Full splendor, - - - - - 18.18

Observations by Lieutenant COLEBROOKE.

Equal altitudes.

* *Fumulboot*, rising, - ^b 7.48.10
 Falling, - 9.44.25

* On the meridian, - 8.46.17,5
 By calculation, - 8.54.35,5 flow, - 8.18"

○ On the meridian, 22d, - ^b 23.50.14,5
 Equation of E. A. - + 7,0
 23.50.21,5 flow, - 9.38,5

23d October, * *Fumulboot*, rising, - ^b 7.51.39
 Falling, - 9.29.05

* On the meridian, - 8.40.22
 By calculation, - 8.50.46,2 flow, - 10.24,2

○ On the meridian, 23d, - ^b 23.48.10,3
 Equation of E. A. - + 7,6
 23.48.17,3 flow, - 11.42,7

From the above, daily los, - - - - - 125,2

An Emerfion of Jupiter's first Satellite.

By watch emerged, - - - - - ^b 9.48.55
 22d October,

ASTRONOMICAL OBSERVATIONS

22d October, <i>Jupiter's</i> second Satellite emerged,	-	-	^b 7.16.06
By <i>Fumulboot</i> , watch flow,	-	-	+ 8.18
Loss in 1 ^b .30' after emergence, at 125",2	-	-	- 07,8
			<hr/>
Emergence,	-	-	7.24.16,2
Ephemeris,	-	-	1.49.57
			<hr/>
Longitude in time,	-	-	5.34.19,2
In degrees,	-	-	^o 83.34.48
23d October, <i>Jupiter's</i> first Satellite emerged,	-	-	^b 9.48.55
By <i>Fumulboot</i> too flow,	-	-	+ 10.24,6
Loss in 1 ^b .8' after <i>Fumulboot</i> passed at 125",2	-	-	+ 06,0
			<hr/>
Emergence,	-	-	9.59.25,6
Ephemeris,	-	-	4.26.08,0
			<hr/>
Longitude in time,	-	-	5.33.17,6
In degrees,	-	-	^o 83.19.54,0

Mr. MAXTON observed this at Vizacpatam, and the two observations shew only 39" difference of Longitude, but the high hill that lies to the north of the palace bore from *Beemulwilfa*, N. 8°.25' E. and by trigonometry its distance was 22,978 miles, therefore it lay north of *Beemulwilfa*, 19'.28" and east 2'.52". The palace lies 12'.20",3 to the north by observations at large, and therefore to the east 1'.48". But *Beemulwilfa* lies to the east of *Vizacpatam*. Mr. MAXTON's eye, it may be presumed, is not so quick as Lieutenant COLEBROOKE's, and will suffice to account for the difference; for by a particular survey round these parts, *Vizianagar* fort does lie 6.36" east of *Vizacpatam*.

NARRAINPOOR.

Which by the table of the route lies west of *Vizianagarum* palace 2'.

Observations

Observations by Lieutenant COLEBROOKE, for time.

On the meridian, October 31st,	^b 23.36.04,3		
Equation - -	+ 6,4		
	<hr/>	23.36.10,7 flow,	- 23.49,3
November 1st,	- 23.34.39,5		
Equation, - -	+ 6,8		
	<hr/>	23.34.46,3 flow,	- - 25.13,7
		Daily loss	- 1.24,4

An Observation of Jupiter's first Satellite.

Sky remarkably clear and glass steady.

31st October, emerged by watch	- - - - -	^b 6.00.45
Too slow at noon,	- - - - -	23 49,3
Loss till observation at 84',4,	- - - - -	22,5
		<hr/>
Emerfion,	-	6.24.56,8
Ephemeris,	-	51.26
		<hr/>
Longitude in time,		5.33.30,8
In degrees,	-	^o 83.22.42,0

KALINGAPATAM, 1784.

Observations by Lieutenant COLEBROOKE, for time.

○ On meridian, November 7th,	^b - 23.50.56,5		
Equation of E. A.	- - + 6,8		
	<hr/>	23.51.03,3 flow,	- - 8'.56'',7
β Cassiopææ on the meridian,	- 8.49.48		
By calculation,	- 9.00.01,6	flow,	- - 10.13,6

Therefore the watch lost 1'.16'',9 in 9 hours, and 205',06 daily.

N. B.

N.B. The watch had run down on the 5th, and the weather was changing from dry to cloudy, which ended in rain.

For Longitude.

An Emerfion of Jupiter's firft Satellite.

Glaſs ſteady, atmoſphere rather thick.

By watch emerged	-	-	-	-	-	-	^b 8.13.35
Too ſlow by the ſtar,	-	-	-	-	-	-	+ 10.13,6
The ſtar paſſed, after the emerfion 36'; loſs for that time,	-	-	-	-	-	-	- 5,1
							<hr/>
						Emerfion,	- - 8.23.43,5
						Ephemeris,	- - 2.47.01,0
							<hr/>
						Longitude in time,	- 5.36.42,5
						In degrees,	- 84° 10' 37,5

IECHAPOORE, 1782.

Observations by T. D. P.

Double altitudes of *Jupiter*, with the octant and artificial horizon.

<i>Time.</i>	<i>Angles.</i>		
^b 8.10.03	— 64.28.10	<i>Jupiter's</i> R. A. at the time,	- ^b 17.21.46,6
13.03	— 63.30.00	Declination	- - ^o 23.02.04S.
15.08	— 62.45.20	☉ R. A. at the time,	- ^b 11.55.08,2
18.53	— 61.50.30	Latitude by COLEBOOKE, 1784,	ſee Table.
<hr/>	<hr/>	See obſervations at large,	- ^o 19.06.45
8.14.17 Mean,	31.34.15		
Ref.	- 1.34		
	<hr/>		
	31.32.41		

From

From the above data, *Jupiter* had passed the meridian $2^b.45'.59''.2$, and the time

was	-	-	-	-	^b 8.12.37,6
		Watch,	-	-	8.14.17
					<hr/>
		Too fast,	-	-	1.39.4

An Eclipse of the Moon.

21st September,	^b 7.00.15	doubtful.
	01.40	begun certainly.
	02.40	strong shadow came on.
	04.14	Penumbra touched a place which I name A.
	09.03	shadow touched A.
	9.06.56	shadow touched the limb at B.
	08.11	Penumbra going.
	10.12	limb not perfectly bright.
	11.20	end certainly, and at B.

By comparison of the observations at A, it appears that the shadow required $4'.49''$ to move through the breadth of the Penumbra. By comparing those at B, it appears that $4'.24''$ were then sufficient.

The mean of these will be very near the truth ; it is $4'.37''$

Shadow came on,	-	-	-	^b 7.02.40
Advance of Penumbra,	-	-	-	- 04.37
				<hr/>
Beginning of eclipse,	-	-	-	6.58.03
				<hr/>
Shadow touched the limb,	-	-	-	9.06.56
Retreat of Penumbra,	-	-	-	+ 04.37
				<hr/>
End of eclipse,	-	-	-	9.11.33
				Duration

ASTRONOMICAL OBSERVATIONS

Duration observed, - - -	^b 2.13.30
Duration by ephemeris, - - -	2.08.30
	<hr/>
	+05.00
By ephemeris end, -	3.28
Beginning, -	1.19.30
	<hr/>
Duration, -	2.08.30
	<hr/>
Ephemeris middle, -	2.23.45
	<hr/>
Middle observed by watch, -	8.04.48
Too fast, -	- 1.39.4
	<hr/>
	8.03.08,6
Ephemeris, -	2.23.45
	<hr/>
Longitude in time, -	5.39.23,6
	<hr/>
In degrees, -	^o 84.50.54

GANGAM FORT, 1782.

Observations by T. D. P. Latitude determined.

4th September, horizon clear, octant, - - -	^b 19.21.30
6th, Very hazy, by sextant, and quadrant, both agreed, -	19.21.03
16th, Sextant, -	19.21.50
Octant, -	19.19.50
	<hr/>
Mean, -	19.21.03

These were taken from the top of the Chief's house, the sea was the horizon, the height above the area of the fort was measured, but the height of that area was guessed at; the dip was taken corresponding to this height from the tables.

An

An Observation of Jupiter's fourth Satellite.

16th September, 1782, immersion, - - - - - ^b 6.45.27
 The change of colour was noted at - - - - - 6.44.04

Clouds prevented the observing of the emerfion of this, and the immersion of the first which happened that night.

GANJAM CAMP, 1784.

Observations by Lieutenant COLEBROOKE.

○ On the meridian, November 20th, - ^b 23.57.36,3
 Equation of E. A. - + 05,5

 23.57.41,8 flow, - 2'.18",2

○ On the meridian, 21st, - ^b 23.56.00
 Equation of E. A. + 05,5

 23.56.05,5 flow, - 3.54,5

○ On the meridian, 22d, - ^b 23.54.15,0
 Equation of E. A. - 05,4

 23.54.20,4 flow, - 5.59,6

* ε *Cassiopeæ*, 24th November.

	<i>First Wire.</i>	<i>Middle.</i>	<i>Upper.</i>	
Rising, -	^b 7.28.20	34.40	42.40	
Falling, -	9.35.53	29.35	21.37	
On the meridian, -	8.32.06,5	32.07,5	32.08,5	= ^b 8.32.07,5
			By calculation, -	8.39.51,2
			Slow, -	7.43,7

Which compared with the last solar observation, gives 91",3 daily loss.

ASTRONOMICAL OBSERVATIONS

An Emerfion of Jupiter's first Satellite.

24th November, by watch emerged,	-	-	-	<i>b</i>	6.37.35
Too flow by the star,	-	-	-		+ 7.43.7
Loss after the emerfion, at 91',3,	-	-	-		- 7.3
					<hr/>
				Emerfion,	6.45.11,4
				Ephemeris	1.04.39
					<hr/>
				Longitude in time,	5.40.32,4
				In degrees,	86.08.06

JEHAUDJEPOOR, 1784.

Observations by Lieutenant COLEBROOKE.

		<i>Middle.</i>	<i>Upper.</i>	
17th December, * <i>Cassiopeæ</i> rising,	-	<i>b</i> 6.31.40	42.03	
falling,	-	8.05.53	55.31	
		<hr/>	<hr/>	
* On the meridian,	-	7.18.46,5	18.47	= <i>b</i> 7.18.46,7
		By calculation,	-	7.54.48,7
		<hr/>		<hr/>
o On the meridian, 17th,	-	<i>b</i> 23.23.59,3	Watch flow,	36.02,0
Equation of E. A.	-	+ 1		
		<hr/>		
		23.24.00	flow,	- 36.00

An Emerfion of Jupiter's first Satellite.

By watch emerged,	-	-	-	<i>b</i>	6.21.25
Too flow by the *	-	-	-		36.02
					<hr/>
				Emerfion,	6.57.27
				Ephemeris,	1.11.50
					<hr/>
				Longitude in time,	5.45.37
				In degrees,	86.24.15

SOOBUN-

SOOBUNREEKA RIVER CAMP, 1784.

Observations by Lieutenant COLEBROOKE.

N.B. Opposite Jellafore, on the Ballafore side of the river.

○ On the meridian, December 24th	-	^b 23.19.34,1	
Equation of E. A.	-	- 7	
		<hr/>	
		23.19.33,4	flow, - 40.26,6
○ On the meridian, December 25th	-	^b 23.18.12	
Equation of E. A.	-	- 1	
		<hr/>	
Daily loss,	-	23.18.11	flow, - 41.49,0
		82',4	

An Emerfion of Jupiter's first Satellite.

17th December, by watch emerged,	-	-	-	^b 8.12.42
Full splendor.	Too slow at the following noon,	-	-	40.26,2
8 ^h .13'.50"	Loss after emerfion, at 82',4	-	-	- 52
				<hr/>
	Emerfion,	-	-	8.52.16,2
	Ephemeris,	-	-	3.04,14
				<hr/>
	Longitude in time,	-	-	5.48.02,2
	In degrees,	-	-	87.00.33,0

An Emerfion of Jupiter's second Satellite.

25th December, by watch emerged,	-	-	-	^b 6.04.40
	Watch flow,	-	-	+ 40.26,6
	Loss till obfervation, at 82',4	-	-	+ 23,2.
				<hr/>
	Emerfion,	-	-	6.45.29,8.
	Ephemeris,	-	-	55.57
				<hr/>
	Longitude in time,	-	-	5.49.32,8
	In degrees,	-	-	87.23.12

A Com-

A Comparison of the Observations for Longitudes, with corresponding Observations at different Places, to fix the Longitudes of those which were undetermined.

By T. D. P.

CALCUTTA.

The observatory was at the Treasury Gate in *Fort William*.

Lunar Eclipses.

	-	b . "		
1776, July 30th, Immersion at <i>Calcutta</i> ,	-		17.01.16	
<i>Greenwich</i> ,	-		11.08.21	b . "
			5.52.55	

As this was not of the best, I reject it.

1779, November 23d. I reject the beginning, because, when compared with *Tycho* in the former part; it appears from a like comparison of the *Greenwich* observations, that it is erroneous a full minute. The first *Copernicus* is also rejected. And by comparing the end doubtful with *Tycho* and *Copernicus* of the latter part in both sets, it appears to be the observation that must be compared with the end at *Greenwich*.

	<i>Calcutta.</i>	<i>Greenwich.</i>	<i>Longitude.</i>
	b ' "	b ' "	b ' "
The body of <i>Tycho</i> touched,	12.35.30	6.42.29	5.53.01,0
Passed,	36.53	43.36	17,0
Immersion,	13.01.41,3	7.08.08	33,3
Emerfion,	14.40.13,3	8.46.23	50,3
Grimaldi touched,	43.06,3	49.45	21,3
The middle of <i>Copernicus</i> ,	15.02.44,1	9.08.59,5	44,6
The body of <i>Tycho</i> touched,	04.56	11.39	17,0
Passed,	06.23	12.49	34,0
The end,	15.39.45,6	9.46.09	36,6

Mean, in time, 5.53.28,3

In degrees, 88.22.04,5

Jupiter's Satellites.

From the beginning in 1774, till the 27th December, 1777, the observations were made with a middling 18-inch reflector, I allow 24" to compare it with the large reflector at *Greenwich*, and 12" for their refractor. The comparison is of actual corresponding observations, except in two cases, in which the *Calcutta* observations are one revolution later. The longitudes of *Paris* and *Stockholm* are taken from WARGENTIN, Phil. Transf. vol. 67. LUNDEN, from thirty-three corresponding observations found in that same paper: of *Chiffleburst*, from WOLLASTON, vol. 74. Of *Geneva*, *Oxford*, and *Marseilles*, from PIGOT, vol. 68 and 76. *Nagpoore* and *Chunargur*, were communicated to me by Lieutenant EWART, of the *Bengal* establishment, who observed at each place a considerable time.

IN FORT WILLIAM, &c.

Date.	Place.	Time.	Correction for Longitude or Glass.	Times correct.	LONGITUDE. In Time. In Degrees.
1774, October 14th,	Calcutta, Stockholm,	<i>b</i> 12.32.25 07.52.00	1st Sat. Im. + 24 - 1.12.21	<i>b</i> 12.32.49 6.39.39	<i>b</i> 5-53-10.0
21st.	Greenwich, Paris, Geneva, Oxford,	0 8.44.47 8.59.20 8.30.26	1st Sat. Im. - 09.25 - 24.05 + 4.59	8.35.00 22 15 25	
		Immersion,	Mean,	8.35.15.5	
			Add one Revolution 1, Day 23d,	18.28.49	
23d.	Calcutta,	8.57.15	1st Sat. Im. + 24	3.04.45 8.57.39	5-53-34.5
December 31st.	Calcutta, Lunden,	11.25.47 6.25.05	- 24 Em. - 52.55	11.25.23 5.32.10	5-53-13.0
1776, November 11th.	Greenwich,	1st Sat. Im.	N. B. Refractor, Add one Revolution 1, Day, 13th,	13.37.32 18.28.06	
13th.	Calcutta,	13.58.56.3	1st Sat. Im. + 12	8.05.38 13.59.08.3	5-53-30.3
17th.	Calcutta, Chislehurst,	15.31.51.3 9.38.48.5	3d Sat. Im. + 12 - 19	15.32.03.3 9.38.29.5	5-53-33.8
December 18th.	Calcutta, Marseilles,	15.58.21 10.25.54	2d Sat. Im. - 21.25	15.58.21 10.04.29	5-53-52.0
			Mean by Jupiter's Satellite, -		5-53-29
			By Lunar Eclipses, -		5-53-28
			Result—Longitude of Calcutta, -		5-53-28.5 88-22-07.5

Date.	Place.	Time.	Correction for Longitude or Glass.	Times correct.	LONGITUDE. In Time. In Degrees.
1782, September 21st.	Ichapooe,		A LUNAR ECLIPSE. The shadow touched the limb.	<i>b</i> 9.05.16.6	<i>b</i>
	Nagpoore,	<i>b</i> 8.44.22	- 5.18.46	3.25.36	
October 9th.	Kosim Kotta, Nagpoore,	1st Sat. E. 6.56.43	JUPITER'S SATELLITES. - 5.18.46	7.09.48 1.37.57	5-39-40.6 84-55-09.0
1784, September 5th.	York, Greenwich,	9.08.54	+ 4.31 Refractor,	9.13.25 15	5-31-51.0 82-57.45
	Paris,	9.22.18	{ + glass, 13 - 9.25	06	
	Beemulwilfa,	14.47.01.1	1st Sat. E. Mean, - 12	9.13.15.5 14.46.49.1	5-33-34.0 83-23-30.0
November 8th.	Kalingapatam, Chunargur,	8.19.45	1st. Sat. E. - 5.32.26	8.23.43.5 2.47.09	5-36-34.5 84-08-37.0

I

OBSERVATIONS

ASTRONOMICAL OBSERVATIONS

OBSERVATIONS at large for determining the Latitudes of Places.

Phenomenon and Face of the Quadrant.	Date.	ARCH OF 96.		Arch of 90.	Refraction or Elevation applied.	Zenith Distance corrected.	Declination.	Latitude by the observation.	Name of the place and its correct Latitude.
		Reading.	Value.						
α Aquilæ, E.	1783. Oct. 9th.	D.S.D.N. 4 3.28,3	4 39.36,2	4 40.00	4,3	4 39.52,4	8.18.24,7N.	12.58.17,1	Viperæ.
	W. 11th.	6-3.01,5	4 54.39,2	4 55.00	5	4 54.54,2		13.13.18,9	
α Cygni, W.	E. 12th.	4 3.28	4 39.29,6	4 40.00	4,3	4 39.49,1		12.58.13,8	44 30.53,8N.
	W. 9th.	33. 1.20,5	31.19.19,3	31.19.10	35,3	31.19.50		13.11.03,8	
Fumuloth, E.	W. 11th.	33. 1.18,5	31.18.26,5	31.18.30	35,3	31.19.03,6		13.11.50,2	S. 12.58.57,5
	E. 11th.	46. 2.18	43.43.32	43.44.00	54,5	43.44.40,5	30.45.43		
α Pegasi, E.	W. 11th.	2-3.12	1. 5.02,4	1. 5.00	1	1. 5.02,2	14 2.42,8N.	12.57.40,6	Viperæ,
	E. 11th.	0. 3.21	0.51.11,3	0.51.30,0	0,8	0.51.21,5		13.11.21,3	
4 Stars, W.	Algenib, E.	Nov. 1. 0.00	0.56.15	0.57.00	0,9	0.56.38,4	13.58.34,7N.	13.11.53,5	13.05.05,35 Trivatore,
	W. 21st.	0. 3.00	0.42.11,3	0.42.30	0,7	0.42.21,3		13. 1.56,4	
Pole at 10 P.	79. 3.16	74.53.18	74.53.30		210,0 + 428,0	75.00.12,2	88. 9.08	13.16.13,3 13.08.55,8	13. 9.00,4
	1784. April 23d.	0. 1.04	0.15.49,2	0.15.55	228,0 0	0.15.55,3	13.00.53 N.	13.16.45	North side of Cortelare river.
α Urf. Maj. W.	α Leonis, W.	52. 3.29	49.39.56	49.40.40	67,0	49.41.25	62.54.43 N.	13.13.18	13.15.01,5
	25th.	0. 2.09	0.32.05	0.32.40	0,5	0.30.43	13.00.53 N.	13.31.34	Arambankum.
α Urf. Maj. W.	26th.	52. 1.29	49.11.48,4	49.12.20	102 67,0	49.13.11,2	62.54.43 N.	13.41.32,2	13.31.36 Akamapett.
	α Virginis, E.	25. 1.01	23.40.45	23.41.00	25	23.41.17,5	10. 1.46 S.	13.39.31,5	13.40.32
α Leonis, W.	27th.	0. 3.10,5	0.46.48	0.47.00	0,8	0.46.54,8	13. 0.53 N.	13.47.47,8	Akarumpauk.
	γ Leonis, W.	7. 2.14	7. 8.01,6	7. 7.20	7	7. 7.48,8	20.55.38 N.	13.47.50	13.47.49
α Virginis, E.	28th.	7. 1.20	6.56.36	6.57. 0	7	6.56.55		13.40.43	Nayrpett.
	α Urf. Maj. W.	25.20.01	23.54.49	23.55.00	25	23.55.19	10. 1.46 S.	13.53.33	13.56.08
α Virginis, E.	29th.	52. 0.12,5	48.50.29,6	48.50.50	65	48.51.45	62.54.43 N.	14 2.58	Korware.
	γ Leonis, W.	25. 2.25	24. 5.22	24. 5.50	25	24. 6.01	10. 1.46 S.	14 4.15	14. 5.12,6
α Urf. Maj. W.	30th.	7. 1. 3	6.49.07,2	6.49.10	6,5	6.49.15	20.55.38 N.	14 6.23	
	α Virginis, E.	52. 0. 9	48.48.57	48.49.40	65	48.50.23	62.54.43 N.	14 4.20	
α Urf. Maj. W.	May 1st.	51. 3.04	48.32.42	48.32.00	64	48.33.25	62.54.43 N.	14.21.18	Vincateechillum.
	α Virginis, E.	25. 3.26	24.19.52	24.20.00	26	24.20.22	10. 1.46	14.18.36	14.19.57

OBSERVATIONS at large for determining the Latitudes of PLACES.

Phenomenon and Face of the Quadrant.	Date.	ARCH OF 96.			Equation applied.	Zenith Distance corrected.	Declination.	Latitude by the observation.	Name of the place and its corrected Latitude.
		Reading.	Value.	Arch of 90.					
1784. D.S.D.N. δ Urf. Maj. W. May 46. 2.17	43.43.06	43.44.00	54	43.44.27	58.13.58	N.	14.29.31	Pinnare River,	
ζ Urf. Maj. W. 3d, 44. 1.10	41.43.27.4	41.33.10	50.3	41.34.09	56. 3.23	N.	14.29 14	North Bank,	
α Virginis, E. 26. 0.15	24.29.05.5	24.29.10	26	24.29.33.7	10. 1.46	S.	14.27.47.7	14.28.35	
α Virginis, E. 10th, 26. 2.22	25.00.17.6	25.00.40	26.2	25.00.55			14.59.09	Ollore*,	
ζ Urf. Maj. W. 44. 1.20	41.37.51	41.37.20	49	41.38.24.5	56. 3.23	N.	14.24.58.5	14.42.03.8	
δ Urf. Maj. W. 12th, 46. 0.22	43.17.10	43.17.10	53	43.18.03	58.13.58	N.	14.55.55	Mooaumillo-	
α Virginis, E. 26. 1.28	24.48.52	24.48.50	25	24.49.16	10. 1.48	S.	14.47.28	dooro,	
ζ Urf. Maj. W. 43. 3.15	41. 7.32	41. 8.10	44	41. 8.35	56. 3.23	N.	14.54.48		
α Virginis, E. 13th, 26. 1.30	24.49.43.5	24.50.00	25	24.50.19.3	10. 1.48	S.	14.48.31.3		
ζ Urf. Maj. W. 43. 3.14	41. 7.05.5	41. 7.10	44	41. 7.51.7	56. 3.23	N.	14.55.31.3	14.51.42.1	
δ Urf. Maj. W. 19th, 45. 2.07	42.42.27.1	42.42.10	53	42.43.11.5	58.13.53	N.	15.30.46.5	Ongle, proper-	
α Urf. Maj. W. 44. 1.17	41.36.32	41.36.00	50	41.37.06	57. 8.02.5	N.	15.30.56.5	ly Wungole,	
α Virginis, E. 27. 0.22	25.28.25	25.29.00	27	25.29.09.5	10. 1.48	S.	15.27.21.5		
ζ Urf. Maj. W. 43. 0.27	40.30.37	40.30.30	49	40.31.22.5	56. 3.23	N.	15.32.00.5	15.29.18.2	
α Virginis, E. 20th, 27. 1.05	25.35.01	25.35.00	27	25.35.27.5	10. 1.48	S.	15.33.39.5	Chicoortee,	
ζ Urf. Maj. W. 43. 0.17	40.26.13	40.26.05	49	40.26.58	56. 3.23	N.	15.36.25	15.35.44.5	
α Virginis, E. 22d, 27. 1.05	25.35.01	25.35.00	27	25.35.27.5	10. 1.48	S.	15.33.39.5	Yenmunbender,	
ζ Urf. Maj. W. 43. 0.13	40.24.29	40.25.00	49	40.25.33.4	56. 3.23	N.	15.37.49.6	15.46.27.5	
α Urf. Maj. W. 23d, 36. 3.15	34.33.37	34.33.50	39	34.34.22.5	50.23.42	N.	15.49.09	Vantipollam,	
α Librae, E. 32. 3.21	30.51.25	30.51.05	34	30.51.49	15. 8.03	S.	15.43.46	15.46.27.5	
α Virginis, E. 25th, 27. 2.15	25.53.28	25.54.00	28	25.54.12	10. 1.48	S.	15.52.24	Banpetla,	
ζ Urf. Maj. W. 42. 3. 3	40. 6.00	40. 5.50	48	40. 6.43	56. 3.23	N.	15.56.40	15.54.32	

LIEUTENANT COLERBROOKE had by this time acquired the art of using the quadrant, and his observations will appear where I did not take any. The next is his, and where his are substituted, they will be marked C. He did observe Chicoortee, the result I had entered in my book, it was 15°.34'.10" but his observation was lost.

α Urf. Maj. W. 26th, 36. 2.16	34.20.09.4	34.20.00	39	34.20.43.7	50.23.42	N.	16.02.58.3	Chundole,
α Librae, E. 33. 0.20	31. 5.02	31. 5.00	34	31. 5.35	15. 8.03	S.	15.57.32	16. 0.15.2 C.
α Urf. Maj. W. 28th, 36. 1.22	34. 8.44	35. 8.05	38	34. 9.02.5	50.23.42	N.	16.14.39.5	Sicacollum, on the North Bank of the Kistna,
α Librae, E. 33. 1.15	31.16.54	31.17.00	34	31.17.31	15. 8.03	S.	16. 9.28	16.12.04.3

* The quadrant was pulled to pieces at Pinnare Camp, and the line of collimation had not been adjusted, it was performed before it was next used.

ASTRONOMICAL OBSERVATIONS

OBSERVATIONS at large for determining the Latitudes of PLACES.

Phænomenon and Face of the Quadrant.	Date.	ARCH OF 96.		Arch of 90.	Equation applied.	Zenith Distance corrected.	Declination.	Latitude by the observation.	Name of the place and its correct Latitude.
		Reading.	Value.						
♄ Urf. Maj. W.	1784. May 29th.	D.S.D.N. 43. 1.18	40.40.43	40.39.55	49	40.41.08	57. 8.02.5 N.	16.26.54.5	Moodenoore,
♋ Virginis, E.		28. 0.21	26.24.14	26.23.30	29	26.24.21	10. 1.48 S.	16.22.33	16.24.38.8 C.
♋ Virginis, E.	June 1st.	28. 1.28	26.41.22	26.42.00	29	26.42.10		16.40.22	Ellore,
♄ Urf. Maj. W.		41. 3.22	39.18.16	39.18.10	48	39.19.10	56. 3.25 N.	16.44.13	16.42.17.5 P.
♄ Urf. Maj. W.		43. 9.03	40.22.15.9	40.22.20	49	40.23.07	57. 8.02.5 N.	16.44.55.5	
♄ Urf. Maj. W.		35. 3.17	33.38.24.5	33.38.40	37.7	33.39.10	50.23.42 N.	16.44.32	
♋ Libræ, E.		33. 3.22	31.48.06.3	31.48.10	35	31.48.43.2	15. 8.04 S.	16.40.39.2	16.42.41.5 C.
☉ Up. L. W.	4th,	5. 2.20	5.18.10	5.18.40	50	5.34.18	22.32.32 N.	16.58.14 P.	Soolaurum,
				Semidia.	+				
					15.49				
				Parallax,	1.0				
♋ Virginis, E.		28. 2.28	26.55.26	26.55.20	29	26.55.52	10. 1.48 S.	16.54.04 C.	16.56.08.5
♋ Virginis, E.	12th,	28. 3.02	26.58.04	26.57.05	29	26.58.03.5		16.56.15.5	Rajahmundrye,
♄ Urf. Maj. W.		41. 2.15.5	39. 1.11.2	39. 1.20	46	39. 2.01.6	56. 3.23 N.	17. 1.12.4	16.58.43.6 P.
♄ Urf. Maj. W.	12th,	35. 2.09	33.20.50	33.21.00	36	33.21.31	50.23.42 N.	17. 2.11	
♋ Libræ, E.		34. 0.23	32. 3.44	32. 2.40	35	32. 3.17	15. 8.04 S.	16.55.13.1	16.58.42 C.
♄ Urf. Maj. W.	13th,	35. 1.29	33.15.33	33.15.00	35.5	33.15.52	50.23.42 N.	17. 7.50	Rajahnagar,
♋ Libræ, E.		27. 1.07	25.35.53	25.35.00	27	25.35.53	8.34.33 S.	17. 1.20	7. 4.35 C.
♄ Urf. Maj. W.	14th,	35. 1.29	33.15.33.5	33.15.55	37	33.16.21	50.23.42 N.	17. 7.21	Peddapore,
♄ Draconis, W.		51. 2.00	48.16.52.5	48.16.10	62.7	48.17.34	65.24.36 N.	17. 7.02	
♋ Libræ, E.		34. 1.18	32.10.05	32. 9.30	34.5	32.10.22	19. 8.04 S.	17. 2.18	
♋ Libræ, E.		27. 1.07	25.35.53.3	25.34.40	25.4	25.36.12	8.34.33 S.	17. 1.39	17. 4.35 P.
♋ Scorpii, E.	18th,	38. 2.20	36.14.25	26.13.40	41.5	36.14.44	19.12.01.6 S.	17. 2.42	
♄ Draconis, W.		36. 2.24	34.23.40	34.24.00	39.0	34.24.29	51.31.18 N.	17. 6.49	17. 4.45.5 C.
♋ Virginis, E.	20th,	28. 3.27	27. 8.59.7	27. 8.30	29.0	27. 9.13.7	10. 1.48 S.	17. 7.26	Gooloopool- loore,
♋ Libræ, E.		27. 1.19	25.41.09.7	25.41.30	28.0	25.41.48	8.34.33 S.	17. 7.15	
♄ Urf. Maj. W.		41. 1.30	38.53.30	38.53.20	44.0	38.54.09	56. 3.33 N.	17. 9.05	
♄ Urf. Maj. W.		35. 1.23	33.12.55.2	33.12.50	37	33.13.15	50.23.42 N.	17.10.27	17. 8.33.5 C.
♄ Urf. Maj. W.	21st,	35. 1.16	33. 9.50.6	33. 9.20	37	33.10.12	50.23.42 N.	17.13.30	Tonding and Matoor,
♋ Libræ, E.		34. 1.39	32.19.18	32.20.00	35	32.20.14	58.18.04 S.	17.12.10	17.12.45 C.
♋ Libræ, E.	22d,	27. 2.10	25.51.16	25.50.20	28	25.53.06	8.34.33 S.	17.18.33	Sateawaurum,
					+				
					1.50				
♋ Coronæ Bo- realis, W.	24th,	10. 2.02	9.51.30	9.50.40	10	9.51.15	27.27.03.5 N.	17.35.48.5	17.18.33 C. Ellmuhillee,
♋ Scorpii, E.		39. 0.19	36.42.06	36.41.50	43	36.42.41	19.12.01.6 S.	17.39.39.4	17.33.14 C.

OBSERVATIONS at large for determining the Latitudes of PLACES.

Phenomenon and Face of the Quadrant.	Date.	ARCH OF 96.		Arch of 90.	Equation applied.	Zenith Distance corrected.	Declination.	Latitude by the Observation.	Name of the place and its correct Latitude.
		Reading.	Value.						
α Coronæ Bo- realis, W.	1784. June 27th	D.S.D.N. 10. 1.08	9.40.04.7	9.39.40	9.6	9.40.02	27.27.03.5N	17.47.01.5	Sobaurum,
β Scorpii, E.	9th	39. 1.23.5	36.58.08.4	36.57.20	43	36.58.27.2	19.12.02 S	17.46.25.2	° 17.46.59.2 C.
α Scorpii, E.	13th	46. 2.11	43.40.17.6	43.41.00	55	43.41.39	25.56.12 S	17.45.27	These were made with difficulty amongst clouds and winds, but they were all that could be had.
⊙ Up. L. W.		5.04.12	3.50.16.4	3.50.00 Ref. & Par. Semia. †	3.6 +	4 5.59	27.55.02 N	17.49.03	
α Lyræ, W.	Sept. 22nd	22.00.29	20.50.14	20.49.40	33	20.50.30	38.35.26.3N	17.44.56.3	Vizacpatam,
β Lyræ, W.	8th	16.01.20	15.22.51	15.22.10	15	15.22.45.5	33.07.16 N	17.44.30.5	
α Aquilæ, E.		9.03.27	9.20.18.2	9.20.00	9	9.20.18.1	8.18.32.5N	17.38.50.6	
β Aquilæ, E.		12.02.05.5	11.45.33	11.45.10	12	11.45.34	5.53.08.3N	17.38.42.3	° 17.41.45
α Coronæ Bo- realis, W.	July 14th	10. 0.16	9.29.32	9.28.50	9.5	9.29.20.5	27.27.03.5N	17.57.43.3	Beemulwilfa Camp A clear night,
γ Draconis, W.		35. 3.07	33.34.01	33.33.10	37.5	33.34.13	51.31.18 N	17.57.05	
α Scorpii, E.		39. 2.03	37. 3.11	37. 2.40	43	37. 3.38.5	19.12.02 S	17.51.36.5	° 17.54.15 C.
β Scorpii, E.		46. 2.23	43.45.44	43.46.00	55	43.46.47	25.56.12 S	17.50.35	Simachillum,
β Libræ, E.		28. 0.08	26.18.31	26.19.00	20.5	26.19.14	8.34.33 S	17.44.41	
α Coronæ Bo- realis, W.	8th	10. 1.05.5	9.38.59	9.38.40	9.5	9.38.59.0	27.27.03.5N	17.48.04.5	° 17.46.28.8 C.

The four following Observations were taken by a quadrant made by RAMSDEN, eighteen inches radius, which shewed Altitudes,

α Lyræ, W.	Aug. 7th	73. 3.10	69.17.13.6	69.17.35	—22	69.17.02.3	38.35.26.1N	17.52.28.4	Beemulwilfa,
β Lyræ, W.	29th	79.03.00.9	74.45.47.3	74.46. 0	—15.6	74.45.38	33.07.16 N	17.52.54.0	Head Quarters,
α Aquilæ, E.		85.03. 2	80.24.24	80.24.50	—10	80.24.27	8.18.32 N	17.54 5	
β Aquilæ, E.		83.00.12	77.58.32	77.58.47	—12	77.58.28	5.53.08 N	17.54.40	° 17.53.32 P.
α Draconis, W.	8th	35.03.11	33.35.46.3	33.35.00	38	33.36.01	51.31.18 N	17.55.17	
α Lyræ, W.		22.00.04	20.39.16	20.38.30	20	20.39.13	38.35.26 N	17.56.13	
α Lyræ, W.	9th	22.00.05	20.39.42	20.39.00	20	20.39.41		17.55.45	
α Sagittarii, E.		55.03.08	52.19.27.3	52.18.50	75	52.20.18.6	34.27.59.5 S	17.52.29	
α Aquilæ, E.	28th	10.00.23.5	9.32.50	9.33.00	10	9.33.05	8.18.32.5N	17.51.37.5	
α Sagittarii, E.	31st	55.03.07	52.19.01	52.18.40	75	52.20.06	34.27.59.5 S	17.52.06.5	
α Lyræ, W.		22.00.06	20.40.09	20.39.30	20	20.40.15	38.35.26 N	17.55.11	
α Cygni, W.	Sept. 28th	28.01.13	26.34.46.6	26.35.00	29	26.35.22	44.31.05.3N	17.55.43.3	
β Aquarii, E.	3d	25.03.30	24.21.37.3	24.22.00	25	24.22.14	6.30.33 S	17.51.41	
α Cephei, W.	27th	46.02.22	43.45.17.3	43.45.00	55	43.46.04	61.40.42 N	17.54.38	
β Aquarii, E.		26.00.00	24.20.30	24.22.20	25	24.22.50	6.30.33 S	17.52.17	
6 North Stars,								17.55.28	
6 South Stars,								17.52.14	

* From the reading of α Aquilæ, 29th August, subtract 48", † and from β Aquilæ 45"

Head Quarters, Cantonments at Beemulwilfa, The Mean, ° 17.53.51 C.

ASTRONOMICAL OBSERVATIONS

OBSERVATIONS at large for determining the Latitudes of PLACES.

From henceforward all the Observations were taken by Lieutenant COLEBROOKE.

Phenomenon and Face of the Quadrant.	Date	ARCH OF 96.		Arch of 90.	Equation applied.	Zenith Distance corrected.	Declination.	Latitude by the Observation.	Name of the place and its correct Latitude.
		Reading.	Value.						
α Cephei, W.	1784, Oct.	D.S.D.N.	0	0	"	0	0	0	
β Aquarii, E.	22d,	46.01.24	43.32.06.8	43.31.30	53	43.32.42.3	61.40.42.2N.	18.08.00	Yizianagur Palace,
α Cygni, W.	23d,	26.00.26	24.33.55.6	24.33.30	26	24.34.08.8	6.30.33 S.	18.03.35.8	
α Cephei, W.		28.00.15.8	26.21.35.5	26.22.00	28	26.22.15.8	44.31.05.3N.	18.08.49.6	
β Aquarii, E.		46.01.25	43.32.32.9	43.31.46	54	43.33.03.5	61.40.42.2N.	18.07.38.7	
α Cygni, W.	25th,	26.00.26	24.33.55.6	24.33.35	26	24.34.11.3	6.30.33 S.	18.03.38.3	18.05.52.3
α Cephei W.		28.00.27	26.26.51.9	26.27.00	28	26.26.24	44.31.05.2N.	18.03.41.2	Brimfing,
β Aquarii, E.		46.02.00	43.36.30.2	43.35.50	54	43.37.04.1	61.40.42.2N.	18.03.38.1	
7 Lacertæ, W.	26th,	26.00.19	24.30.51	24.30.00	26	24.30.51.5	6.30.33 S.	18.00.18.0	18.01.59
Fumulhoot, E.		33.01.23	31.20.25.2	31.20.00	34.4	31.20.47	49.10.48 N.	17.50.01	Santipollum,
α Cephei, W.	31st,	51.03.07	48.34.00.8	48.33.30	64	48.34.49.5	30.45.25.6 S.	17.49.23.8	17.49.42.4
β Aquarii, E.		46.02.00	43.35.37.5	43.35.00	54	43.36.13	61.40.42.2N.	18.05.29.2	Chintulwila,
α Cephei, W.		26.00.18	24.30.24.6	24.30.00	25.7	24.30.38	6.30.33 S.	18.00.05	18.02.17.1
β Aquarii, E.	Nov.	46.01.26	43.32.59.3	43.32.50	54	43.33.48.6	61.40.42.2N.	18.05.53.6	Narrairpoore,
Fumulhoot, E.	1st,	26.00.23	24.32.36.5	24.32.20	26	24.32.54.3	6.30.33 S.	18.02.21.3	
β Calliopææ, W.		52.00.08	48.48.30.9	48.48.30	65	48.49.35.5	30.45.25.6 S.	18.04.08.9	
α Aquarii, E.	3d,	42.01.29	39.19.18.4	39.49.00	48	39.49.57.2	57.57.50 N.	18.07.52.8	18.05.18.7
7 Lacertæ, W.		20.02.26	19.24.33.5	19.24.00	20	19.24.36.8	1.21.30.6 S.	18.03.06.2	Kundawilla,
α Aquarii, E.	4th,	33.00.11	31.01.05.1	31.01.30	34	31.01.51.6	49.10.48 N.	18.08.56.4	18.06.01.3
7 Lacertæ, W.		20.03.10	19.31.34.9	19.31.30	20	19.31.52.5	1.21.30.6 S.	18.10.21.9	Timorgudha,
α Andromedis, W.		33.00.00	30.56.15	30.55.20	34	30.56.21.5	49.10.48 N.	18.14.26.5	18.12.24.2
γ Pegasi, E.	5th,	10.00.27	9.34.22	9.34.20	10	9.34.31	27.53.56 N.	18.19.25	Sicacole Camp,
α Cephei, W.	7th,	4.02.06	4.15.45.7	4.15.00	4	4.15.27	13.59.10 N.	18.14.37	18.17.01
Fumulhoot, E.		46.00.21	43.16.43.7	43.17.00	53	43.17.45	61.40.42.2N.	18.22.57.2	Kalingapatam Camp,
Fumulhoot, E.	9th,	52.01.11	49.03.54	49.04.00	65	49.05.02	30.45.25.6 S.	18.19.36.4	18.21.16.8
α Andromedis, W.		52.01.28	49.11.22.1	49.11.20	64	49.12.25		18.26.59.4	Kulliparoo,
γ Pegasi, E.		10.00.02	9.23.22.4	9.23.30	10	9.23.36	27.53.53 N.	18.30.17	
α Andromedis, W.		4.03.02	4.28.04	4.27.30	5	4.27.52	13.59.07 N.	18.26.59	18.28.39
γ Pegasi, E.	11th,	9.02.27	9.06.14.5	9.05.40	10	9.06.07	27.53.53 N.	18.47.46	
Fumulhoot, E.	14th,	5.00.05	4.43.27	4.43.0	4.5	4.43.18	13.59.07.5 N.	18.42.25.5	18.45.05.8
β Calliopææ, W.		53.00.10	49.45.38.7	49.45.30	67	49.46.41.4	30.45.22.5 S.	19.01.19	Kutwaul Talanb,
		41.01.28	38.52.37.1	38.52.00	56	38.53.04.6	57.57.46.7N.	19.04.42.1	19.03.00.5

OBSERVATIONS at large for determining the Latitudes of PLACES.

Phænomenon and Face of the Quadrant.	Date.	ARCH OF 96.		Arch of 90.	Equa- tion of the Sol.	Zenith Dif- ference cor- rected.	Declination.	Latitude by the obser- vation.	Name of the place and its cor- rect Latitude.	
		Reading.	Value.							
♄ Andromedis, Nov. 1784. D.S.D.N.		0	"	"	"	"	"	"	Ichapoor,	
W. 15th.	9.01.10	8.44.42.5	8.45.00	8.7	8.45.00	27.53.59 N.	19.08.59	0	0	
γ Pegasi, E.	5.01.23	5.05.25.3	5.05.00	5	5.05.17.5	13.59.13.3 N.	19.04.30.8	0	19.06.45	
7 Lacertæ, W.	16th.	31.03.10	29.50.20	29.49.40	33	29.50.33	49.10.45 N.	19.20.12	0	Surrampoor,
Fumulhoot, E.	53.01.15	50.01.54.3	50.02.00	67	50.03.04.2	30.45.22.5 S.	19.17.41.7	0	19.18.57	
7 Lacertæ, W.	17th.	31.03.13	29.51.39.1	29.51.00	33	29.51.52.6	49.10.45 N.	19.18.52.4	0	Munloor Cot- tah,
Fumulhoot, E.	53.01.10	49.59.40.4	49.59.30	67	50.00.42.2	30.45.22.5 S.	19.15.19.7	0	19.17.05.5	
E. 18th.	53.01.24	50.05.51.6	50.05.30	67	50.06.48		19.21.25.5	0	Ganjam Camp,	
β Cassiopææ, W.	41.00.13	38.31.58	38.31.00	46	38.32.15	57.57.53 N.	19.25.38	0	19.23.32	
Fumulhoot, E.	25th.	53.02.06	50.12.00.7	50.12.00	67	50.13.07.5	30.45.22.5 S.	19.27.45	0	Piaghee,
β Cassiopææ, W.	41.00.03	38.27.34.7	38.26.50	45.6	38.27.58	57.57.50.0 N.	19.29.55	0	19.28.50	
Fumulhoot, E.	26th.	43.02.14	50.15.31.7	50.15.30	67	50.16.38	30.45.22.5 S.	19.31.15.5	0	Maloodée,
β Cassiopææ, W.	40.03.25	38.23.11	38.23.10	45.6	38.23.56.1	57.57.53 N.	19.33.57	0	19.32.36.5	
Fumulhoot, E.	29th.	53.03.04	50.25.11.8	50.24.40	67	50.26.02	30.45.22.5 S.	19.40.40.5	0	Manickpatam,
♄ Andromedis, W.	8.02.29	8.10.52.2	8.10.50	8	8.10.59.1	27.53.59.0 N.	19.43.00	0	0	
♄ Cassiopææ, W.	38.00.01	35.37.56.4	35.37.30	40.8	35.38.24	55.21.23.0	19.42.59	0	19.41.50	
Fumulhoot, E.	Dec. 53.03.21	50.32.40	50.32.30	67	50.32.42	30.45.22.5 S.	19.48.19.5	0	Jaggernaut,	
γ Pegasi, E.	4th.	6.00.21	5.46.43.7	5.46.30	6	5.46.43	13.59.13.3 S.	19.45.56.3	0	0
♄ Cassiopææ, W.	37.03.22	35.33.06.3	35.32.40	41	35.33.34.2	55.21.23 N.	19.47.49	0	0	
♄ Andromedis, W.	8.02.12	8.03.26	8.03.00	8	8.03.21	27.53.59 N.	19.50.38	0	19.41.50	
♄ Andromedis, W.	7th.	8.01.21	7.53.17.5	7.53.20	8	7.53.27	27.53.59 N.	20.00.32	0	Ahmetpoore,
♄ Cassiopææ, W.	37.02.26	35.20.48	35.21.00	40	35.21.34	55.21.23 N.	19.59.49	0	0	
♄ Cassiopææ, W.	45.01.24	42.35.52	42.36.00	52	42.36.44	62.36.07 N.	19.59.23	0	0	
γ Pegasi, E.	6.01.06	5.54.12	5.54.00	6	5.54.12	13.59.13.3 N.	19.53.25.3	0	0	
η Ceti, E.	33.01.05	31.12.30.7	31.12.00	34	31.12.49.4	11.19.35 S.	19.53.14.4	0	0	
θ Ceti, E.	31.00.17	29.11.13.3	29.10.30	32	29.11.23.6	9.17.47 S.	19.53.36.6	0	19.56.40.2	
♄ Cassiopææ, W.	37.02.05	35.11.34.3	35.11.00	40	35.11.57	55.21.23 N.	20.09.26	0	Peeply,	
♄ Cassiopææ, W.	8th.	41.02.07	38.57.27.1	38.57.00	46	38.57.59.6	59.06.56 N.	20.08.56	0	0
η Ceti, E.	33.02.00	31.24.22.6	31.24.00	34.4	31.24.46	11.19.35 S.	20.05.11	0	20.07.11	
♄ Andromedis, W.	9th.	8.00.08	7.33.31	7.33.00	7.5	7.33.23	27.53.59 N.	20.20.36	0	Ballunta,
γ Pegasi, E.	6.02.22	6.15.18	6.15.30	6	6.15.30	13.59.13 N.	20.14.43	0	20.17.40	

ASTRONOMICAL OBSERVATIONS

OBSERVATIONS at large for determining the Latitudes of PLACES.

Phenomenon and Face of the Quadrant.	Date.	ARCH OF 96.		Arch of 90.	Elevation of the Sun.	Zenith Distance corrected.	Declination.	Latitude by the observation.	Name of the place and its correct Latitude.
		Reading.	Value.						
γ Cassiopææ, W.	1784, Dec. 10th	D.S.D.N. 41.02.22	39.04.02.6	39.03.30	46	39.04.30	59.52.54 N.	20.28.21.7	Sowlagunda, near Kuttack.
α Ceti, E.		33.03.13	31.43.59	31.43.30	35	31.44.20	11.19.35 S.	20.24.45	20.26.33.3
ε Cassiopææ, W.	15th	44.02.16	41.50.09.2	41.49.40	51	41.50.45.7	62.36.07 N.	20.45.21.3	Koomereah River, north side,
α Piscium, E.		20.00.29	18.57.44.7	18.57.40	19	18.58.01.4	1.43.03 N.	20.41.04.4	20.43.13
α Cassiopææ, W.	17th	36.02.20	34.26.18.5	34.26.00	39	34.26.48.3	55.21.23 N.	20.54.34.7	Jehaujeppore River, north side,
α Ceti, E.		34.01.04	32.18.19.3	32.08.20	35	32.08.55	11.19.35 S.	20.49.20	20.51.57
ε Cassiopææ, W.	19th	41.00.15	38.32.50.5	38.32.30	45	38.33.25.3	59.32.54 N.	20.59.28.7	Chorakootce,
δ Cassiopææ, W.		40.02.18	38.06.02.1	38.05.30	44	38.06.30	59.06.56 N.	21.00.26	
θ Ceti, E.		32.01.04	30.15.49.3	30.15.20	33.3	30.16.08	9.17.47 S.	20.58.21	20.59.09
ε Cassiopææ, W.	20th	44.00.29	31.27.44.7	31.27.30	50	31.28.27.4	62.36.07 N.	21.07.40.4	Raneeka Taulaub,
δ Ceti, E.		23.00.29	21.42.06	21.42.00	22	21.42.25	0.36.32 S.	21.05.53	21.06.46
α Cassiopææ, W.	21st	36.01.15	34.05.39.3	34.05.20	38	34.06.08	55.21.23 N.	21.15.15	Kaunse Baunse,
δ Cassiopææ, W.		40.01.16	37.51.05.7	37.51.00	44	37.51.47	59.06.56 N.	21.15.09	
α Ceti, E.		34.02.24	32.31.10.3	32.30.40	36	32.31.31.2	11.19.35 S.	21.11.56.2	
θ Ceti, E.		32.02.06	30.30.45.7	30.30.20	33	30.31.06	9.17.47 S.	21.13.19	21.13.52.3
α Cassiopææ, W.	22d	36.00.24	33.55.33	33.55.30	38	33.56.09.5	55.21.23 N.	21.25.13.5	Aumnulla,
α Ceti, E.		34.03.12	32.39.57.3	32.39.40	35.4	32.40.24	11.19.35 S.	21.20.49.0	21.23.01.2
ε Cassiopææ, W.	23d	43.02.24	40.57.05.4	40.57.00	49.3	40.57.52	62.36.07 N.	21.38.14.3	Daumdurpoor,
γ Andromedis, W.		20.03.25	19.38.10.5	19.37.40	21.8	19.38.19	41.17.22 N.	21.39.50	
α Piscium, E.		21.00.24	19.51.48	19.51.00	21	19.51.48	1.43.03 N.	21.34.48.0	
δ Ceti, E.		23.02.18	22.09.47.2	22.10.00	22.4	22.10.16	0.36.32.0 S.	21.33.44.0	21.36.38
ε Cassiopææ, W.	24th	43.02.06	40.49.10.8	40.49.00	39	40.49.54.4	62.36.07 N.	21.46.12.6	Soobanreeka River, at Rauje
δ Ceti, E.		23.03.09	22.19.54	22.19.30	32	22.20.04	0.36.32 S.	21.43.32.0	Gaut, on the Ballalore side,
ε Cassiopææ, W.	26th	43.01.30	40.46.16	40.46.00	49	40.46.54	62.36.07 N.	21.49.13.0	
ε Eridani, E.		34.00.06	31.55.08	31.55.08	35	31.55.43	10.13.26.6 S.	21.42.16.4	21.45.18.5
δ Cassiopææ, W.	27th	39.03.02	37.16.49	37.16.00	48	37.17.13	59.06.56 N.	21.49.43	Jellalore Camp.
δ Ceti, E.		23.03.10	22.20.20	22.20.00	24	22.20.34	0.36.32 S.	21.44.03	21.46.53
α Ceti, E.	28th	35.01.27	33.14.40.6	33.14.00	38	33.14.58.3	11.19.35 S.	21.55.23.3	Dantoon Camp
δ Cassiopææ, W.		39.02.11	37.06.32.5	37.06.00	43	37.06.59.3	59.06.56 N.	21.59.56.7	21.57.49

IN FORT WILLIAM, &c.

OBSERVATIONS at large for determining the Latitude of PLACES.

Phenomenon and Face of the Quadrant.	Date.	Arch of 56.		Arc b of 90	Equation applied.	Zenith Distance Corrected.	Declination.	Latitude by this observation.	Name of the place & its correct Latitude.
		Reading.	Value.						
1784.	D.S.D.N.								
7 Cassiopeæ, W.	29th, Dec.	39.03.21	37.25.10	37.24.40	42	37.25.37	59.32.55.5 N.	22.07.18	Khutnagar,
7 Ceti, E.		35.02.06	33.19.30.6	33.19.10	37	33.19.57.3	11.19.35 S.	22.00.23	22.03.50
7 Cassiopeæ, W.	30th,	39.03.02	37.16.49	37.16.30	42	37.17.22	59.32.55.5 N.	22.15.33.5	Mokurrum poor,
7 Cassiopeæ, W.		39.01.08	36.51.19.7	36.50.40	43	36.51.43	59.06.56 N.	22.15.13	0 7 "
7 Ceti, E.		35.02.27.5	33.28.57.5	33.28.30	37	33.29.16	11.19.35 S.	22.09.41	22.12.32, 2
7 Persei, W.	31st,	32.00.29	30.12.44.7	30.13.00	33	30.13.25.4	52.37.59 N.	22.24.33.6	Kaffal River,
7 Persei, W.		18.03.24	17.40.50.4	17.40.39	18	17.40.58.2	40.06.50 N.	22.25.51.8	
7 Ceti, E.		24.01.26	22.55.29.3	22.55.00	24	22.55.39	00.36.32 S.	22.19.07	0 7 "
12 Eridani, E.		55.02.16	52.08.54.5	52.09.10	73	52.10.15.3	29.51.02 S.	22.19.13.3	22.22.11.3
7 Cassiopeæ, W.	4th, Jan.	39.00.10	36.38.08.7	36.37.40	42	36.38.36.3	59.06.56 N.	22.28.19.7	Midnapoor Fort,
7 Cassiopeæ, W.		42.03.07	40.07.46	40.07.30	48	40.08.26	62.36.07 N.	22.27.41	0 7 "
7 Ceti, E.		24.02.00	22.58.07.5	22.58.00	24	22.58.48	00.36.32 S.	22.22.16	22.25.08.3
7 Cassiopeæ, W.	5th,	42.03.05	40.06.33	40.06.00	48	40.07.15	62.36.07 N.	22.28.52	Bunpoor,
7 Ceti, E.		24.02.06	22.50.46	22.50.30	24	23.01.02	00.36.32 S.	22.24.38	22.26.41
7 Cassiopeæ, W.	6th,	38.03.12	36.24.57.7	36.25.00	43	36.25.42	59.06.56 N.	22.41.14	Narraindeh, wul,
12 Eridani, E.		55.03.22	52.25.36.4	52.25.30	75	52.26.48.2	29.51.02 S.	22.35.46.2	22.38.30
7 Persei, W.	7th,	31.03.09	29.49.53.6	29.49.20	33	29.50.10	52.37.59 N.	22.47.49	Madapoor,
12 Eridani, E.		56.00.10	52.34.23	52.34.40	74	52.35.46	29.51.02 S.	22.44.44	22.46.16.5
7 Persei, W.	8th,	31.03.05	29.48.03	29.47.50	33	29.48.32	52.37.59 N.	22.49.27	Chunderbund,
12 Eridani, E.		56.00.09	52.34.14	52.34.00	74	52.35.20	29.51.02 S.	22.42.18	22.46.52.5
7 Persei, W.	10th,	32.00.03	30.01.19	30.01.00	33	30.01.42.5	52.37.39 N.	22.50.26.5	Habra. Gaut.
12 Eridani, E.		55.03.14	52.22.05.4	52.22.10	74	52.33.21.7	29.51.02 S.	22.32.19.7	22.34.18.1

Mr. BURROWS published, in the Lady's Diary, a Theorem similar to mine, page 17: he shewed it to me last year: my original Book of Observations convinced him, that his publication could not have been known to me when I wrote the Theorem.

ROYAL GRANT OF LAND, ENGRAVED ON A COPPER PLATE,
BEARING DATE TWENTY-THREE YEARS BEFORE CHRIST; AND
DISCOVERED AMONG THE RUINS AT MONGUEER.

Translated from the Original SANSKRIT, by CHARLES WILKINS, Esq. in the Year
1781.

DEB PAUL DEB *

PROSPERITY!

HIS wishes are accomplished. His heart is steadfast in the cause of others. He walks in the paths of virtue. — May the achievements of this fortunate Prince cause innumerable blessings to his People!

By displaying the strength of his genius, he hath discovered the road to all human acquirements; for being a *Soogor* (1), he is Lord of the Universe.

Gopdat, King of the World, possessed matchless good Fortune: he was Lord of two Brides: the Earth and her Wealth. By comparison of the learned he was likened unto *Preestob* (2), *Sogor* (3), and others, and it is credited.

When his innumerable army marched, the heavens were so filled with the dust of their feet, that the birds of the air could rest upon it.

He acted according to what is written in the *Shastra* (4), and obliged the different sects to conform to their proper tenets. He was blessed with a son, *Dormo-Paal*, when he became independent of his forefathers, who are in heaven.

His elephants moved like walking mountains, and the earth, oppressed by their weight and moulderred into dust, found refuge in the peaceful heavens.

In this translation the Sanskrit names are written, as they are pronounced in Bengal; but, in the following paper, the translator has adopted the more elegant pronunciation of *Farney* and *Castelnau*.

(1) *Soogor* signifies an Atheist, or follower of the tenets of *Soogor*, a Philosopher, who is said to have flourished at a place called *Keekal* in the province of *Bihar*, one thousand years after the commencement of the *Kalca* *Yog*, or *Iron Age*; of which this is the 4832d Year. He believed in visible things only, or such as may be deduced from effects the cause of which is known; as from smoke the existence of fire. He wrote many books to prove the absurdity of the religion of the *Brahmins*, and (some upon) Astronomy and other sciences, all which are said to be now in being. He further held that all our actions are attended by their own rewards and punishments in this life; and that all animals having an equal right to existence with Man, they should not be killed either for sport or food.

(2) *Preestob* was the son of *Bemo*, and *Raajaa* of a place called *Beind*, near *Lucknow*. He flourished in the first Age of the World; and is said to have travelled the earth, and having prepared it for cultivation, obliged the people to live in society.

(3) *Sogor* the name of a *Raajaa* who lived in the second Age at *Uudho*, and is said to have dug the rivers.

(4) *Shastra* book of divine ordinations: The word is derived from a root signifying to command.

He went to extirpate the wicked and plant the good, and happily his salvation was effected at the same time: for his servants visited *Kedaar* (1), and drank milk according to the law; and they offered up their vows, where the Ganges joins the ocean, and at *Gokornaa* (2), and other places (3).

When he had completed his conquests, he released all the rebellious Princes he had made captive, and each returned to his own country laden with presents, reflected upon this generous deed, and longed to see him again; as mortals, remembering a pre-existence, wish to return to the realms of light.

This Prince took the hand of the daughter of *Porobol*, Raajaa of many countries, whose name was *Ronnaa Debee*; and he became settled.

The people, being amazed at her beauty, formed different opinions of her: some said it was *Lockee* (4) herself in her shape; others that the earth had assumed her form; many said it was the Raajaa's fame and reputation; and others that a household goddess had entered his palace. And her wisdom and virtue set her above all the ladies of the court.

This virtuous and praise-worthy Princess bore a son *Deb Paal Deb*, as the shell of the ocean produces the pearl:—

In whose heart there is no impurity; of few words, and gentle manners, and who peaceably inherited the kingdom of his father, as *Budbeefotwo* (5) succeeded *Soogot*.

He, who marching through many countries making conquests, arrived with his elephants in the forests of the mountains of *Beendbyo* (6), where seeing again their long-lost families, they mixed their mutual tears; and who going to subdue other Princes, his young horses meeting their females at *Komboge* (7), they mutually neighed for joy.

He who has opened again the road of liberality, which was first marked out in

(1) *Kedaar*—a famous place, situated to the north of Hindoostan, visited, to this day, on account of its supposed sanctity.

(2) *Gokornaa*—a place of religious resort near *Panjab*.

(3) This and a few other passages appear inconsistent with the principles of a *Soogot*; to reconcile it therefore it should be remarked, that, as he was issuing his orders to subjects of a different persuasion, it was natural for him to use a language the best calculated to strike them with awe, and bind them to a performance of his commands. The *Pundit*, by whose assistance this translation was made, when he was desired to explain this seeming contradiction, asked whether we did not, in our courts, swear a *Mussulman* upon the *Koran*, and a *Hindoo* by the waters of the *Ganges*, although we ourselves had not the least faith in either.

(4) *Lockee*—the Hindoo Goddess of fortune.

(5) *Budbeefotwo*—was the son of *Soogot*.

(6) *Beendbyo*—name of the mountains on the continent near *Ceylon*.

(7) *Komboge*—now called *Cambay*.

the *Kreeto Joog* (1) by *Bolee* (2), in which *Bhaargob* (3) walked in the *Treetaa Joog* (4); which was cleaned by *Karno* (5) in the *Dwapor Joog* (6), and was again choked up in the *Kolee Joog* (7); after the death of *Sokodweefsee* (8).

He who conquered the earth from the source of the Ganges, as far as the well-known bridge, which was constructed by the enemy of *Dosaafyo* (9); from the River of *Luckecool* (10), as far as the ocean of the habitation of *Boroon* (11).

At *Mood-go-gheeree* (12), where is encamped his victorious army; across whose river a bridge of boats is constructed for a road, which is mistaken for a chain of mountains; where immense herds of elephants, like thick black clouds, to darken the face of day, that people think it the season of the rains; whither the Princes of the North send so many troops of horses, that the dust of their hoofs spreads darkness on all sides; whither so many mighty Chiefs of *Jumboodweep* (13) resort to pay their respects, that the earth sinks beneath the weight of the feet of their attendants. There *Deb Paal Deb* (who, walking in the footsteps of the mighty Lord of the great *Soogots*, the great Commander, *Raajaa* of *Mobaa Raajaas*, *Dhormo Paal Deb*, is himself mighty Lord of the great *Soogots*, a great Commander, and *Raajaa* of *Mobaa Raajaas*) issues his commands:—To all the inhabitants of the town of *Mesheeka*, situated in *Kreemeelaa*, in the province of *Sree Nogor* (14), which is my own property, and which is not divided by any land belonging to another; to all *Raajok* and *Raaj-pootro*; to the (15) *Omaatyo*, *Mobaa-kaarttaa-kreeteeko*, *Mobaa-Dondo-Nayk*, *Mobaa-Proteebaar*, *Mobaa-Saamont*, *Moobaa-Dow-Saadhon-Saadhoneeko*,

(1) *Kreeto Joog*—the first Age of the World, sometimes called the *Suttas Joog* or age of purity.

(2) *Bolee*—a famous Giant of the first Age who is fabled to have conquered earth, heaven, and hell.

(3) *Bhaargob*—a *Brabmon*, who having put to death all the princes of the earth, usurped the government of the whole.

(4) *Treetaa Joog*—the second Age, or of three parts good.

(5) *Karno*—a famous Hero in the third Age of the World. He was General to *Doorjodbon*, whose wars with *Joodistee* are the subject of the *Mohabharat*, the grand Epick Poem of the Hindoos.

(6) *Dwapor Joog*—the third Age of the world.

(7) *Kolee Joog*—the fourth or present Age of the World, of which 4884 years are elapsed.

(8) *Sokodweefsee*—an epithet of *Beekromadeetyo*, a famous Raajaa. He succeeded his brother *Sokaadeetyo*, whom he put to death.

(9) *Dosaafyo*—one of the names of *Raabon*, whose wars with *Raam* are the subject of a poem called the *Raamayon*.

(10) *Luckecool*—now called *Luckeebor*.

(11) *Boroon*—God of the ocean.

According to this account the Raajaa's *Dominions* extended from the Cow's Mouth to Adam's Bridge in *Ceylon*, said to have been built by *Raam* in his wars with *Raabon*; from *Luckeebor* as far as *Goozerat*.

(12) *Mood-go-gheeree*—now called *Monguer*.

(13) *Jumboodweep*—according to the Hindoo Geography, implies the habitable part of the earth.

(14) *Sree Nogor*—the ancient name of *Patna*.

(15) *Omaatyo*, Prime Minister, *Mobaa-kaarttaa-kreeteeko*, Chief Investigator of all things, *Mo-baa-Dondo-Nayk*, Chief officer of Punishments, *Mobaa-Proteebaar*, Chief Keeper of the Gates, *Mobaa-Saamont*, Generalissimo, *Mobaa-Dow-Saadhon-Saadhoneeko*, Chief Obviator of Difficulties, *Mobaa-Kwomaaraa-Matyo*, Chief instructor of Children.

Saadboneeko, *Mabaa-Koomaaraa-Matya*; to the *Promaatree* and *Sorobbongo*; to the *Raajostaaneeyo*, *Ooporeeko*, *Daasaapraaadbeeko*, *Chowrod-dboroneeko*, *Daandeeko*, *Dohdopaaseeko*, *Sowl-keeko*, *Gowlmeeko*, *Kyotroo*, *Praantopaalo*, *Kotbtopaalo* and *Kaandaarokyo*, to the *Todaajooktoko* and the *Beeneejooktoko*; to the keeper of the elephants, horses and camels; to the keeper of the mares, colts, cows, buffaloes, sheep, and goats; to the *Dootoprysooneeko*, *Gomaa-Gomeeko*, and *Obbeetworomaano*; to the *Beesypotee*, *Toropotee* and *Tareeko*. To the different tribes *Gowr*, *Maalob*, *Kbosa*, *Hoon*, *Kooleeko*, *Kornato*, *Laasaato*, and *Bhoto*; to all others of our subjects, who are not here specified; and to the inhabitants of the neighbouring villages, from the *Braabmond* and fathers of large families, to the tribes of *Medo*, *Ondhoroko*, and *Chondaalo*.

Be it known, that I have given the above-mentioned town of *Mesheka*, whose limits include the fields where the cattle graze, above and below the surface, with all the lands belonging to it; together with all the *Mango* and *Modboo* trees; all its waters, and all their banks and verdure; all its rents and tolls, with all fines for crimes, and rewards for catching thieves. In it there shall be no molestation, no passage for troops; nor shall any one take from it the smallest part. I give likewise every thing that has been possessed by the servants of the *Raajaa*: I give the Earth and Sky, as long as the Sun and Moon shall last, except, however, such lands as have been given to God, and to the *Braabmons*, which they have long possessed and now enjoy. And that the glory of my father and mother, and my own fame may be increased, I have caused this *Saason* (1) to be engraved, and granted unto the great *Botbo Beebkoraato Meefro*, who has acquired all the wisdom of books and has studied the *Beads* (2) under *Oslaayono*; who is descended from *Owpmamnyobo*; who is the son of the learned and immaculate *Botbo Boraabordato*, and whose grandfather was *Botbo Beefworuato*, learned in the *Beads*, and expert in performing the *Jog* (3).

Know all the aforefaid, that as bestowing is meritorious, so taking away deserves

Children. *Promaatree*, Keeper of the Records. *Sorobbongo*, Patrols. *Raajostaaneeyo*, Vice Roy. *Ooporeeko*, Superintendent. *Daajaa-raadhizeko*, Investigator of Crimes. *Chow-rod-dbo-roneeko*, Chief Catcher. *Daan-doo*, Mace Bearer. *Doodo-paseeko*, Keeper of the Instruments of Punishment. *Sowl-keeko*, Collector of Customs. *Gowlmeeko*, Commander of a small party. *Kyotroo*, Supervisor of Cultivation. *Praantopaalo*, Guard of the Suburbs. *Kotbtopaalo*, Commander of a Fort. *Kaandaarokyo*, Guard of the Walls of the City. *Todaajooktoko*, Chief Guard of the Walls. *Beeneejooktoko*, Director of Affairs. *Dootoprysooneeko*, Chief of the Spies. *Gomaa-Gomeeko*, Messengers. *Obbeetworomaano*, Swift Messengers. *Beesypotee*, Governor of a City. *Toropotee*, Superintendent of the Rivers. *Tareeko*, Chief of the Boats.

(1) *Saason*—signifies an Edict.

(2) *Beads*—Hindoo Scriptures.

(3) *Jog*—Sacrifice.

punishment; wherefore, leave it as I have granted it. Let all his neighbours and those who till the land, be obedient to my commands. What you have formerly been accustomed to perform and pay, do it unto him in all things. Dated in the 33d *Sombot* (1), and 21st day of the month of *Maargo*.

Thus speak the following *Slokes* (2) from the *Dbormo Onoosaaſon*:

1. " *Ram* hath required, from time to time, of all the *Raajaas* that may reign, that the bridge of their beneficence be the same, and that they do continually repair it.

2. " Lands have been granted by *Sogor* and many other *Raajaas*; and the same of their deeds devolves to their successors.

3. " He who dispossesses any one of his property, which I myself or others have given, may he, becoming a worm, grow rotten in ordure with his forefathers!

4. " Riches and the life of man are as transient as drops of water upon a leaf of the *Lotos*. Learning this truth, O man! do not attempt to deprive another of his reputation."

The *Raajaa*, for the publick good, hath appointed his virtuous son, *Raajyo Paal*, to the dignity of *Jowbo Raajaa*. He is in both lines of descent illustrious, and hath acquired all the knowledge of his father.

(1) *Sombot*—implies the *Æra* of *Raajaa Beekromadeetyo*. The *Brahmons*, throughout *Hindostan* keep time according to the three following Epochs: The *Kalyabdo* from the flight of *Kreesbno*, or commencement of the *Kolee Joog*, 4882 years. The *Sombot*, from the death of *Beekromadeetyo*, 1837 years. The *Sokaabdo*, from the death of *Raajaa Soko*, 1702.

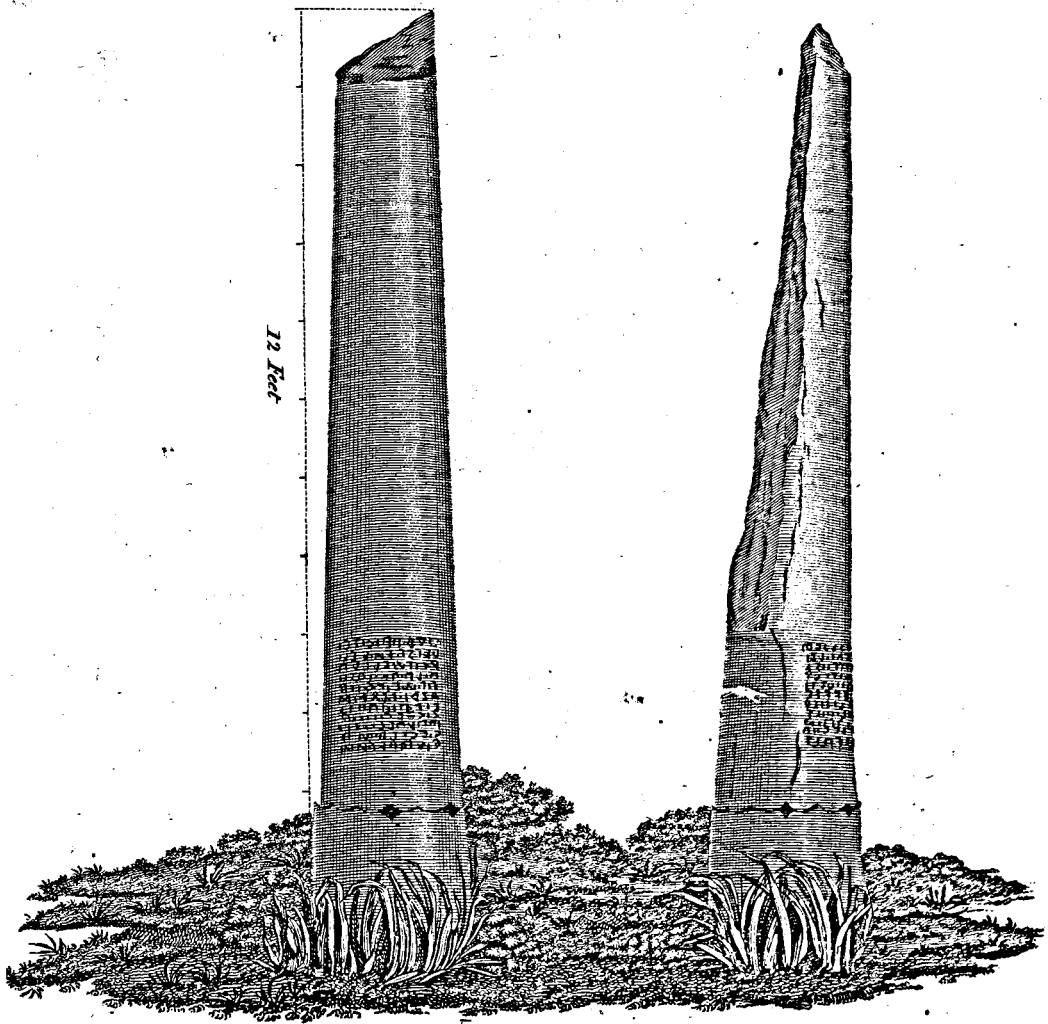
(2) *Slokes*—stands, commonly, but erroneously, written *Ashlogus*.

Specimen of the Character in the Inscription

श्रीमक्षयसुख्यवल्गुः

Front View

Side View



IV.

AN INSCRIPTION ON A PILLAR NEAR BUDDAL.

Translated from the SANSKRIT by CHARLES WILKINS, Esq.

SOME time in the month of November, in the year 1780, I discovered, in the vicinity of the town of *Buddal*, near which the Company have a factory, and which at that time was under my charge, a decapitated monumental column, which at a little distance has very much the appearance of the trunk of a coco-nut tree broken off in the middle. It stands in a swamp overgrown with weeds, near a small temple dedicated to *Hārgowrēē*, whose image it contains. Upon my getting close enough to the monument to examine it, I took its dimensions and made a drawing of it; and soon after a plate was engraved, from which the accompanying is an impression.

It is formed of a single stone of a dirty grey complexion; and it has lost by accident a considerable part of its original height. I was told upon the spot that it had, in the course of time, sunk considerably in the ground; but upon my digging about the foundation I found this was not the case. At a few feet above the ground is an inscription engraved in the stone, from which I took two reversed impressions with printer's ink. I have lately been so fortunate as to decypher the character; and I have the honour to lay before the Society a transcript of the original in the modern writing, and a translation; and at the same time to exhibit the two impressions I took from the stone itself.

The original character of this inscription is very different from the modern form; but it so much resembles that on the plate found by Col. WATSON at *Mon-gueer*, that I am induced to conclude it to be a work of the same period. The language is *Sāmskrēt*, and the whole is comprised in twenty-eight metrical verses of various measures.

CHARLES WILKINS.

14th July, 1785.

I. VEERA

PROSPERITY!

I.

VĒERĀ DEV was of the *Sāndēlyā* race (1); from him was descended *Pāncbāl*, of whose generation, and of whom, was *Gārgā* born.

II.

He, another *Sākrā* (2), was ruler but of one quarter, and had no authority in other regions. He, too, was defeated by *Dityā* (3) chiefs; but being a virtuous prince, he became supreme over every country without reserve; and his conduct was such, that he laughed *Vrēbhāspatē* (4) to scorn.

III.

Eechā (5) was his wife; and, like love, she was the mistress of his heart. She was admired for the native purity of her mind, and her beauty was like the light of the moon.

IV.

In his countenance, which was like the flower of the water (6), were to be traced the lines of four sciences (7). The three worlds were held in subjection by his hereditary high rank.

From these two was descended a *Brāhmān* like *Kāmālyōnē* (8), and he took unto himself the name of *Srē Dārbhā-pāncē*:

V.

Whose country, (extending to *Rēvā-jānāk* (9); to the father of *Gowrē* (10) whose piles of rocks reek with the juice exuding from the heads of intoxicated elephants, and whose snow-white mountains are brightened by the sun's rays; to the two oceans:—to that whence *Arōon* (11) riseth from its bed, and to that wherein

(1) A tribe of *Brāhmāns* still extant.

(2) *Eendrā*, the God of the Heavens, who is supposed to be the Guardian of the East.

(3) Evil spirits. *Eendrā* is said to have lost his kingdom, for a while, to the *Asūrs* or evil spirits.

(4) The tutor of the good spirits, and the planet Jupiter.

(5) Love, desire.

(6) The Lotus.

(7) Arms, Musick, Mechanicks, Physicks.

(8) *Brāhmā*.

(9) Perhaps the *Narbādda*.

(10) The snowy mountains that part India from Tartary. *Gowrē* one of the names of the *Pārvātī*, the consort of *Sīv*.

(11) The Charioteer of the Sun.—The Aurora of the Hindoos.

the sun sinketh in the west), the Prince *Srē Dēv Pāl* (1), by his policy, rendered tributary;

VI.

At whose gates (although the prospect, hidden by the dust arising from the multitude of marching force, was rendered clear from the earth being watered by constant and abundant streams flowing from the heads of lustful elephants of various breeds), stood, scarce visible, amongst the vast concourse of nobles flocking to his standard from every quarter, *Srē Dēv Pāl* in expectation of his submission.

VII.

Whose throne, that Prince (who was the image of *Eṅdrā*, and the dust of whose feet was impressed with the diadems of sundry potentates) himself ascended with a flash of glory, although he had formerly been wont to offer him large sums of *Pītās* (2) bright as the lunar rays.

VIII.

To him was born, of the Princess *Sārkarā*, the Brāhmān *Sōmēsvār*, who was like *Sōm* (3) the offspring of *Ātrē*, and a favourite of the most high.

IX.

He adopted the manners of *Dhānānjay* (4), and did not exult over the ignorant and ill-favoured. He spent his riches amongst the needy. He neither vainly accepted adulation, nor uttered honey words. His attendants were attached by his bounty; and because of his vast talents, which the whole universe could not equal, he was the wonder of all good men.

X.

Anxious for a home and an asylum, he took the hand of *Rāmnā* (5), a princess of his own likeness, according to the law, even as *Sēv* the hand of *Sēvā* (6)—even as *Hārē* (7) the hand of *Lākṣmī*.

XI.

From this pair proceeded into life, bursting forth like *Gōbā* (8) with a counte-

(1) If this be the prince mentioned in the copper plate found by Col. WATSON, he reigned at Mongcer above 1800 years ago.

(2) A square coin.

(3) The Moon.

(4) One of the sons of Pandoo, commonly called *Arjun*.

(5) A Princess of this name is also mentioned in Colonel WATSON'S plate.

(6) *Sēvā* is the feminine of *Sēv*.

(7) *Hārē*, a name of *Vijayā*.

(8) *Gōbā*, a name of *Kartik*.

nance of a golden hue, the fortunate *Kēdārā Mēṣṣrā*, whose actions rendered him the favourite of heaven.—The lofty diadem, which he had attained, shone with faultless splendour, kissing the vast circumference of the earth. His extensive power was hard to be limited; and he was renowned for boundless knowledge raised from his own internal source.

XII.

The ocean of the four sciences, which had been at a single draught drunk up, he brought forth again, and laughed at the power of *Agṣṣtyā* (1).

XIII.

Trusting to his wisdom, the king of *Gowr* (2) for a long time enjoyed the country of the eradicated race of *Oṣṣkal* (3), of the *Hoons* (4) of humbled pride, of the kings of *Drāvēṣṣ* (5) and *Gōōrjār* (6), whose glory was reduced, and the universal sea-girt throne.

XIV.

He considered his own acquired wealth the property of the needy, and his mind made no distinction between the friend and the foe. He was both afraid and ashamed of those offences, which condemn the soul to sink again into the ocean of mortal birth; and he despised the pleasures of this life, because he delighted in a supreme abode.

XV.

To him, emblem of *Vrēṣṣbāṣṣpātēṣṣ* (7), and to his religious rites, the prince *Srēṣṣ Sōōrā Pāl* (who was a second *Eendrā*, and whose soldiers were fond of wounds) went repeatedly; and that long and happy companion of the world, which is girt with several oceans as with a belt, was wont, with a soul purified at the fountain of faith, and his head humbly bowed down, to bear pure water before him.

XVI.

Vānwā, of celestial birth, was his consort, with whom neither the fickle *Lākṣṣmēṣṣ* nor *Sātēṣṣ* (8) constant to her lord, were to be compared.

- (1) Who is said to have drunk up the ocean.
 (2) The kingdom of *Gowr* anciently included all the countries which now form the kingdom of Bengal on this side the *Brāhmāṣṣōōtrā*, except *Mongueer*.
 (3) Orixā.
 (4) Huns.
 (5) A country to the south of the Carnatīck.
 (6) Goozerat.
 (7) The preceptor of the good spirits, and the planet *Jupiter*.
 (8) The consort of *Sēṣṣ*.

XVII.

XVII.

She, like another *Dēvākēē* (1), bore unto him a son of high renown, who resembled the adopted of *Yāsōdbā* (2) and husband of *Lākṣmēē* (3).

XVIII.

This youth, by name *Srēē Gōōrāvā Mēēfrā*, was acquainted with all the constellations. He resembled *Rām*, the son of *Ĵāmādāgnēē* (4). He was another *Rām*.

XIX.

His abilities were so great, that he was solicitous to discover the essence of things, wherefore he was greatly respected by the Prince *Srēē Nārāyān Pāl*. What other honour was necessary?

XX.

His policy (who was of no mean capacity, and of a reputation not to be conceived), following the sense of the *Vēds*, was of boundless splendor, and, as it were, a descent of *Dbārmā*, the Genius of Justice. It was regulated by the example of those who trust in the power of speech over things future, who stand upon the connexion of family, who are in the exercise of paying due praise to the virtues of great men, and who believe in the purity of *Astrology*.

XXI.

In him was united a lovely pair, *Lākṣmēē* and *Sārāśwātēē*, the disposer of fortune, and the Goddess of Science, who seemed to have forsaken their natural enmity, and to stand together pointing at friendship.

XXII.

He laughed to scorn, him, who, in the assemblies of the learned, was intoxicated with the love of argument, and confounded him with profound and elegant discourses framed according to the doctrine of the *Sāstrās*; and he spared not the man, who, because of his boundless power and riches, was overwhelmed with the pride of victory over his enemy in the field.

XXIII.

He had a womb, but it obstinately bore him no fruit. One like him can have

(1) The real mother of *Krēēḥnā*.

(2) The foster-mother of *Krēēḥnā*.

(3) *Rōōkmēēnēē* the consort of *Krēēḥnā*. She is here called *Lākṣmēē*, in compliance with the idea of her being a descent of that goddess.

(4) This is neither the conqueror of *Cylon*, nor the brother of *Krēēḥnā*.

no great relish for the enjoyments of life! He never was blessed with that giver of delight, by obtaining which a man goeth unto another almoner (1).

XXIV.

He, who was, as it were, another *Vālmāṅkī* (2) born in this dark age of impiety, amongst a dreadful and a cruel race of mortals, was a devout man who displayed the learning of the *Vēds* in books of moral tales.

XXV.

His profound and pleasing language, like *Gāṅgā*, flowing in a triple course (3) and constant stream, purifieth and delighteth.

XXVI.

He, to whom, and to those of whose generation, men were wont to resort as it were to *Brāhmā*, waited so long in expectation of being a father, that, at length, he himself arrived at the state of a child.

XXVII.

By him was recorded here upon this lasting column, the superior beauty of whose shaft catcheth the eye of the beholder, whose aspiring height is as boundless as his own ideas, which is, as it were, a stake planted in the breast of *Kālē* (4), and on whose top sits *Tārksyā* (5), the foe of serpents and favourite bird of *Haree*, the line of his own descent.

XXVIII.

Gārōor, like his fame, having wandered to the extremity of the world, and descended even unto its foundation, was exalted here with a serpent in his mouth.

This work was executed by the artist *Bēṅḍōō Bhādrā*.

(1) He had no issue to perform the *Srādh* for the release of his soul from the bonds of sin. By another almoner is meant the deity.

(2) The first poet of the Hindoos, and supposed author of the *Rāmāyān*.

(3) He is supposed to have written in three languages.

(4) Time.

(5) Otherwise called *Gārōor*.

REMARKS ON THE TWO PRECEDING PAPERS.

By the PRESIDENT.

NO man has greater respect than myself for the talents of Mr. WILKINS, who, by decyphering and explaining the old *Sanscrit* inscriptions lately found in these provinces, has performed more than any other *European* had learning enough to accomplish, or than any *Asiatick* had industry enough even to undertake: but, some doubts having arisen in my mind concerning a few passages in the two preceding translations, I venture to propose them in the form of notes with entire deference to his judgement.

P. 62. l. 10. *this fortunate prince*)—Is not the first couplet in honour of BUDDHA, one of whose names, in the *Amarçôsh*, is SUGATA? A follower of his tenets would have been denominated a *Saugat*, in the derivative form. We must observe, that the *Bauddhs*, or *Saugats*, are called *Atbeists* by the *Brâhmans*, whom they opposed; but it is mere invective; and this very grant fully disproves the calumny by admitting a future state of rewards and punishments. SUGAT was a reformer; and every reformer must expect to be calumniated.

P. 62. l. 17. *When his innumerable army*)—The third stanza in the original is here omitted, either by an oversight, or because the same image of *weeping elephants* occurs afterwards, and might have been thought superfluous in this place: nevertheless, I insert a literal translation of it.

“By whom, having conquered the earth as far as the ocean, it was left, as being unprofitably seized; so he declared: and his elephants weeping saw again in the forests their kindred whose eyes were full of tears.”

P. 63. l. 9. *of many countries*)—The *Pandits* insist, that *Râshtracûta* in the original is the name of a particular country.

P. 66. l. 4. *dated in the 33d Sombot*)—That is *year*; for *Samvat* is only an abbreviation of *Samvatâra*. This date, therefore, might only mean the thirty-third year of the King's reign; but, since VICRAMA'DITTA was surnamed the *foe of SACA*, and is praised by that name in a preceding stanza, we may safely infer, that the grant was dated thirty-three years after the death of that illustrious Emperor, whom the king of *Gaur*, though a sovereign prince, acknowledged as lord paramount of *India*.

P. 68. Verse II. *a virtuous prince*) Many stanzas in this inscription prove, that the *Sândilya* family were not *princes*, but that some of them were *prime ministers* to the kings of *Gaur*, or *Bengal*, according to this comparative genealogy.

Kings.	Ministers*.
GO'PĀLA.	PA'NCHA'LA.
DHERMAPĀLA.	GARGA.
DEVĀPĀLA. B. C. 23.	* DERBHAPA'NI.
RA'JYĀPĀLA.	SOME'SWARA.
S'URĀPĀLA.	* CE'DA'RAMIS'RA.
NA'RA'YANĀPĀLA. A. C. 67.	* GURAVAMIS'RA.

So that, reckoning thirty years to a generation, we may date the pillar of GURAVAMIS'RA in the sixty-seventh year after CHRIST. A *Pandit*, named RA'DHA'CAN'TA, with whom I read the original, appeared struck with my remark on the two families, and adopted it without hesitation; but, if it be just, the second stanza must be differently interpreted. I suspect *dhârma*, the genius of *justice* or *virtue*, to be the true reading instead of *dharmya*, or *virtuous*, and have no doubt, that *parô* must be substituted for *parô*: the sense will then be, that INDRA was ruler in the East only, and, though valiant, had been defeated even there by the *Daityas* or *Titans*, but that DHARMA was made sovereign over him in all quarters.

P. 68, Ver. V. *Whose country*) The original is:

à révájanacánmatangajamadaftimychch'hilâfanghatéh,
à gaurîpûritîswaréndraciranaihpuþhyatfitimnógiréh,
mârtan'dâftamayódayârun'ajalâd á varîrasidwayât,
nityâ yasya bhuwan chacâra caradân sri dévapâlô nripah.

The

The father of *Réva* is the *Mahéndra* mountain in the south, in which that river has its source; as the father of *GAURI* is the *Himálaya* in the north; where *ISWARA*, who has a *moon* on his forehead, is believed often to reside: hence *RA'DHA'CA'NTA* proposed a conjectural emendation, which would have done honour to *SCALIGER* or *BENTLEY*. Instead of *indra*, which is a name of the *sun*, he reads *indu*, or the *moon*, by changing only a small straight line into a small curve; and then the stanza will run thus:

By whose policy the great Prince *DE'VAPA'LA* made the earth tributary, from the father of *Réva*, whose piles-of-rocks-are-moist-with-juice-from-the-heads-of-lascivious-elephants, to the-father-of-*GAURI*, whose-white-mountains-are-brightened-with-beams-from-the-moon-of-*ISWARA*; - and as far as the-two-oceans whose-waters-are-red-with-the-rising-and-with-the-setting-Sun.

The words connected by hyphens are compounds in *Sanscrit*.

P. 69. Verse VI. submission) I understand *avafara* in this place to mean the *leisure* of the Minister from public affairs, for which even the King waited at the head of his army.

P. 69. Verse VII. fums of *Pētās*) The common sense of *pit'ha* is a *chair, seat, or throne*; and in this sense it occurs in the thirteenth verse. *U'dupachch'babipit'ham*, or *with-a-seat-bright-as-the-moon*, appears to be the compound epithet of *āsanam*, or *chair of state*, which though the King had often given to his Minister, yet, abashed by his wisdom, and apprehensive of his popularity, he had himself ascended his throne *with fear*.

P. 69. Verse X. The tenth stanza is extremely difficult, as it contains many words with two meanings, applied in one sense to the Minister *CE'DARA MIS'RA*, but, in another, to *CARTICE'YA*, the *Indian Mars*: thus, in the first hemistich, *śic'bin* means *fire* or a *peacock*; *śic'há*, a *bright flame*, or a *crest*, and *śacti*, either *power* or a *spear*. As the verse is differently understood, it may be a description of the *Bráhmén* or of the Deity.

P. 70. Verse XII. The *Bráhmans* of this province insist, that by the four *Vidyà's*, or branches of *knowledge* are meant the four *Véda's*, not the *Upavéda's*, or *Medicine, Archery, Musick, and Mechanics*; and they cite two distichs from the *Agnipurána*, in which *eighteen Vidyà's* are enumerated, and, among them, the *four Véda's*; three only of which are mentioned in the *Amurcōsh* and in several older books. In this verse also *RA'DHA'CA'NT* has displayed his critical sagacity: instead of *nála* he reads *bála*, and, if his conjecture be right, we must add "even when he was a boy."

P. 70. Verse XVI. constant to her lord) *RA'DHA'CA'NT* reads *anapatyayà*, or *childless*, for *anupatyayà*; *SATI* having borne *no children*, till she became regenerate in the person of *PÁ'RVATI*.

P. 71. Verse XXIII. it obstinately bore him no fruit) The original stanza is uncommonly obscure: it begins with the words *yōnirabbhūva*, the two first syllables of which certainly mean *a womb*; but several *Pandits*, who were consulted apart, are of opinion, that *yō* is the relative, of which some word in the masculine gender, signifying *speech*, is the antecedent, though not expressed: they explain the whole stanza thus—"That *speech*, which came forth (*nirabbhūva*) inconsiderately, of which *there was no fruit*, he "was a man who spoke nothing of that kind for his own gratification: he was a man also, by whom no "present-of-playthings was ever given, which the suppliant having received goes to another more bountiful "giver." If the relative had been *yan* in the neuter gender, I should have acquiesced in the translation offered by the *Pandits*; but the suppression of so material a word as *speech*, which, indeed, is commonly feminine in *Sanscrit*, appears unwarrantably harsh according to *European* ideas of construction.

P. 72. Verse XXVI. If the preceding interpretation be just, the object of the pillar was to perpetuate the names of *GURAVA MIS'RA* and his ancestors; and this verse must imply, that *he expected to receive from his own sons the pious offices, which he had performed to his forefathers*.

V.

SOME ACCOUNT OF THE SCULPTURES AND RUINS AT MAVALI-PURAM, A PLACE A FEW MILES NORTH OF SADRAS, AND KNOWN TO SEAMEN BY THE NAME OF THE SEVEN PAGODAS.

By WILLIAM CHAMBERS, ESQ.

AS amidst inquiries after the histories and antiquities of *Afa* at large, those of that division of it in which this Society resides, may seem on many accounts to lay claim to a particular share of its attention, a few hints put down from recollection, concerning some monuments of *Hindoo* antiquity, which, though situated in the neighbourhood of *European* settlements on the *Choromandel* coast, have hitherto been little observed, may it is conceived be acceptable, at least as they may possibly give rise hereafter to more accurate observations, and more complete discoveries on the same subject. The writer of this account went first to view them in the year 1772, and curiosity led him thither again in 1776; but as he neither measured the distances nor size of the objects, nor committed to writing at the time the observations he made on them, he hopes to be excused if after the lapse of so many years, his recollection should fail him in some respects, and his account fall far short of that precision and exactness, which might have been expected, had there then existed in *India*, so powerful an incentive to diligent enquiry and accurate communication, as the establishment of this Society must now prove.

The Monuments he means to describe, appear to be the remains of some great city, that has been ruined many centuries ago; they are situated close to the sea, between *Covelong* and *Sadras*, somewhat remote from the high road, that leads to the different *European* Settlements. And when he visited them in 1776, there was still a native village adjoining to them, which retained the antient name, and in which a number of *Bramins* resided that seemed perfectly well acquainted with the subjects of most of the Sculptures to be seen there.

The rock or rather hill of stone, on which great part of these works are executed, is one of the principal marks for mariners as they approach the coast, and to them the place is known by the name of the *Seven Pagodas*, possibly because
the

the summits of the rock have presented them with that idea as they passed: but it must be confessed, that no aspect which the hill assumes as viewed on the shore, seems at all to authorize this notion; and there are circumstances, which will be mentioned in the sequel, that would lead one to suspect, that this name has arisen from some such number of Pagodas that formerly stood here, and in time have been buried in the waves. But, be that as it may, the appellation by which the natives distinguish it, is of a quite different origin; in their language, which is the *Tamulic* (improperly termed *Malabar*) the place is called *Mávalipuram*, which in *Sanskrit*, and the languages of the more northern *Hindoo*s, would be *Mabábalipúr*, or the *City of the great Bali*. For the *Tamulians* (or *Malabars*) having no *b* in their alphabet, are under a necessity of shortening the *Sanskrit* word *Mahâ*, *great*, and write it *mâ**. They are obliged also for a similar reason to substitute a *v* for a *b*, in words of *Sanskrit*, or other foreign original that begin with that letter, and the syllable *am* at the end is merely a termination, which, like *um* in *Latin*, is generally annexed to neuter substantives†. To this etymology of the name of this place it may be proper to add, that *Bālî* is the name of a hero very famous in *Hindoo* romance, and that the river *Mávaligonga*, which waters the eastern side of *Ceylone*, where the *Tamulic* language also prevails, has probably taken its name from him, as according to that orthography, it apparently signifies the *Ganges* of the great *Bālî*.

The rock or hill of stone above mentioned; is that which first engrosses the attention on approaching the place; for as it rises abruptly out of a level plain of great extent, consists chiefly of one single stone, and is situated very near to the sea beach, it is such a kind of object as an inquisitive traveller would naturally turn aside to examine. Its shape is also singular and romantic, and, from a distant view, has an appearance like some antique and lofty edifice. On coming near to the foot of the rock from the north, works of imagery ‡ and sculpture crowd so thick upon the eye, as might seem to favour the idea of a petrified town, like those that have been fabled in different parts of the world by too credulous travellers §. Proceeding on

* They do indeed admit a substitute, but the abbreviation is most used.

† This explains also, why the *Sanskrit* word *Vêd*, by which the *Hindoo*s denominate the books of the law of their religion, is written by the *Tamulians* *Vêdam*, which is according to the true orthography of their language, and no mistake of *European* travellers as some have supposed; while the same word is called *Bêd* by the *Bengalies*, who have in effect no *V* in their alphabet.—See *Dow*, Vol. I. Dissert. P. 41.

‡ Among these, one object, though a mean one, attracts the attention on account of the grotesque and ridiculous nature of the design; it consists of two monkies cut of one stone, one of them in a stooping posture, while the other is taking the insects out of his head.

§ See *SHAW*'s Travels, P. 155, et seq.

by the foot of the hill on the side facing the sea, there is a pagoda rising out of the ground of one solid stone, about sixteen or eighteen feet high, which seems to have been cut upon the spot out of a detached rock, that has been found of a proper size for that purpose. The top is arched, and the stile of architecture according to which it is formed, different from any now used in those parts. A little further on, there appears upon an huge surface of stone, that juts out a little from the side of the hill, a numerous group of human figures in bas-relief, considerably larger than life, representing the most remarkable persons, whose actions are celebrated in the *Mabab-bárit*, each of them in an attitude, or with weapons, or other insignia, expressive of his character, or of some one of his most famous exploits. All these figures are, doubtless, much less distinct than they were at first; for upon comparing these and the rest of the sculptures that are exposed to the sea air, with others at the same place, whose situation has afforded them protection from that element, the difference is striking, the former being every where much defaced, while the others are fresh as recently finished. This defacement is no where more observable, than in the piece of sculpture which occurs next in the order of description. This is an excavation in another part of the east side of the great rock, which appears to have been made on the same plan, and for the same purpose, that Chowtries are usually built in that country, that is to say, for the accommodation of travellers. The rock is hollowed out to the size of a spacious room, and two or three rows of pillars are left, as a seeming support to the mountainous mass of stone which forms the roof. Of what pattern these pillars have originally been, it is not easy now to conjecture, for the air of the sea has greatly corroded them, as well as all the other parts of the cave. And this circumstance renders it difficult to discover at first sight, that there is a scene of sculpture on the side fronting the entrance. The natives, however, point it out, and the subject of it is manifestly that of *Krishen* attending the herds of *Nund Gbse*, the *Admetus* of the *Hindoo*s, from which circumstance, *Krishen* is also called *Gopaul*, or the cowherd, as *Apollo* was entitled *Nomius*.

The objects that seem next to claim regard, are those upon the hill itself, the ascent of which, on the north, is, from its natural shape, gradual and easy at first, and is in other parts rendered more so, by very excellent steps cut out in several places, where the communication would be difficult or impracticable without them. A winding stair of this sort leads to a kind of temple cut out of the solid rock, with some figures of idols in high relief, upon its walls, very well finished and perfectly fresh, as it faces the west, and is therefore sheltered from the sea air. From this temple

again there are flights of steps that seem to have led to some edifice, formerly standing upon the hill, nor does it seem absurd to suppose, that this may have been a palace, to which this temple, as a place of worship, may have appertained. For besides the small detached ranges of stairs that are here and there cut in the rock, and seem as if they had once led to different parts of one great building, there appear in many places, small water channels cut also in the rock, as if for drains to an house, and the whole top of the hill is strewed with small round pieces of brick, which may be supposed from their appearance to have been worn down to their present form, during the lapse of many ages. On ascending the hill by its slope on the north, a very singular piece of sculpture presents itself to view. On a plain surface of the rock, which may once have served as the floor of some apartment, there is a platform of stone, about eight or nine feet long, by three or four wide, in a situation rather elevated, with two or three steps leading up to it, perfectly resembling a couch or bed, and a lion very well executed at the upper end of it by way of pillow, the whole of one piece, being part of the hill itself. This the *Bramins*, inhabitants of the place, call *the bed of Dermarajah* or *Judisther*, the eldest of the five brothers whose fortunes and exploits are the leading subject in the *Mababbarit*. And at a considerable distance from this, at such a distance indeed as the apartment of the women might be supposed to be from that of the men, is a bath excavated also from the solid rock, with steps in the inside, which the *Bramins* call the bath of *Dropedy*, the wife of *Judisther* and his brothers. How much credit is due to this tradition, and whether this stone couch may not have been antiently used as a kind of throne rather than a bed, is matter for future inquiry. A circumstance, however, which may seem to favour this idea is, that a throne in the *Sanscrit* and other *Hindoo* languages is called *Singbâsen*, which is composed of the words *Sing* a lion, and *âsen* a seat.

There are all that appear on that part of the upper surface of the hill, the ascent to which is on the north, but on descending from thence you are led round the hill to the opposite side, in which there are steps cut from the bottom to a place near the summit, where is an excavation that seems to have been intended for a place of worship, and contains various sculptures of *Hindoo* Deities. The most remarkable of these, is a gigantic figure of *Visnoo*, asleep on a kind of bed, with a huge snake wound about in many coils by way of pillow for his head, and these figures, according to the manner of this place, are all of one piece hewn from the body of the rock.

But though these works may be deemed stupendous, they are surpassed by others that

that are to be seen at the distance of about a mile, or a mile and an half to the southward of the hill. They consist of two Pagodas of about thirty feet long by twenty feet wide, and about as many in height, cut out of the solid rock, and each consisting originally of one single stone. Near these also stand an elephant full as big as life, and a lion much larger than the natural size, but very well executed, each hewn also out of one stone. None of the pieces that have fallen off in cutting these extraordinary sculptures, are now to be found near or any where in the neighbourhood of them, so that there is no means of ascertaining the degree of labour and time that has been spent upon them, nor the size of the rock or rocks from which they have been hewn, a circumstance which renders their appearance the more striking and singular. And though their situation is very near the sea-beach, they have not suffered at all by the corrosive air of that element, which has provided them with a defence against itself, by throwing up before them a high bank that completely shelters them. There is also great symmetry in their form, though that of the Pagodas is different from the stile of architecture, according to which idol temples are now built in that country. The latter resembles the *Egyptian*, for the towers are always pyramidal, and the gates and roofs flat and without arches, but these sculptures approach nearer to the *Gothick* taste, being surmounted by arched roofs or domes that are not semicircular but composed of two segments of circles meeting in a point at top. It is also observable that the lion in this group of sculptures, as well as that upon the stone couch above mentioned, are perfectly just representations of the true lion, and the natives there give them the name, which is always understood to mean a lion in the *Hindoo* language, to wit, *Sing*; but the figure which they have made to represent that animal in their idol temples for centuries past, though it bears the same appellation, is a distorted monster totally unlike the original; insomuch that it has from hence been supposed, that the lion was not antiently known in this country, and that *Sing* was a name given to a monster, that existed only in *Hindoo* romance. But it is plain that that animal was well known to the authors of these works, who in manners as well as arts seem to have differed much from the modern *Hindoos*.

There are two circumstances attending these monuments, which cannot but excite great curiosity, and on which future inquiries may possibly throw some light. One is, that on one of the Pagodas last mentioned, there is an inscription of a single line, in a character at present unknown to the *Hindoos*. It resembles neither the *Deyva-nâgre*, nor any of the various characters connected with or derived from it,

which

which have come to the writer's knowledge from any part of *Hindostan*. Nor did it, at the time he viewed it, appear to correspond with any character, *Asiatick* or *European*, that is commonly known. He had not then, however, seen the alphabet of the *Balic*, the learned language of the *Siamese*, a sight of which has since raised in his mind a suspicion, that there is a near affinity between them, if the character be not identically the same. But as these conjectures, after such a lapse of time, are somewhat vague, and the subject of them is perhaps yet within the reach of our researches, it is to be hoped that some method may be fallen upon of procuring an exact copy of this inscription.

The other circumstance is, that though the outward form of the Pagodas is complete, the ultimate design of them has manifestly not been accomplished, but seems to have been defeated by some extraordinary convulsion of nature. For the western side of the most northerly one, is excavated to the depth of four or five feet, and a row of pillars left on the outside to support the roof, but here the work has been stopped, and an uniform rent of about four inches breadth has been made throughout the solid rock, and appears to extend to its foundations, which are probably at a prodigious depth below the surface of the ground. That this rent has happened since the work begun, or while it was carrying on, cannot be doubted, for the marks of the mason's tools are perfectly visible in the excavated part on both sides of the rent, in such a manner as to show plainly, that they have been divided by it. Nor is it reasonable to suppose, that such a work would ever have been designed, or begun, upon a rock that had previously been rent in two.

Nothing less than an earthquake, and that a violent one, could apparently have produced such a fissure in the solid rock; and that this has been the case in point of fact, may be gathered from other circumstances, which it is necessary to mention in an account of this curious place.

The great rock above described is at some small distance from the sea, perhaps fifty or an hundred yards, and in that space the *Hindoo* village before mentioned stood in 1776. But close to the sea are the remains of a Pagoda built of brick, and dedicated to *Sib*, the greatest part of which has evidently been swallowed up by that element; for the door of the innermost apartment, in which the idol is placed, and before which there are always two or three spacious courts surrounded with walls, is now washed by the waves, and the pillar used to discover the meridian at the time of founding the Pagoda*, is seen standing at some distance in the sea.

* See Voyage du M. Gentil, Vol. I. Page 158.

In the neighbourhood of this building, there are some detached rocks, washed also by the waves, on which there appear sculptures, though now much worn and defaced. And the natives of the place declared to the writer of this account, that the more aged people among them, remembered to have seen the tops of several Pagodas far out in the sea, which being covered with copper (probably gilt) were particularly visible at sun-rise, as their shining surface used then to reflect the sun's rays, but that now that effect was no longer produced, as the copper had since become incrusted with mould and verdigrease.

These circumstances look much like the effects of a sudden inundation, and the rent in the rock above described, makes it reasonable to conjecture, that an earthquake may have caused the sea to overflow its boundaries, and that these two formidable enemies, may have joined to destroy this once magnificent city. The account which the *Bramins*, natives of the place, gave of its origin and downfall, partly it should seem on the authority of the *Mababbârit*, and partly on that of later records, at the same time that it countenances this idea, contains some other curious particulars which may seem to render it worthy of attention. Nor ought it to be rejected on account of that fabulous garb, in which all nations, but especially those of the east, have always clad the events of early ages.

“ *Hirindcheren*, said they, was a gigantick prince, that rolled up the earth into a
 “ shapeless mass, and carried it down to the abyss, whither *Visnoo* followed him
 “ in the shape of an hog, killed him with his tusks, and replaced the earth in its
 “ original situation. The younger brother of *Hirindcheren* was *Hirinakassap*, who
 “ succeeded him in his kingdom, and refused to do homage to *Visnoo*. He had a
 “ son named *Pralbaud*, who at an early age openly disapproved this part of his fa-
 “ ther's conduct, being under the tuition of *Sokerâchârj*. His father persecuted
 “ him on this account, banished him, and even sought to kill him, but was pre-
 “ vented by the interposition of heaven, which appeared on the side of *Pralbaud*.
 “ At length *Hirinakassap* was softened, and recalled his son to his court, where as
 “ he sat in full assembly, he began again to argue with him against the supremacy
 “ of *Visnoo*, boasted that he himself was lord of all the visible world, and asked
 “ what *Visnoo* could pretend to more. *Pralbaud* replied, that *Visnoo* had no
 “ fixed abode, but was present every where. Is he, said his father, in that pillar?
 “ Yes, returned *Pralbaud*. Then let him come forth, said *Hirinakassap*; and rising
 “ from his seat, struck the pillar with his foot; upon which *Visnoo*, in the
 “ *Narasinghab Awtâr*, that is to say, with a body like a man, but an head like a
 “ lion,

“ lion, came out of the pillar and tore *Hirinakassap* in piéces. *Visbnoo* then fixed
 “ *Pralbaud* on his father's throne, and his reign was a mild and virtuous one,
 “ and as such was a contrast to that of his father. He left a son named *Namachee*
 “ who inherited his power and his virtues, and was the father of *Balee*, the founder
 “ of the once magnificent city of *Mababalipoor*, the situation of which is said to be
 “ described in the following verse, taken from the *Mahabbárit*.

गङ्गायाः दक्षिणेभागे योजनानां शतद्वयम्—

पञ्चयोजन यात्रो पूर्वदिशि पश्चिमे—

The sense of which is literally this :

“ South of the *Ganges* two hundred *Yojen*

“ Five *Yojen* * westward from the eastern sea.”

Such is the *Bramin* account of the origin of this place. The sequel of its history, according to them, is as follows :

“ The son of *Balee* was *Banácheren*, who is represented as a giant with a
 “ thousand hands. *Anuredh*, the son of *Krishen*, came to his court in disguise, and
 “ seduced his daughter, which produced a war, in the course of which *Anuredh* was
 “ taken prisoner, and brought to *Mababalipoor*, upon which *Krishen* came in person
 “ from his capital *Duárikab*, and laid siege to the place. *Sib* guarded the gates, and
 “ fought for *Banácheren*, who worshipped him with his thousand hands, but *Krishen*
 “ found means to overthrow *Sib*, and having taken the city cut off all *Banácheren*'s
 “ hands except two, with which he obliged him to do him homage. He conti-
 “ nued in subjection to *Krishen* till his death, after which a long period ensued, in
 “ which no mention is any where made of this place, till a Prince arose whose
 “ name was *Malécheren*, who restored the kingdom to great splendour and enlarged
 “ and beautified the capital. But in his time the calamity is said to have happened
 “ by which the city was entirely destroyed, and the cause and manner of it, have
 “ been wrapt up by the *Bramins*, in the following fabulous narration. *Malécheren*,
 “ say they, in an excursion, which he made one day alone and in disguise, came
 “ to a garden in the environs of the city, where was a fountain so inviting, that
 “ two celestial nymphs had come down to bathe there. The *Rajah* became

* The *Yojen* is a measure often mentioned in the *Sanscrit* books, and according to some accounts is equal to nine, according to others twelve *English* miles. But at that rate the distance here mentioned, between this place and the *Ganges*, is prodigiously exaggerated, and will carry us far south of *Ceylon*; this, however, is not surprising in an *Hindoo* poem, but from the second line it seems pretty clear that this city at the time this verse was composed must have stood at a great distance from the sea.

“ enamoured

" enamoured of one of them, who condescended to allow of his attachment to
 " her, and she and her sister nymph used thenceforward to have frequent inter-
 " views with him in that garden. On one of those occasions, they brought with
 " them a male inhabitant of the heavenly regions, to whom they introduced the
 " *Rajah*; and between him and *Maléberén* a strict friendship ensued. In conse-
 " quence of which he agreed, at the *Rajah's* earnest request, to carry him in dis-
 " guise to see the court of the divine *Inder*, a favour never before granted to any
 " mortal. The *Rajah* returned from thence, with new ideas of splendour and
 " magnificence, which he immediately adopted in regulating his court, and his re-
 " tinue, and in beautifying his seat of government. By this means *Mabábalipoor*
 " became soon celebrated beyond all the cities of the earth, and an account of its
 " magnificence having been brought to the gods assembled at the court of *Inder*,
 " their jealousy was so much excited at it, that they sent orders to the God of the
 " sea to let loose his billows and overflow a place, which impiously pretended to
 " vie in splendour, with their celestial mansions. This command he obeyed, and
 " the city was at once overflowed by that furious element, nor has it ever since
 " been able to rear its head."

Such is the mode in which the *Bramins* chuse to account for the signal over-throw of a place, devoted to their wretched superstitions.

It is not, however, improbable, that the rest of this history may contain, like the mythology of *Greece* and *Rome*, a great deal of real matter of fact, though enveloped in dark and figurative representations. Through the disguise of these, we may discern some imperfect records of great events, and of revolutions that have happened in remote times, and they perhaps merit our attention the more, as it is not likely that any records of ancient *Hindoo* history exist, but in this obscure and fantastic dress. Their poets seem to have been their only historians, as well as divines, and whatever they relate, is wrapped up in this burlesque garb, set off, by way of ornament, with circumstances hugely incredible and absurd, and all this without any date, and in no other order or method, than such as the poet's fancy suggested, and found most convenient. Nevertheless, by comparing names and grand events, recorded by them, with those interspersed in the histories of other nations, and by calling in the assistance of ancient monuments, coins, and inscriptions as occasion shall offer, some probable conjectures at least, if not important discoveries, may, it is hoped, be made on these interesting subjects. It is much to be regretted, that a blind zeal, attended with a total want of curiosity, in the *Moham-
 * * * * *
 medan*

medan governors of this country, have been so hostile to the preservation of *Hindoo* monuments and coins. But a spirit of inquiry among *Europeans* may yet perhaps be successful, and an instance which relates to the place above described, though in itself a subject of regret, leaves room to hope, that futurity may yet have in store some useful discoveries. The *Kauzy* of *Madras*, who had often occasion to go to a place in the neighbourhood of *Mababalipoor*, assured the writer of this account, that within his remembrance, a ryot of those parts had found, in plowing his ground, a pot of gold and silver coins, with characters on them which no one in those parts, *Hindoo* or *Mohammedan*, was able to decypher. He added, however, that all search for them would now be vain, for they had doubtless been long ago devoted to the crucible, as, in their original form, no one there thought them of any value.

The inscription on the Pagoda mentioned above, is an object, which, in this point of view, appears to merit great attention. That the conjecture, however, which places it among the languages of *Siam*, may not seem in itself chimerical, the following passages from some authors of repute, are here inserted to show, that the idea of a communication having formerly subsisted between that country and the Coast of *Choromandel*, is by no means without foundation, nay, that there is some affinity, even at this day, between the *Balic* and some of the *Hindoo* languages, and that the same mode of worship seems formerly to have prevailed in the *Deckan*, which is now used by the *Siamese*.

MONSIEUR DE LA LOUBERE, in his excellent account of *Siam*, speaks thus of the origin of the *Balic* language.

“ The *Siamese*, says he, do not mention any country, where the *Balic* language, which is that of their laws and their religion, is at present in use. They suppose, indeed, on the report of some among them, who have been on the Coast of *Choromandel*, that it bears some resemblance to some of the dialects of that country, but they at the same time allow, that the character in which it is written, is not known but among themselves. The secular missionaries settled at *Siam* believe that this language is not entirely a dead one; because they have seen in their hospital, a man from the neighbourhood of *Cape Comorin*, who mixed several *Balic* words in his discourse, declaring that they were in use in his country, and that he himself had never studied nor knew any other than his mother tongue. They at the same time mention, as matter of certainty, that the religion

“ religion of the Siamese comes from those parts, as they have read in a Balic book that Sommonacodom, the idol of the Siamese, was the son of a king of Ceylone *.”

The language of the man mentioned in this passage, who came from the neighbourhood of *Cape Comorin*, could be no other than the *Tamulic*; but the words here alluded to may very possibly have been derivatives from the *Sanscrit*, common to both that and the *Balic*.

In another part of the same work, where the author treats of the history of *Sommonacodom* at large, on the authority of the *Balic* books, he says :

“ The father of Sommonacodom, according to the same Balic book, was a king of Teve Lanca, that is to say, of the famous Ceylone †.”

Here it is observable that while the country of *Siam* seems to be utterly unknown, both to the natives of *Ceylone* and *Hindoestan*, *Ceylone* should nevertheless be so well known to the *Siamese*, and under the same appellation it bears in the *Sanscrit*. An epithet is also here prefixed to it, which seems to be the same as that used by the *Hindoos* in speaking of that island, for they also call it in *Sanscrit* *Déve Lanca* or *the Sacred Lanca*. From several passages in the same work it also appears, that the *Sanscrit* word *Mahâ*, which signifies *great*, is constantly used in the *Balic* language in the same sense. And the names of the days of the week are most of them the same in *Sanscrit* and in *Balic*, as may be seen in the following comparison of them.

<i>Sanscrit.</i>	<i>Balic.</i>	
Aditta-vâr,	Van Athit,	Sunday.
Soma-vâr,	Van † Tchân,	Monday.
Mungela-vâr,	Van Angkaan,	Tuesday.
Bouta-vâr,	Van Pout,	Wednesday.
Brahspati-vâr,	Van Prahout,	Thursday.
Soucra-vâr,	Van Souc,	Friday.
Sany-vâr,	Van Sãoa,	Saturday.

* “ Les Siamois ne nomment aucun pays, où la langue Bali, qui est celle de leurs loix et de leur religion, soit aujourd'hui en usage. Ils soupçonnent à la vérité, sur la rapport de quelques-uns d'entre eux, qui ont été à la côte de Coromandel, que la langue Balic a quelque ressemblance avec quelqu'un des dialectes de ce pays-là : mais ils connoissent en même temps que les lettres de la langue Balic ne sont connues que chez eux. Les Missionnaires séculiers à Siam croyent que cette langue n'est pas entièrement morte; parce qu'ils ont vu dans leur hôpital un homme des environs du Cap de Comorin, qui mettoit plusieurs mots Balis dans son langage, assurant qu'ils étoient en usage en son pays, et que lui n'avoit jamais étudié et ne favoit que sa langue maternelle. Ils donnent d'ailleurs pour certain que la religion des Siamois vient de ces quartiers-là, parce qu'ils ont lu dans un livre Balic que Sommonacodom, que les Siamois adorent, étoit fils d'un Roi de l'isle de Ceylone.”

† “ Le père de Sommonacodom étoit, selon ce même livre Bali, un Roi de Teve Lanca, c'est à dire, un Roi de la célèbre Ceylan.”

‡ Here one *Hindoos* word is substituted for another, for *Tchân* in *Hindoostan*, and *Tchänder* in *Sanscrit*, signify the moon as well as *Soma*.

The same author gives, in another place, an account of a pretended print of a foot on a rock, which is an object of worship to the *Siamefe*, and is called *Prabât*, or the venerable foot. For *Prâ* in *Balic*, he says, signifies *venerable*, which agrees with *prâper* and *pramest* in *Sanskrit*; and *Bât* in the same tongue is a foot, as *Pâd* in *Sanskrit*. After which he goes on to say :

“ We know that in the island of Ceylone, there is a pretended print of a human foot, which has long been held in great veneration. It represents, doubtless, the left foot, for the *Siamefe* say that *Sommonacodom* set his right foot on their *Prabat*, and his left foot at *Lanca* *.”

From *KNOX*'s history of *Ceylone* it appears, that the impresson here spoken of is upon the hill called by the *Chingelays* *Hamaell*, by *Europeans* *Adam's Peak*. And that the natives believe it to be the foot-step of their great idol *Buddou*. Between the worship of whom, as described by *KNOX*, and that of *Sommonacodom*, as related by *M. DE LA LOUBERE*, there is a striking resemblance in many particulars, which it may be proper here to enumerate.

1st. Besides the foot-steps above mentioned, there is a kind of tree (which from description appears to be the *Pipel* tree, so well known in *India*), which the *Chingelays* hold sacred to *Buddou*, and the *Siamefe* to *Sommonacodom*. Infomuch that the latter deem it meritorious to hang themselves upon it. The *Chingelays* called it *Bogabab*; for *gabab*, in their language, signifies a tree, and *bo* seems to be an abbreviation of *Bod* or *Buddou*; and the *Siamefe* call it in *Balic*, *Prâ si Mabâ Pout*, which according to *DE LA LOUBERE*'s interpretation, signifies the tree of the great *Pout* †. This he supposes to mean *Mercury*, for he observes that *Pout* or *Poot* is the name of that planet in the *Balic* term for *Wednesday*; and in another place, he says, *Pout* is one of the names of *Sommonacodom*. It is certain that *Wednesday* is called the day of *Bod* or *Budd* in all the *Hindoo* languages, among which the *Tamulic*, having no *b*, begins the word with a *p*, which brings it very near the *Balic* mode of writing it. It is equally certain that the days of the week in all these languages, are called after the planets in the same order as with us, and that *Bod*, *Budd*, or *Pood*, holds the place of *Mercury*. From all which it should appear that *Pout*, which among the *Siamefe* is another name for *Sommonacodom*, is itself a corruption of *Buddou*, who is the *Mercury* of the *Greeks*. And it is singular

* “ On fait que dans l'isle de Ceylan, il y a un pretendu vestige de pied humain, que depuis long-temps y est en grande veneration. Il represente sans doute le pied gauche; car les Siamois disent que *Sommonacodom* posa le pied droit à leur *prabat*, et le pied gauche à *Lanca*.”

† In vulgar *Siamefe* they call it *Ton-pô*.

that,

that, according to M. DE LA LOUBERE, the mother of *Sommonacodom* is called in *Balic Maba-mania*, or the *great Mania*, which resembles much the name of *Maia*, the mother of *Mercury*. At the same time that the *Tamulic* termination *en*, which renders the word *Pooden*, creates a resemblance between this and the *Woden* of the *Gotthick* nations, from which the same day of the week is denominated, and which on that and other accounts is allowed to be the *Mercury* of the *Greeks*.

2dly. The temples of *Sommonacodom* are called *Pibán*, and round them are habitations for the priests resembling a college; so those of *Boddou* are called *Vibár*, and the principal priests live in them as in a college. The word *Vibár*, or as the natives of *Bengal* would write it *Bibár*, is *Sanscrit*; and *Ferishtab*, in his history of *Bengal*, says, that this name was given by the *Hindoos* to the province of *Behár*, because it was formerly so full of *Bramins* as to be, as it were, one great *seminary of Learning*, as the word imports.

3dly. The *Siamese* have two orders of priests, and so have the worshippers of *Buddou*. Both the one and the other are distinguished by a yellow habit, and by another circumstance which must be mentioned in the words of the respective authors. KNOX says of the *Buddou* priests, "They have the honour of carrying the *Tallipot* with the broad end over their heads foremost, which none but the king does." And M. DE LA LOUBERE says of the *Siamese* priests, "To defend themselves from the sun they have the *Talapat*, which is their little umbrella in the form of a screen*."

The word here used is common to most of the *Hindoo* languages, and signifies the leaf of the *Palmyra tree*. M. DE LA LOUBERE mentions it as a *Siamese* word, without seeming to know its origin or primary signification.

4thly. The priests of *Buddou*, as well as those of *Sommonacodom*, are bound to celibacy, as long as they continue in the profession; but both the one and the other are allowed to lay it down and marry.

5thly. They both eat flesh, but will not kill the animal.

6thly. The priests of either nation are of no particular tribe, but are chosen out of the body of the people.

These circumstances plainly show that this is a system of religion different from that of the *Véds*, and some of them are totally inconsistent with the principles and practice of the *Bramins*. And indeed it is manifest from KNOX's whole account,

* "Pour se garantir du soleil ils ont le Talapat, qui est leur petit parasol en forme d'écran."

that the religion of the *Chingelays* is quite distinct from that which prevails at this day among the *Hindoos*, nor does it appear that there is such a race of men as that of the *Bramins* among them. The only part in which there seems to be any agreement is in the worship of the *Debtabs*, which has probably crept in among them from their *Tamulian* neighbours, but that is carried on in a manner very different from the *Braminical* system, and appears to be held by the nation at large in very great contempt if not abhorrence. KNOX's account of it is this: "Their temples" (i. e. those of the *Debtabs*) are, he says, called *Covels*," which is the *Tamulic* word for *Pagoda*. He then goes on to say, "A man piously disposed, builds a small house at his own charge, which is the *temple*, and *himself becomes priest thereof*. This house is seldom called *God's House*, but most usually *Jacco the Devil's*." But of the prevailing religion he speaks in very different terms, and describes it as carried on with much parade and splendour, and attended with marks of great antiquity. "The Pagodas or temples of their Gods, says he, are so many that I cannot number them. Many of them are of rare and exquisite work; built of hewn stone, engraven with images and figures, but by whom and when I could not attain to know, the inhabitants themselves being ignorant therein. But sure I am they were built by far more ingenious artificers than the *Chingelays* that now are on the land. For the Portuguese in their invasions have defaced some of them, which there is none found that hath skill enough to repair to this day." In another place, he says; "Here are some antient writings engraven upon rocks which puzzle all that see them. There are divers great rocks in divers parts in *Cande Uda*, and in the northern parts. These rocks are cut deep with great letters for the space of some yards, so deep that they may last to the world's end. No body can read them; or make any thing of them. I have asked Malabars and Gentoos, as well as *Chingelays* and Moors, but none of them understood them. There is an antient temple, *Goddiladenni* in *Yattanour*, stands by a place where there are of these letters." From all which the antiquity of the nation and their religion is sufficiently evident, and from other passages it is plain, that the worship of *Buddou* in particular, has been from remote times a very eminent part of that religion; for the same author, speaking of the tree at *Anurodgburro*, in the northern part of the island, which is sacred to *Buddou*, says, "The due performance of this worship they reckon not a little meritorious: insomuch that, as they report, ninety kings have reigned there successively, where, by the ruins that still remain, it appears they spared not for pains and labour, to build temples and high monuments to

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“ the honour of this God, as if they had been born to hew rocks and great stones, and lay them up in heaps. These kings are now happy spirits, having merited it by these labours.” And again he says, “ For this God above all other, they seem to have an high respect and devotion,” &c.

And from other authorities it will appear, that this worship has formerly been by no means confined to *Ceylone*, but has prevailed in several parts of *India* prior to that of the *Bramins*, nay that this has been the case even so late as the ninth and twelfth centuries of the *Christian Era*.

In the well-known * *Anciennes Relations*, translated from the *Arabick*, by that eminent Orientalist EUSEBIUS RENAUDOT, the *Arabian* traveller gives this account of the custom of dancing-women, which continues to this day in the *Decan*, but is not known among the *Hindoos* of *Bengal* or *Hindoostan* proper.

“ There are in *India* publick women, called *women of the idol*, and the origin of this custom is this: when a woman has made a vow for the purpose of having children, if she brings into the world a pretty daughter, she carries it to *Bod*, so they call the idol which they adore, and leaves it with him †.”

This is a pretty just account of this custom, as it prevails at this day in the *Decan*, for children are indeed devoted to this profession by their parents, and when they grow up in it, they are called in *Tamulic* *Devadâsi* or *female slaves of the idol*. But it is evident they have changed their master since this *Arabian* account was written, for there is no idol of the name of *Bod* now worshipped there. And the circumstance, of this custom being unknown in other parts of *India*, would lead one to suspect, that the *Bramins*, on introducing their system of religion into that country, had thought fit to retain this part of the former worship, as being equally agreeable to themselves and their new disciples.

The same *Arabian* travellers give us an account of a very powerful race of *Hindoo* kings, according to them indeed the most powerful in *India*, who then reigned on the *Malabar* coast with the title of *Balbâra*. Their dominion appears to have extended over *Guzerat*, and the greatest part, if not the whole, of the antient kingdom of *Vishapoor*. For the *Arabian* geographer quoted by M. RENAUDOT, makes *Nabekvârab* the metropolis of these princes, which is doubtless *Nabervalab*, the

* *Anciennes relations des Indes et de la Chine, de deux voyageurs Mohametans, qui y allèrent dans le neuvième siècle. Paris, 1718, 8vo.*

† “ Il y a dans les Indes des femmes publiques, appellés femmes de l'idole, l'origine de cette coutume est telle: Lors qu'une femme a fait un voeu pour avoir des enfans, si elle met au monde une belle fille, elle l'apporte au *Bod*, c'est ainsi qu'ils appellent l'idole qu'ils adorent, auprès duquel elle la laisse, &c.” *Anc. Rel. p. 109.*

ancient capital of *Guzerat*, though M. RENAUDOT seems not to have known that place; and the rest of the description sufficiently shows the great extent of their dominion southward. M. D'ANVILLE speaks of this race of kings on the authority of the *Arabian* geographer EDRISI, who wrote in the twelfth century, according to whom it appears that their religion was, even so late as that period, not the *Braminical*, but that of which we are now speaking. M. D'ANVILLE's words are these: "Edrisi acquaints us with the religion which this prince professed in saying; that his worship was addressed to *Bodda*, who according to St. Jerome and Clemens Alexandrinus was the founder of the sect of the Gymnosophists, in like manner as the Bramins were used to attribute their institution to Brahma*."

The authority of CLEMENS ALEXANDRINUS is also cited on the same subject by RELANDUS in his 11th Dissertation, where, treating of the language of *Ceylone*, he explains the word *Vebâr*, above spoken of, in these terms:

"Vehâr signifies a temple of their principal God Buddou, who, as Clemens Alexandrinus has long ago observed, was worshipped as a God by the Hindoos †"

After the above quotations, the following extract from the voyage of that inquisitive and ingenious traveller M. GENTIL, published in 1779, is given as a further and very remarkable illustration of this subject.

"This system is also that of the Bramins of our time; it forms the basis of that religion, which they have brought with them into the southern parts of the Peninsula of Hindostan, into Madura, Tanjore, and Maïssore.

"There was then in those parts of India, and principally on the Coast of Choromandel and Ceylone, a sort of worship, the precepts of which we are quite unacquainted with. The god Baouth, of whom at present they know no more in India than the name, was the object of this worship; but it is now totally abolished, except that there may possibly yet be found some families of Indians, who have remained faithful to Baouth, and do not acknowledge the religion of the Bramins, and who are on that account separated from and despised by the other casts.

"I have not indeed heard that there are any such families in the neighbourhood of Pondichery, but there is a circumstance well worthy of remark, which none of the travellers that have treated of the Coast of Choromandel and Pondichery

* "L'Edrisi nous instruit sur la religion que professoit ce Prince, en disant que son culte s'adressoit à Bodda, que selon St. JEROME et St. CLEMENT D'ALEXANDRIE, avoit été l'instituteur des Gymnophistes comme les Brachmanes rapportoient à Brahma leur institut." *Ant. Geog. de l'Inde*, p. 94.

† "*Vebâr*, templum dei primarii Buddoe *Boutra* quem Indos ut Deum venerari jam olim notavit Clemens Alexandrinus." *Strom. lib. 1. p. 223. Rel. Diss. pars tertia*, p. 85.

"seem

“ seem to have noticed. It is this, that at a short league’s distance to the south of this town, in the plain of Virapatnam, and pretty near the river, we find a statue of granite very hard and beautiful. This statue, which is from three feet to three and an half in height, is sunk in the sand to the waist, and weighs doubtless many thousand weight ; it is, as it were, abandoned in the midst of this extensive plain. I cannot give a better idea of it, than by saying, that it exactly agrees with and resembles the Sommonacodom of the Siamese ; its head is of the same form, it has the same features, its arms are in the same attitude, and its ears are exactly similar. The form of this divinity, which has certainly been made in the country, and which in no respect resembles the present idols of the Gentoos, struck me as I passed this plain ; I made various inquiries concerning this singular figure, and the Tamulians one and all assured me that this was the god Baouth, who was now no longer regarded, for that his worship and his festivals had been abolished, ever since the Bramins had made themselves masters of the people’s faith *.”

M. GENTIL then goes on to say a good deal more upon this subject, in the course of which he supposes, that this deity is the *Fo* of the *Cbinese*, whose worship, by their own accounts, was brought from *India*. And indeed the abridgment of the name *Pout*, mentioned in a note of this paper, which the vulgar *Siamese* reduce to the single syllable *Po*, seems to countenance this opinion. But as this is foreign to our present purpose, and the above passages, it is hoped, are sufficient to establish what was proposed, it seems high time to take leave of this subject, with an apology for that prolixity, which is inseparable from this kind of discussion.

17th June, 1784.

* “ Ce système est aussi celui des Brame de nos jours ; il fait la base de la religion qu’ils ont apportée dans le sud de le presqu’île de l’Indostan, le Madure, le Tanjaour, et le Maïssour.
 “ Il y avoit alors dans ces parties de l’Inde, et principalement à la côte de Coromandel et à Ceylan, un culte dont on ignore absolument les dogmes : le dieu Baouth, dont on ne connoit aujourd’hui, dans l’Inde, que le nom, étoit l’objet de ce culte ; mais il est tout-à-fait aboli, si ce n’est qu’il se trouve encore quelques familles d’Indiens séparées et méprisées des autres castes, qui sont restées fidèles à Baouth, et qui ne reconnoissent point la religion des Brame.
 “ Je n’ai pas entendu dire qu’il y ait de ces familles aux environs de Pondichery ; cependant, une chose très-digne de remarque, et à laquelle aucun des voyageurs qui parlent de la côte de Coromandel et de Pondichery, n’ont fait attention, est que l’on trouve à une petite lieue au sud de cette ville, dans la plaine de Virapatnam, assez près de la rivière, une statue de *Granit* très-dur et très-beau : cette statue, d’environ trois pieds à trois pieds et demi de hauteur, est enfoncée dans le sable jusqu’à la ceinture, et pese sans doute plusieurs milliers ; elle est comme abandonnée au milieu de cette vaste plaine : je ne peux mieux en donner une idée, qu’en disant qu’elle est exactement conforme et ressemblante à *Sommonacodom* des Siamois ; c’est la même forme de tête, ce sont les mêmes traits dans le visage, c’est la même attitude dans les bras, et les oreilles sont absolument semblables. La forme de cette divinité, qui certainement a été faite dans le pays, et qui ne ressemble en rien aux divinités actuelles des Gentils, m’avoit frappé lorsque je passai dans cette plaine ; je fis diverses informations sur cette figure singulière, les Tamouls m’assurèrent tous que c’étoit Baouth qu’on ne regardoit plus ; que son culte et ses fêtes étoient cessées depuis que les Brame s’étoient rendus les maîtres de la croyance du peuple.”

VI.

HINTS RELATIVE TO FRICTION IN MECHANICKS.

By MR. REUBEN BURROW.

HYPOTHESIS.

IN the following estimation of friction, the weight or force necessary to overcome the resistance, &c. is supposed to be proportional to the pressure.

OF FRICTION IN THE INCLINED PLANE.

Let AB be an inclined plane *, and let PR represent a weight sustained on it by any force Rm acting in the direction Rm; and draw PD perpendicular to AB, and let Rm meet PD in n: Now as Rn represents the force that would be necessary to sustain the body, exclusive of friction, and Pn represents the pressure against the plane; if mt be drawn perpendicular to PD meeting it in t, then will nm be the force necessary to overcome the friction in that direction, and Pt the real pressure against the plane AB, when the whole force Rm necessary to overcome both the weight and the friction, acts in the direction Rm; and as the force nm is equivalent to nt and tm; and nt has no other effect than to alter the pressure, therefore tm is the only force which overcomes the resistance of friction; and as this force is as the pressure, therefore tm is proportional to Pt, and hence the Locus of all the points m, is a right line.

Again, suppose the body, instead of being drawn along, to be sustained at rest only upon the plane; this, it is evident, will require a less force than the other, because the friction prevents the body in part from descending †: Let Rm be the force required, and let the same construction be made as before; then because Rn is the force that would be necessary if there was no friction; mn is the effect of the friction itself; but mn is equivalent to the forces mt and tn; and as Pn would be the pressure exclusive of friction, Pt is the pressure inclusive; and as the force lost is as the friction, and mt is as the force lost, therefore mt is as Pt, for the friction is as the pressure; consequently the Locus of all the points m is a right line passing

* Fig. 1.

† Fig. 2.

through

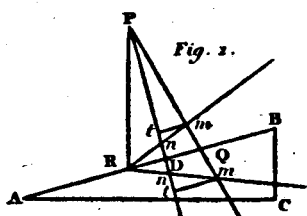


Fig. 2.

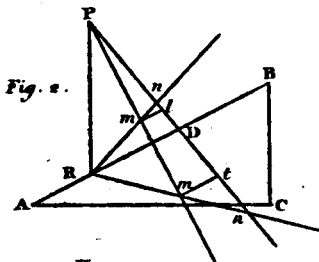


Fig. 4.

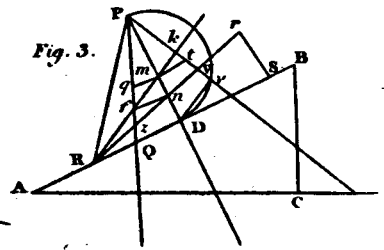


Fig. 3.

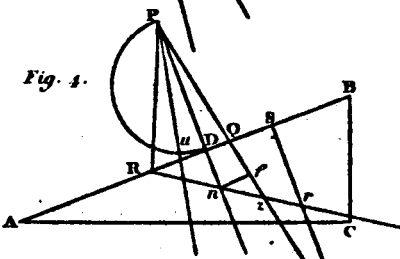


Fig. 4.

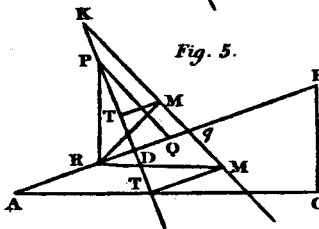


Fig. 5.

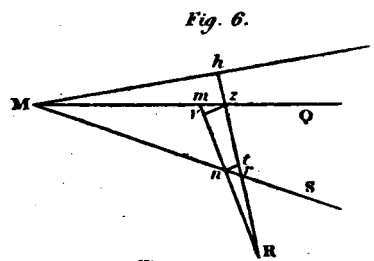


Fig. 6.

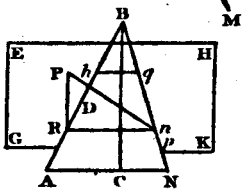


Fig. 7.

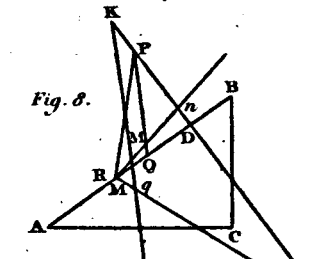


Fig. 8.

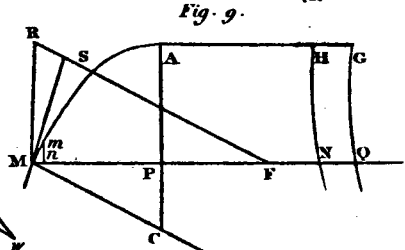


Fig. 9.

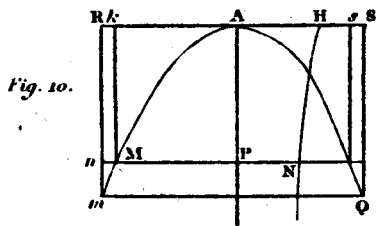


Fig. 10.

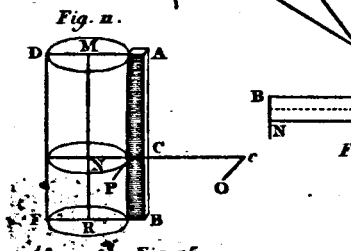


Fig. 11.

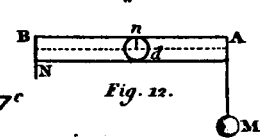


Fig. 12.

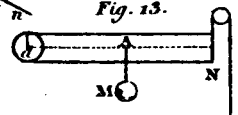


Fig. 13.

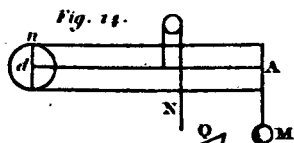


Fig. 14.

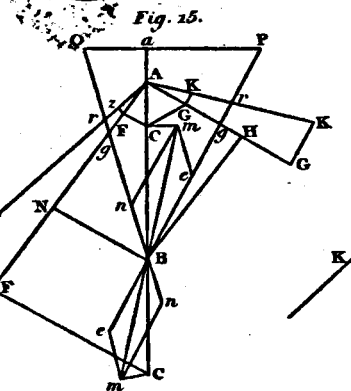


Fig. 15.

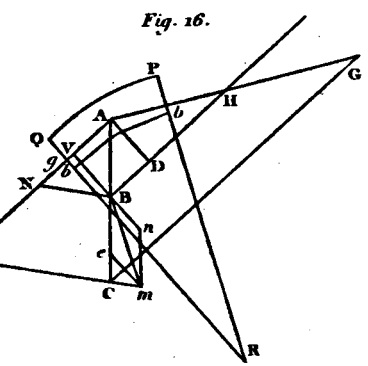


Fig. 16.

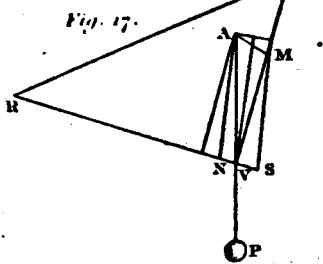


Fig. 17.

through P, and making the same angle as DPQ in the former case, and only differing by being drawn on the contrary side of PD.

SCHOLIUM.

In what follows, the force requisite to sustain any body is considered under three different distinctions; first, when it is just barely sufficient to overcome the weight and resistance arising from friction, and the body is considered as just beginning to move in the direction of the force applied, and the force in this case is called the *moving force*: secondly, when this force is diminished till the body would begin to move or descend in a contrary direction if the force was diminished farther; this last I call the *suspending force*; and it is plain that whatever force is applied to the body less than the moving, and greater than the suspending force, the body will remain at rest: lastly, it is manifest that there is an intermediate state in which such a degree of force may be applied, that the friction will have no effect either way; and this force is the same as would keep the body in equilibrio if there was no friction, because the effect or tendency of friction is to keep the body at rest, or prevent it from moving either way; this being premised there will be little difficulty in the following.

PROBLEM I.

Having given the weight of the body to be sustained; the inclination of the plane and the ratio of the friction to the pressure; to find the force requisite to sustain the weight in a given direction.

In the foregoing figures, draw PR and PD at right angles to the horizon and plane respectively, PR representing the weight; take PD to DQ as the pressure to the friction, and let DQ be taken upwards or downwards as the requisite force is motive or suspensive; join PQ and draw the line Rm in the given direction meeting PQ in m; then Rm is the force required.

COROLLARY 1. If the friction be the n part of the pressure, and W be the weight, s and c the sine and cosine of the plane's elevation, then the moving force parallel to the plane will be $W (s + c : n)$, and the suspending force $W (s - c : n)$.

COROLLARY 2. If the direction of the force be parallel to the horizon, and t be the tangent of the plane's elevation, then $W (tn + 1) : (n - t)$ will be the moving force, and $W (tn - 1) : (n + t)$ the suspending force, and Wt the force excluding friction.

EXAMPLE. If the weight be a ton, the friction $\frac{1}{3}$ of the pressure; $AB=5$,
o
 $BC=3$,

$BC=3$, and $AC=4$, then the moving force will be 3235 pounds; the suspending force 747 pounds, and the force-excluding friction 1680 pounds; nearly.

PROBLEM II.

Given the weight of the body, the inclination of the plane, and the ratio of the friction to the pressure; to find the direction so that the sustaining force may be a given quantity, or the least possible.

Draw DQ and QP as before, and let PR be to Rm as the weight to the given force; then from the center R with a distance equal to Rm , intersect PQ in m ; then Rm is the required direction when the force is given, but to have it the least possible draw Rm at right angles to PQ , then Rm is the direction required.

COROLLARY I. An expression for the sustaining force, when the least possible, may be found as follows: in the triangles PDQ , RQm , the angle Q is common, therefore $PQ:PD::RQ:Rm$; but PD is a fourth proportional to AB , AC , and PR , and DQ is to PD as 1 to n , supposing this the given ratio; also RD is a fourth proportional to AB , BC , and PR , consequently RQ is equal to DQ either added to, or subtracted from, DR , as it is the first, or second case; and because $PQ:PD::\sqrt{(nn+1)}:n::RQ:Rm$, therefore $Rm=PR(n \cdot BC \pm AC):AB\sqrt{(nn+1)}$ or $(ns \pm cW:(\sqrt{nn+1}))$, by substituting s and c for the natural sine and cosine of the plane's elevation, and using the negative or affirmative sign as the force required, is the moving or suspending one respectively.

EXAMPLE. If $AB=5$, $BC=3$, and $AC=4$, and the weight 1 ton; then the least moving and sustaining forces will be 1825 and 702 pounds respectively.

COROLLARY 2. Because the triangles PDQ and RQm are similar, and the ratio of PD to DQ constant to each fixed value of n ; therefore the angle QRm being equal to DPQ , will also be constant whether the inclination of the plane be variable or not; and hence the angles of the direction with the plane for the draught to be made with the greatest advantage, are found for different values of n as follows:

n	QRm	n	QRm	n	QRm	n	QRm	n	QRm	n	QRm
1	45.0	2	26.34	3	18.26	4	14.2	5	11.19	6	9.28
$1\frac{1}{4}$	38.40	$2\frac{1}{2}$	23.58	$3\frac{1}{2}$	16.54	$4\frac{1}{2}$	13.15	$5\frac{1}{2}$	10.47	7	8.8
$1\frac{1}{2}$	33.41	$2\frac{3}{4}$	21.48	$3\frac{3}{4}$	15.57	$4\frac{3}{4}$	12.32	$5\frac{3}{4}$	10.18	8	7.8
$1\frac{3}{4}$	29.45	$2\frac{7}{8}$	19.59	$3\frac{7}{8}$	14.56	$4\frac{7}{8}$	11.53	$5\frac{7}{8}$	9.52	9	6.20

N. B.

N. B. The direction, or angle QRm , is to be taken below the plane for the suspending, and above the plane for the moving force.

SCHOLIUM. Though at first sight the former part of the above problem which shews the best method of applying an active force, seems superior to the other, yet on farther consideration the other appears of equal consequence, and particularly in building and fastening walls, banks of earth, and fortifications, &c. and the application of what are called *Land-ties*, &c. Thus if a weight, for instance, is to be drawn along the plane RB , and the friction be $\frac{1}{4}$ of the pressure, the best direction is when Rm makes an angle of $18^{\circ}.26'$ above the plane; but if the weight is a quantity of earth or stone, or any thing to be suspended, as in the case of land-ties, the best angle (on the foregoing supposition) must be $18^{\circ}.26'$ below the plane.

SCHOLIUM.

In those propositions the friction is estimated according to the most generally received opinion, that the resistance is proportional to the whole pressure compounded of the weight of the body, and the additional force necessary to overcome the friction; but it has been asserted that there may be cases where the friction is not proportional to the whole pressure, but to that which would arise if the body was sustained in a given direction exclusive of friction; and that there might also be cases, where the resistance arising from tenacity or cohesion might be as the relative pressure against the plane, and the force to overcome it the same in every direction; something similar to a globe stuck fast in wet tenacious clay: I shall therefore give solutions to both cases.

In the first case *, the force requisite to sustain the body in direction RV exclusive of friction is Rn ; and as Rn is equivalent to RD and Dn , therefore Pn is the pressure exclusive of friction; and as the friction is the n part of the pressure, the force acting parallel to AB to overcome it is the n part of Pn ; but the force which acting in direction Rn will be equivalent to the n part of Pn in the direction Rn , is a fourth proportional to n times RD , Pn , and Rn ; but because DQ is the n part of DP , therefore fn is the n part of Pn , and the fourth proportional aforesaid will be nz ; consequently the sum or difference of Rn and nz must be a given quantity, or the least possible: the problem therefore is reduced † to drawing a line Rn from the given point R , meeting the two lines PD and PQ given in posi-

* Fig. 3.

† Fig. 4.

tion in n and z , so that nz added to or taken from Rn , the sum or difference may be a given quantity, or the least possible. To do this, let DS be taken equal to DR , and draw Sr parallel to PD meeting PQ in M ; then because Rn is equal to rn , the sum or difference of the quantities aforesaid is rz ; and when rz is required to be a given quantity, the question is reduced to that particular case of the inclinations of *Appollonius*, in solids, which has been resolved by *Newton* and *Barrow*; the limits of the problem or the mode of drawing the line Rr , so that the intercepted part rz may be the least possible, may be investigated as follows:

* Suppose it done, and Rrz the position required, and let Rnm be indefinitely near to Rz , and Mh perpendicular to Rz ; then by applying the analysis of the ancients to the *Newtonian* doctrine of prime and ultimate ratios, mn is equal to zr ; and if from the center R with the distances Rz and Rn , the arcs zv and nt be supposed to be described, vn is equal to zt , and consequently tr equal to mv ; but $rt : tn :: rh : Mh$, and $tn : zv :: Rr : Rz$, and $zv : vm :: Mh : hz$, whence by compounding the proportions, $tr : vm :: Rr . rh : Rz . zh$, and as the two first terms are equal, the last are equal, and consequently $Rr : Rz :: zh : rh$, and dividing $Rr : rz :: zh : rz$, therefore Rr is equal to zh ; and consequently the point h is in an hyperbola, whose asymptotes are QM and SM produced: but because the angle MhR is a right angle, the point h is also in the circumference of a circle, therefore a line drawn from R to h , the point where the hyperbola and circle intersect, is the position required.

In the other case, where the resistance arising from tenacity or cohesion, is supposed to be as the relative pressure against the plane, and the force to overcome it the same in each direction; we have Rn for the sustaining force exclusive of friction; and the n part of Pn for the friction, and consequently the sum or difference of these is the expression for the whole force; and the problem may be thus constructed. Take PD to DQ as the pressure to the friction, and join PQ ; on PD describe a circle, in which take Dv equal to DQ ; join Pv and draw RV perpendicular to it: then RV will represent the direction and measure of the whole force, when it is the least possible.

For DQ and Dv are equal, and consequently nf is equal to Vn ; but DQ is the n part of DP , therefore nf or Vn is the n part of Pn , and consequently RV is equal to the sum or difference of Rn , and the n part of Pn ; but RV is the least possible by construction, and therefore the other is a minimum also. For draw any

• Fig. 6.

other

other line Rk meeting RV in k and PD in m; and draw mq, mt parallel to DQ and Dv; then the sum or difference of Rm and mt is equal to the sum or difference of Rm and mq; but the sum or difference of Rm and mt is greater than RV, and therefore the sum or difference of Rn, and the n part of Pn, is the least possible.

PROBLEM III.

Given the weight of the body; the inclination of the plane, and the force sustaining the body in a given direction; to find the ratio of the friction to the pressure.

Take PR as before (see Fig. 1. 2.), draw Rm in the given direction, and take PR to Rm as the weight of the body to the force sustaining it; draw Pm meeting AB in Q; and PD perpendicular to AB; then PD is to DQ as the pressure to the friction.

PROBLEM IV.

If AhqN be the segment of an equilateral triangle, which by moving parallel to itself, and the horizon, generates a solid, upon which a figure hmGEHKpqh moves touching the former in hm and qp; required the effect of the friction; still supposing it the n part of the pressure.

Let P be the center of gravity of half the body *, and PR its weight as before; then the body, by means of its inflexibility, is kept together in the same manner as if it was actuated by a force parallel to the horizon; but if PDn be perpendicular to Ah, and Rn parallel to the horizontal line AC, meeting PD in n; Pn will be the pressure against the side Ah, and the friction is the n part of Pn; but PR : Pn :: AC : AB, therefore if AC represent the weight of half the body, the n part of AB will express the weight requisite to overcome the friction for that half; and by doubling the expressions they serve for the whole: wherefore let W represent the weight of the body; f the secant of the angle BAC; then Wf will be the pressure against the plane AD; and the n part of Wf the force necessary to overcome the friction; and as this last is the force necessary to draw the body along a horizontal plane, therefore the force necessary to draw the body along a horizontal plane, is to that necessary to draw it along the body whose section is AhqN, as AC to AB, or as 1 to f.

* Fig. 7.

Because when the angle CAB is given, the ratio of PR to Pn is constant, therefore when the solid whose section is AhqN is elevated, making an angle with the horizon, so that its base forms an inclined plane; PR in that case represents the pressure in a normal direction to that plane, and Pn the pressure against the solid; and as the friction is increased in the ratio of the pressure, therefore if the pressure, which the body would have on the inclined plane, be increased in the ratio of AC to AB, or radius to the secant of the angle CAB, then the pressure on the angular plane or body, whose perpendicular section is AhqN will be had, and consequently its n part, or the friction. Hence this construction *; let PR represent the weight; then PD at right angles to AB, represents the pressure that the body would exert against the common inclined plane; take DK to DP as AB in the foregoing figure to AC, or as the secant of the inclination of the angular plane with its base to radius; let Dq be the n part of DK, and join Kq; then RM drawn any how to meet Kq in M, gives RM for the measure of the whole force in that direction; and it is the moving or suspending force according as Dq is taken upwards or downwards in the line AB.

It is evident that Kq is parallel to PQ, and therefore though the least force (which is perpendicular to Kq) differ from that in the former cases; yet the directions for having the greatest effect are still the same as in the foregoing table: the demonstration is in effect the same as the first.

COROLLARY. By supposing f to be the secant of the angle †, that the sides of the angular plane make with the base; proceeding as Corollary 2d of Problem 1st, and putting t for the natural tangent of the plane's inclination, and W for PR the weight, we have $W (tn + f) : (n - t)$ for the moving; and $W (tn - f) : (n + t)$ for the suspending force, necessary to draw the body along the angular inclined plane by a force acting parallel to the base of the plane.

EXAMPLE. Let AB, BC, and AC, be 5, 3, and 4 respectively, and let the inclination of the sides be 45° ; the weight of a ton and the friction one third of the pressure; then 3648 pounds is the moving, and 499 the suspending force.

SCHOLIUM.

In this proposition, those parts of the plane on which the body moves, are sup-

* Fig. 5.

† Fig. 8.

posed rectilinear, as mostly happens in practice; but the friction is easily estimated in curvilinear surfaces, and may be found generally as follows:

Let AMP* be half the section perpendicular to the horizon, and to the axis of the solid which forms the curvilinear plane on which the body is moved; AP the axis; PM the ordinate, and MS a tangent to the curve at the point M; also let RM represent the weight or pressure in a direction perpendicular to the horizon at the point M; and let RF be perpendicular to MS meeting MP in F; also let PN be taken equal to MR, and PQ equal to RF; and suppose the same construction to be made for every point of the curve, and let HN be the locus of all the points N, and GQ the locus of all the points Q; then will the friction when drawn along the horizontal plane, be to the friction of the same body when drawn along the curvilinear plane in the same direction, as the area APNH to the area APQG.

For the friction on the horizontal plane being as the sum of the pressures, is as the sum of all the elementary lines MR or PN; that is, as the area AHNP; and the friction on the curvilinear plane is, for the same reason, as the sum of all the RF or PQ, namely as the area APQG: hence the truth of the proposition is manifest.

COROLLARY 1. Because Mn or the fluxion of y is to Mm the fluxion of the curve, as MR or PN to RF or PQ, therefore if PN be a function of AP, PQ will be a fourth proportional to the fluxion of the ordinate, the fluxion of the curve AM, and this function; wherefore if the curves HN and AM be given; the nature of the curve GQ will be known, and its area may be found by the common methods of quadratures.

COROLLARY 2. It is evident, that when the planes are inclined to the horizon; the frictions of the right and curvilinear planes are still in the same ratio as in the preceding cases, and consequently may be found by the same mode of proceeding.

COROLLARY 3. It is also evident, that the above method holds good whether the parts of the body are connected together or not, with respect to their motion in the direction RM, so long as each elementary part MR may be considered as sustained at the point M by a force parallel to MP; but when the body is rigid or inflexible the case becomes more simple, for MR is then constant, and APNH becomes a parallelogram.

COROLLARY 4. By supposing given properties to exist in any two of the curves AM, HN, or GQ, the nature of the third will be known; and hence a
number

* Fig. 9.

number of problems relative to friction, may be proposed and resolved by a proper application of the direct and inverse methods of fluxions.

PROPOSITION 5. THEOREM.

In the application of forces to overcome friction, the same allowances must be made for the forces acting to advantage or disadvantage by means of levers or other mechanical powers as are made in the common doctrine; for instance if a weight of two pounds, by acting at the distance of one foot from the fulcrum of a lever, be sufficient to overcome the friction, then one pound at two feet distance will have the same effect, &c.

This is too evident to need a demonstration.

OF FRICTION IN THE SCREW.

As any force acting perpendicular to the direction of a moving body does not affect the motion of the body in that direction; so the force acting perpendicular to the axis of the screw, has no effect on the motion of a body raised thereby exclusive of friction; it therefore requires the same force to raise a body by means of a screw, as to raise the same body in equal time along an inclined plane of the same elevation, as the threads of the screw by means of a force acting parallel to the base of the inclined plane: now, if we suppose the weight so contracted or condensed as to be capable of being placed on one of the threads of the screw, and fastened to an imaginary lever always perpendicular to its axis: then it is evident, this lever will have no effect but to change the direction of the weight, and keep it in the midst of the thread of the screw; and if a force be applied at the weight always perpendicular to this lever, so as to sustain or draw it along, this force will be determined exactly the same as was done before in the inclined plane: but the rigidity of the parts of the "female screw" serves exactly the same purpose as this imaginary lever, and makes the weight act upon the threads like a body sustained on an inclined plane by a force parallel to its base; and as the force to overcome both the weight and the friction, is reciprocally as the distance from the center of the axis, therefore the distance of the power from the center of the axis, is to the distance from the same center to the middle of the threads of the screw, as the force necessary to sustain the body on the inclined plane, to the same force in the screw at the distance of the power. The same proportion holds good whether the threads be cut perpendicular to

to the axis or in an angle; for in the first, the common plane is to be taken, and in the second, the inclined or angular one considered in the fourth proposition: Wherefore if d be the distance from the center of the axis to the middle of the threads of the screw; D the distance of the same center to the point where the force is applied; the force to overcome the weight and friction is $Wd (tn \pm f) : (n \mp t) D$, where the letters express the same things as before, and the upper sign is for the moving, and the lower for the suspending force. N. B. t is the natural tangent of the angle made by a line touching one of the threads, and a plane at right angles to the axis of the screw; or it is equal to the distance of the respective edges of two threads, divided by the circumference of the cylinder, out of which the screw is cut.

COROLLARY 1. When lines drawn from the center of the axis of the screw to coincide with the threads, are at right angles to the axis, the above expression becomes $Wd (t \pm n) : (n \mp t) D$, for f becomes radius or unity.

COROLLARY 2. When n is equal to t , the moving force will be infinite; also the suspending force will be nothing when t is the n part of f ; and when $Wd (tn - f) : (n \pm t) D$, becomes negative it expresses the quantity of force, which must act in a contrary direction to reduce the body just to a state of suspension.

SCHOLIUM.

It would be needless to make any allowance for the curvilinear surfaces of the threads of screws, as they seldom differ much from the two foregoing forms; neither is it of much consequence to allow for their parts being at different distances from the axis, as their breadth seldom bears any considerable ratio to the length of the levers by which they act; but the case is different when large bodies revolve on each other, and therefore it will be necessary to shew the mode of proceeding in such cases.

Let $MmAQ$ be a convex solid generated by the revolution of the curve MAQ , about its axis perpendicular to the horizon; and $MRSQ$ a concave body exactly fitting it; then if this last body be revolved about the axis AP by means of the lever Pf , the force necessary to overcome the friction of one body turning upon the other may be found as follows: suppose the revolving body divided into an infinite number of concentric tubes, that may descend independent of each other, and press freely against the body on which they revolve, and yet be so connected that the lever Pf ,

* Fig. 10.

P

may

may give the same angular velocity at the same time to each; also let the ordinates PN of the curve HN, represent the weight or pressure (in a direction perpendicular to the horizon) of each of the indefinitely small parts Mk, or elementary lines of the body at the distance PM from the axis; and let c be the circumference of a circle whose radius is unity: Then, because the friction of each of the elementary tubes MRSQ is as its pressure; and the pressure is as the number of lines Mk and the pressure of each; therefore as this number is as PM.Mn.c, we have the n part of this expression for the force which acting at M would overcome the friction of the cylindrical tube, if moved round upon a horizontal plane; but as the pressure of each elementary part is increased in the ratio of Mn to Mm, when moved on the the solid MAQ, the real force will be $(PM.c.Mm.PN) : n$; Also $Pf : PM :: (PM.c.Mm.PN) : n$ to the small elementary force which will overcome the last force when acting at f; consequently the whole force will be equal to the fluent of $(PM^2.PN.Mm.c) : (n.Pf)$.

COROLLARY. By means of the curves AM, HN, &c. conclusions may be drawn similar to those in the corollaries to the scholium of the fourth proposition.

OF FRICTION IN THE LEVER.

It has been already observed, that a force acting perpendicular to the direction of a body, in motion does not alter the body's motion in that direction; therefore if * we suppose DB to be an upright cylinder, and AB a body touching it in a line as in the figure, and retained close to it by an imaginary force drawing it perpendicular towards the axis: then if a force CP be applied to C, the center of gravity of AB, and be always supposed to act perpendicularly to the radius CN drawn from the center of the axis to the point C, the friction will be the same in drawing the body round the cylinder, as in drawing it along a horizontal plane with an equal pressure; and if it be moved round by a force acting at a greater distance, the force will be reciprocally as the distance; on the contrary, if the body AB be fixed, and the cylinder turned round about its axis, the friction will be the same as if the cylinder was fixed, and the body drawn round it by CP as before: Likewise the friction is the same, whether the cylinder be fixed and the body AB moved round the axis MR by a force Qc applied at c; or whether the point c be fixed with AB fastened to Cc, and the cylinder be revolved in a circle whose center is c, so as always to retain its parallelism with respect to any fixt object; and as this last case obtains in all the axletrees of carriages, since every point of the wheel's contact with the ground

* Fig. 11.

may be considered as the center of motion for that instant, therefore the effect of the resistance arising from the friction of the concave part of the nave upon the axletree, is to the effect that would arise from drawing the same weight over a horizontal plane of the same kind as the parts that rub each other, as the radius of the axis, to the radius of the wheel: It must be observed that this is not the only friction to which carriages are subject, for there is another part arising from the cohesion of the wheel and the ground at their contact, which is to be found and allowed for by the three first propositions.

In the above, the pressure and friction have been supposed to be as the weight, as it is on a horizontal plane; but by the scholium to the fourth proposition, it is plain that the pressure is greater than the weight, and may be so in any proportion; however, as it appears by calculation that the pressure on an arc of ninety degrees is to that on its chord only as 1,183 to 1, when both the concave and convex parts have exactly the same curvature; the difference will be so trifling, when the cylinders have different curvatures as usual, as to require very seldom to be allowed for.

This being premised, let M^* be a weight placed at the point A of a lever moveable about an axis whose center is d and radius dn ; and let N be the sustaining force acting at B : Now it is evident that the pressure on the axis d , differs so little from the weight, that it may be safely taken for it without any considerable error, except in some remarkable cases which may be allowed for from what has been said already; and therefore the friction which ought in strictness to be taken as the n part of the pressure, will here be taken as the n part of the weight upon the axis: Now if N be taken for the force which acting at B would be just sufficient to keep the weight M at A , in equilibrio, exclusive of friction; and if W be the additional force to be added to N so as to overcome the friction; then will $M+P$, $M-P$, and $P-M$, be the weight upon the axis at d in the first, second, and third figures respectively (supposing the sum of M and N to be equal to P); now as the friction is the n part of each of these quantities, and its effect is to keep the lever in a state of rest; therefore in whatever direction the force at N endeavours to draw the lever by acting at B , the friction tends to counteract that force by keeping the lever steady or acting in a contrary direction at n ; and as the effect of the friction, and the additional force W , are in equilibrio; and the friction acts by means of the lever dn , and the force W by the lever dB ; therefore Bd is to dn , as the sum or difference of the n part of $N+W$ and M , is to W ; consequently $W = dn (M+N) : (n \cdot Bd - dn)$, in the

; Fig. 12, 13, 14.

first

first figure; $W = dn(M - N) : (n.Bd + dn)$, in the second figure; and in the third figure, $W = d(N - M) : (n.Bd - dn)$: all these are the expressions for the moving forces.

To find the suspending forces, or the forces which acting at N shall be just sufficient to prevent the weight M from descending: Let M and N be the same as before, and let w be the force which taken from N, will leave a force just sufficient to prevent M from descending; then the weight upon d, in the first figure will be $M + N - w$; in the second figure, the weight will be $M - N + w$; and in the third figure, $N - M - w$; and by proceeding as before, the values of w in the suspending forces, are $dn(M + N) : (n.Bd + dn)$; $dn(M - N) : (n.Bd - dn)$, and $dn(N - M) : (n.Bd + dn)$, in the first, second, and third figures, respectively.

Because $Bd : dA :: M : N$, therefore if this value of N be substituted in each of the above expressions for the friction; the whole force capable of sustaining the friction and weight M will be had: thus for example, the moving force to overcome the friction and weight M in the first figure, will be $M(n.dA + dn) : (n.Bd - dn)$, and the suspending force $M(n.dA - dn) : (n.Bd + dn)$, in the second figure, the moving force will be $M(n.dA + dn) : (n.Bd + dn)$, and the suspending force $M(n.dA - dn) : (n.Bd - dn)$; and in the third figure, the moving force will be $M(n.dA - dn) : (n.Bd - dn)$, and the suspending force will be $M(n.dA + dn) : (n.Bd + dn)$.

The method of finding n from each of the above equations is evident, and consequently the ratio of the friction to the pressure by experiments.

ON FRICTION IN THE WEDGE.

Let AC* be the force necessary to sustain the wedge QPB in the direction aB perpendicular to QP, friction included; and let AB be the force exclusive of friction: draw AN and AH perpendicular to the BQ and BP; CG parallel to AN, and CF parallel to AH: Now GA and AF, the forces of the wood against the side of the wedge, in those directions, compound a force equivalent to the diagonal CA in the direction CA, and therefore a force represented by AC in that direction, must be applied to the head of the wedge at a to overcome these forces: Let gr be the n part of Ag, and let the lines Ar be drawn, and also GK and FZ perpendicular to AG and AF meeting the lines Ar in K and Z; then will GK and FZ represent the friction against the sides BP and BQ, being each the n part of AG and AF, the pressure against each side, respectively; wherefore if Be be taken in PB, and Bn in

* Fig. 15.

BQ, equal to GK and FZ respectively, the forces Be and Bn in those directions must compound a force to which the force BC in the direction BC must be equivalent, and consequently if Bm be the force compounded of Be and Bn; and Cm be joined, Cm must be perpendicular to mB; since Be or GK is the force of friction arising from the pressure against BP, which tends to prevent the wedge from moving either in the direction BP or PB; and Bn or FZ has a similar effect with respect to the direction in the line BQ; and by hypothesis BC is just sufficient to balance these forces: It is also evident from what was said concerning the inclined plane, that Be and Bn must be taken in the directions PB and QB for the moving force, but in the directions BP and BQ for the suspending force.

The method of calculation is evident; for as aB, AG, and AF, are perpendicular to QP, BP, and BQ, the triangles QPB and CAG are similar, and the parallelogram Bnme similar to FAGC; whence by supposing certain parts given, the rest may be found, &c.

COROLLARY. When the wedge is isosceles the point m falls on C, and Be is equal to Bn, and therefore Be or GK is equal to $(AB+BC)PB : (n.QP)$; but $PB : Ba :: 2Be : BC$, and therefore $BC = 2Ba (AB+BC) : (n.QP)$ or equal to $(2Ba.BA) : (n.QP - 2Ba)$, and therefore $AC = (n.QP.AB) : (n.QP - 2Ba)$, and by following the same method for the suspending force, we find $BC = (2Ba.AB) : (n.QP + 2Ba)$, and consequently AC is equal to $(n.QP.AB) : (n.QP + 2Ba)$.

SCHOLIUM.

By proceeding in a similar method, the forces of the arch-stones of bridges, &c, may be determined; for let QbbP be a stone sustained by the parts of the arch pressing against Pb and Qb, and let A be its center of gravity, and AB perpendicular to the horizon; also let AB and AC be the same as before: then because the body is in equilibrio, the force in direction AC will be equivalent to the force in a contrary direction, arising from the pressures against the body in the directions GA and KA, together with the force of friction; and because the pressures are AG and AK, if Be (the n part of AG) be drawn parallel to PB; and Bn (the n part of AK) be drawn parallel to Qb; and the parallelogram Bnme be completed, and Cm joined; Bm will be the force arising from friction, and the angle BmC a right angle; the adjacent figure* is for the moving force, but the method is similar for the suspensive force; and it is evident that the one construction is of use to determine the

* Fig. 15.

force

force which tends to break an arch by pressing it downwards, and the other, the force that tends to break it upwards.

But as that excellent mathematician P. FRISI in his *Instituzioni di Meccanica*, has objected to the division of the force AB into the forces AN and AH, and thence concluded BELIDOR and COUPLET to have been mistaken on that account in their writings upon bridges; I shall, therefore, prove that the common method is really a consequence of what that gentleman himself allows, and that his objections are not well founded. In the first place he allows the force AB to be equivalent to the forces AV and AD or VB; now (excluding friction) if that part of the arch which touches Pb was removed, it is evident QbbP would immediately begin to descend along Qb with a force represented by VB or AD; but this descent is prevented by that part of the arch which touches Pb, and therefore the force of that arch in the direction HA, must be such as to be equivalent to DA in the direction DA or BV; but no force greater or less than HA will be equivalent to DA in the direction DA, and therefore HA is the real pressure or force against Pb: again, HD is the pressure in a perpendicular direction to Qb arising from this force; and as AV is the pressure against Qb arising from the force AB, therefore AV together with HD is the whole pressure against Qb in the direction AV; but because the body is in equilibrium, and consequently the action or force in the direction AV equal to the reaction in a contrary direction; therefore AV+HD or AN (because NV is equal to HD by the property of the parallelogram) represents the pressure against Qb, and AH the pressure against Pb; which is contrary to what P. FRISI asserts, and agreeable to the usual method.

The same learned Author has made another very material mistake from a similar cause at page 67 of the aforesaid treatise, relative to the tension of ropes; which cannot be attributed to haste or inadvertency, as he expressly asserts the holders of the common opinion to be mistaken, in consequence of their using the theory of composition of forces without sufficient precaution: I shall therefore, after giving his own words, take the liberty of shewing where I apprehend he is mistaken.

“ Parleremo più a lungo delle altre ricerche matematiche, alle quali ha dato occasione la controversia insorta intorno alla cupola di S. Pietro. Coll' occasione che si è discorso in Milano di munire la fabbrica del Duomo di un Conduttore elettrico, che dalla cima dell' aguglia si dirimasse, e scendesse per differenti parti del tempio, si è ancora parlato dell' azione, che i fili del Conduttore potrebbero esercitare contra l'aguglia, e si sono proposti varj Problemi intorno alle tensioni delle funi. Io qui aggiu-

aggiugnerò le soluzioni, che ho ritrovato, e incomincierò dalla prima risoluzione delle forze tendenti, la quale siccome é interamente differente da quella, che hanno seguitato altri Autori, così non sarà meraviglia che porti dei risultati interamente differentes da quelli che sono stati finora publicati. Penda il * filo QVR, dai punti Q, ed R, e vi si attacchi in V il peso P. si produca la verticale PV in A; si esprima il peso P colla retta AV, e dal punto A; si tirino sopra QV, RV le perpendicolari AM, AN. Sarà MV l'intera forza esercitata secondo QV, ed NV farà quella che si eserciterà secondo RV.

“ La stessa cosa si dedurrebbe risolvendo la forza AV nelle due Aq, Ar parallele ai fili QV, RV, e poi risolvendo di nuovo la forza Aq nelle due AN, Nq, e similmente la Ar in due altre AM, Mr. Mentre queste risoluzioni é manifesto che la forza totale esercitata nel tendere il filo QV dev'essere $Aq \rightarrow Mr = rV \rightarrow Mr = MV$, e la tensione del filo $RV = Vq - Nq = NV$.

“ S'ingannerebbe chi misurasse separatamente la tensione del filo QV dalla forza Aq, ossia rV, e la tensione di RV da Ar, oppure da qV. Egli è vero, che le due tensioni equivalgono insieme come alla sola forza AV, così ancora alle due Ar, Aq, oppure alle quattro insieme AN, Nq, AM, Mr. ma nel prendere le tensioni separate bisogna in oltre avvertire, che quando l'angolo QVR non è retto, una porzione di Aq agisce secondo RV, ed una porzione di Ar secondo QV: e separando le azioni fara MV, la tensione del filo QV, ed NV quella di RV.”

In the first place I shall demonstrate the truth of the established method from principles that FRISI has himself allowed; and secondly, point out the absurdity of his conclusions.

1. Let Vn and Sr be parallel to AN; then because NVn is a right angle, and the force VA may be resolved into VN and Vn, in those directions, therefore if RV and VP were to remain in the same position, and the force which now keeps the body suspended by acting in the direction VQ, was to act in the direction Vn with a force expressed by Vn; it is then granted that the equilibrium would still be maintained, and the tensions would be as Vn and VN; and therefore as no force VS whatever acting at V in the direction RV, can have any effect in the direction Vn perpendicular to RV, it necessarily follows that the force in any other direction VQ must be such as to be equivalent to Vn in the direction Vn; but it is likewise granted that no other force but Vr in the direction VQ can be equivalent to Vn in

* Fig. 17.

the direction Vn ; and as the force Vr is equivalent to Vn and VS ; and as VS , or its equal qN , only gives an additional tension to NV ; the tension which the cord RV was supposed to have before, which whole tension is equal to the reaction of the tack R ; therefore qV is the tension of the cord RV , and Vr that of Qv .

2. Let the points Q and R coincide, and RV , QV , and VP , will then be perpendicular to the horizon; and if VQ or VR be assumed to express the weight P ; then will the points A , R , Q , M , and N coincide; and according to *FRISI's* principle, the tensions of RV , VQ , and VP , will be equal; but from the well known principle of the pulley, each cord VQ and VR bears but half the weight P , and therefore this absurdity follows, that a cord is as much stretched with half the weight as it would with the whole.

Again, if the points R , V , and Q , be supposed horizontal, it follows from the common theory that the tension of the rope RVQ would be infinite; but VN and VM vanish when RVQ is horizontal, and therefore by *FRISI's* principle, the tension in that case would be nothing at all; but it is well known from the most common experiments to be very considerable, even when RQV is but nearly horizontal, and therefore the new theory of this great mathematician is indefensible.

REMARK. All the foregoing except the last scholium, was written in 1775, before the author had seen any thing to speak of on the subject; he had designed, and executed great part of an extensive treatise on friction according to different hypotheses; but as no body would be at the risk of publishing it, and he could not afford it himself, the most of it was accidentally lost; what is here given is an extract only of some of the first part, where velocity was not taken into the account, and where there were no complicated algebraic or fluxional expressions which would be difficult to print in this country.

TO THE HONOURABLE SIR WILLIAM JONES,

President of the Asiatick Society.

SIR,

I HAVE the honour to obey the orders of the Honourable the Governor General and Council, in transmitting to you, for the information of the *Asiatick Society*, an extract of a letter addressed to the Governor General, on the 2d of last month, by Lieutenant SAMUEL TURNER, who was appointed on an embassy to *Tibet*, and a copy of an account enclosed in it of Mr. TURNER's interview with TEESHOO LAMA, at the Monastery at *Terpaling*.

I have the honour to be, with great respect,

Sir,

Your most obedient and most humble servant,

E. HAY, *Secretary.*

COUNCIL CHAMBER,
Political Department, April 13, 1784.

EXTRACT OF A LETTER FROM MR. SAMUEL TURNER TO THE
HONOURABLE THE GOVERNOR GENERAL, DATED PATNA, 2d
MARCH, 1784.

DURING my residence in *Tibet*, it was an object I had much at heart to obtain an interview of the infant TEESHOO LAMA, but the emperor of *China's* general orders, restricting his guardians to keep him in the strictest privacy, and prohibiting indiscriminately the admission of all persons to his presence, even his votaries, who should come from a distance, appeared to me an obstacle almost insurmountable; yet, however, the Rajah, mindful of the amity subsisting between the Governor and him, and unwilling, I believe, by any act to hazard its interruption, at length consented to grant me that indulgence. As the meeting was attended with very singular and striking circumstances, I could not help noting them with most particular

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attention;

attention; and though the repetition of such facts, interwoven and blended as they are with superstition, may expose me to the imputation of extravagance and exaggeration, yet I should think myself reprehensible to suppress them; and while I divest myself of all prejudice and assume the part of a faithful narrator, I hope, however tedious the detail I propose to enter into may be found, it will be received with candour, and merit the attention of those for whose perusal and information it is intended, were it only to mark a strong feature in the national character, of implicit homage to the great religious sovereign, and to instance the very uncommon, I may say almost unheard of, effects of early tuition.

I shall, perhaps, be still more justified in making this relation, by adverting to that very extraordinary assurance, the Rajah of *Teesboo Loomboo* made me but a few days before my departure from his court, which, without further introduction, I will beg leave literally to recite.

At an interview he allowed me, after having given me my audience of leave, said he, "I had yesterday a vision of our tutelary deity, and to me it was a day replete with much interesting and important matter. This guardian power, who inspires us with his illuminations on every momentous and great occasion, indulged me with a divination, from which I have collected that every thing will be well; set your heart at rest, for though a separation is about to take place between us, yet our friendship will not cease to exist; but through the favour of interposing providence you may rest assured it will encrease, and terminate eventually in that which will be for the best."

I should have paid less regard to so strange an observation but for this reason, that however dissonant from other doctrines their positions may be found, yet I judge they are the best foundation to build our reliances upon, and superstition combining with inclination to implant such friendly sentiments in their minds will ever constitute, the opinion having once obtained, the strongest barrier to their preservation. Opposed to the prejudices of a people, no plan can reasonably be expected to take place: agreeing with them, success must be the result.

A true extract,

E. HAY, *Secretary to the Governor General and Council.*

COPY

VII.

COPY OF AN ACCOUNT GIVEN BY MR. TURNER OF HIS INTERVIEW WITH TEESHOO LAMA AT THE MONASTERY OF TERPALING, ENCLOSED IN MR. TURNER'S LETTER TO THE HONOURABLE THE GOVERNOR GENERAL, DATED PATNA, 2d MARCH, 1784.

ON the 3d of December, 1783, I arrived at *Terpaling*, situated on the summit of a high hill, and it was about noon when I entered the gates of the Monastery, which was not long since erected for the reception and education of TEESHOO LAMA. He resides in a palace in the center of the Monastery, which occupies about a mile of ground in circumference, and the whole is encompassed by a wall. The several buildings serve for the accommodation of three hundred *Gylongs* appointed to perform religious service with TEESHOO LAMA, until he shall be removed to the Monastery and Musnud of *Teesboo Loomboo*. It is unusual to make visits either here or in *Bootan* on the day of arrival: we therefore rested this day, only receiving and sending messages of compliment.

On the 4th in the morning, I was allowed to visit TEESHOO LAMA, and found him placed in great form upon his Musnud; on the left side stood his father and mother, on the other the officer particularly appointed to wait upon his person. The Musnud is a fabrick of silk cushions piled one upon the other until the seat is elevated to the height of four feet from the floor; an embroidered silk covered the top, and the sides were decorated with pieces of silk of various colours suspended from the upper edge and hanging down. By the particular request of TEESHOO LAMA's father, Mr. SAUNDERS and myself wore the *English* drefs.

I advanced, and, as is the custom, presented a white pelong handkerchief, and delivered also into the LAMA's hands the Governor's present of a string of pearls and coral, while the other things were set down before him. Having performed the ceremony of the exchange of handkerchiefs with his father and mother, we took our seats on the right of TEESHOO LAMA.

A multitude of persons, all those ordered to escort me, were admitted to his
 preference

presence and allowed to make their prostrations. The infant LAMA turned towards them, and received them all with a cheerful and significant look of complacency. His father then addressed me in the *Tibet* language, which was explained to me by the interpreter, that TEESHOQ LAMA had been used to remain at rest until this time of the day, but he had awoke very early this morning, and could not be prevailed on to remain longer in bed, for, added he, "the *English* Gentlemen were arrived, and he could not sleep." During the time we were in the room, I observed the LAMA's eyes were scarce ever turned from us, and when our cups were empty of tea, he appeared uneasy, and throwing back his head and contracting the skin of his brow, he kept making a noise, for he could not speak, until they were filled again. He took out of a golden cup, containing confections, some burnt sugar, and stretching out his arm made a motion to his attendants to give them to me. He then sent some in like manner to Mr. SAUNDERS, who was with me. I found myself, though visiting an infant, under the necessity of saying something, for it was hinted to me, that notwithstanding he is unable to reply, it is not to be inferred that he cannot understand. However, his incapacity of answering excused me many words, and I just briefly said, That the Governor General on receiving the news of his decease in *China*, was overwhelmed with grief and sorrow, and continued to lament his absence from the world until the cloud that had overcast the happiness of this nation by his re-appearance was dispelled, and then, if possible, a greater degree of joy had taken place than he had experienced of grief on receiving the first mournful news. The Governor wished he might long continue to illumine the world with his presence, and was hopeful that the friendship which had formerly subsisted between them would not be diminished, but rather that it might become still greater than before, and that by his continuing to shew kindness to my countrymen, there might be an extensive communication between his votaries, and the dependants of the *British* nation. The little creature turned, looking steadfastly towards me with the appearance of much attention while I spoke, and nodded with repeated, but slow movements of the head, as though he understood and approved every word, but could not utter a reply. The parents, who stood by all the time, eyed their son with a look of affection, and a smile expressive of heartfelt joy at the propriety of the young LAMA's conduct. His whole regard was turned to us; he was silent and sedate, never once looking towards his parents, as if under their influence at the time; and with whatever pains his manners may have

have been formed so correct, yet I must own his behaviour on this occasion appeared perfectly natural and spontaneous, and not directed by any action or sign of authority.

The scene in which I was here brought to take a part was too new and extraordinary, however trivial, if not absurd, as it may appear to some, not to claim from me great attention and consequently minute remark.

TEESHOO LAMA is at this time about 18 months of age. He did not speak a word, but made most expressive signs, and conducted himself with astonishing dignity and decorum. His complexion is of that hue which in *England* we should term rather brown, but not without colour. His features good—small black eyes—an animated expression of countenance—and altogether I thought him one of the handsomest children I had ever seen. I had but little conversation with the father. He told me he had directions to entertain me three days on account of TEESHOO LAMA, and entreated me with so much earnestness to pass another on his own account, that I could not resist complying with his request. He then invited us for tomorrow to an entertainment he proposed to make at a small distance from the Monastery, which invitation having accepted, we took our leave and retired.

In the course of the afternoon I was visited by two officers of the LAMA's household, both of whom are immediately attendant on his person. They sat and conversed with me some time, enquired after Mr. BOGLE, whom both of them had seen; and then remarking how extremely fortunate it was the young LAMA's having regarded us with very particular notice, observed on the very strong partiality of the former TEESHOO LAMA for the *English*, and that the present one often tried to utter the name of the *English*. I encouraged the thought, hopeful that they would teach the prejudice to strengthen with his encreasing age, and they assured me that should he, when he begins to speak, have forgot, they would early teach him to repeat the name of HASTINGS.

On the morning of the 6th, I again waited on TEESHOO LAMA to present some curiosities I had brought for him from *Bengal*. He was very much struck with a small clock, and had it held to him, watching for a long time the revolutions of the moment hand; he admired it, but with gravity and without any childish emotion. There was nothing in the ceremony different from the first day's visit. The father and mother were present. I staid about half an hour, and retired to return and take leave in the afternoon.

The votaries of TEESHOO LAMA already begin to flock in numbers to pay their adorations

adorations to him. Few are yet admitted to his presence. Those who come esteem it a happiness if he is but shewn to them from the window, and they are able to make their prostrations before he is removed. There came to-day a party of *Kilmaaks* (*Calmic Tartars*) for purposes of devotion and to make their offerings to the LAMA. When I returned from visiting him, I saw them standing at the entrance of the square in front of the palace, each with his cap off, his hands being placed together elevated, and held even with his face. They remained upwards of half an hour in this attitude, their eyes fixed upon the apartment of the LAMA, and anxiety very visibly depicted in their countenances. At length, I imagine, he appeared to them, for they began altogether by lifting their hands, still closed, above their heads, then bringing them even with their faces, and after lowering them to their breasts, then separating them: to assist them in sinking and rising, they dropt upon their knees and struck their heads against the ground. This with the same motions was repeated nine times. They afterwards advanced to deliver their presents, consisting of talents of gold and silver, with the products of their country, to the proper officer, who having received them, they retired apparently with much satisfaction.

Upon enquiry I learnt that offerings made in this manner are by no means unfrequent, and in reality constitute one of the most copious sources from which the LAMAS of *Tibet* derive their wealth.

No one thinks himself degraded by performing these humiliations. The persons I allude to who came for this devout purpose, were attendant on a man of superior rank, that seemed to be more engrossed than the rest in the performance of the ceremony. He wore a rich satin garment lined with fox skins, and a cap with a tassel of scarlet silk flowing from the centre of the crown upon the sides all round, and edged with a broad band of *Siberian* fur.

According to appointment I went in the afternoon to make my last visit to TEESHOO LAMA. I received his dispatches for the Governor General, and from his parents two pieces of satin for the Governor, with many compliments.

They presented me with a vest lined with lambskins, making many assurances of a long remembrance, and observing that at this time TEESHOO LAMA is an infant and incapable of conversing, but they hoped to see me again when he shall have become of age. I replied that by favour of the LAMA I might again visit this country, I looked forward with anxiety to the time when he should mount the Mufnud, and should then be extremely happy in the opportunity of paying my respects.

respects. After some expressions and protestations of mutual regard, my visit was concluded: I received the handkerchiefs and took my leave: and am to pursue my journey towards *Bengal* to-morrow at the dawn of day.

(Signed) SAMUEL TURNER.

A true Copy,

E. HAY, *Secretary to the Governor General and Council.*

TO SIR WILLIAM JONES, KNIGHT,

President of the Asiatick Society.

SIR,

THE Honourable the Governor General having received and laid before the Board a Letter addressed to him by Lieutenant SAMUEL TURNER, containing the Account of a Journey made to *Teeshoo Loomboo* by a *Goffeyn* named POORUNGEER, and the circumstances of his reception by TEESHOO LAMA; and the Board deeming it worthy of the attention of the *Asiatick Society*, I have the honour, in obedience to their directions, to transmit to you a copy of it.

I have the honour to be,

Sir,

Your most obedient humble Servant,

E. HAY, *Secretary.*

FORT WILLIAM,
Secret Department, Feb. 22, 1786.

VIII.

AN ACCOUNT OF A JOURNEY TO TIBET.

TO THE HONOURABLE JOHN MACPHERSON, Esq.

GOVERNOR GENERAL, &c. &c. &c.

Fort William.

HONOURABLE SIR,

HAVING, in obedience to the instructions with which you were pleased to honour me, examined POORUNGEER, the *Goffeyn*, who has at different times been employed in deputations to the late TEESHOO LAMA, formerly accompanied him to the court of *Pekin*, and who is lately again returned from *Tibet*, and having collected from him such an account of the journey he has just performed, and other information as he could give me relative to the countries he has left; I beg leave to submit it to you in the following narrative.

In the beginning of last year POORUNGEER, having received dispatches from Mr. HASTINGS, a short time previous to his departure from *Bengal*, for TEESHOO LAMA and the Regent of *Teshoo Loomboo*, immediately set about preparing for the distant journey he had engaged to undertake which employed him until the beginning of the following month of March, when I beg leave to recal to your remembrance I had the honour to present him to you for his dismissal. He then commenced his journey from *Calcutta*, and early in the month of April had passed, as he relates, the limits of the Company's Provinces, and entered the mountains that constitute the kingdom of *Bootan*, where, in the prosecution of his journey, he received from the subjects of the DAIB RAJA, the most ample and voluntary assistance to the frontier of his territory, nor met with any impediment to oppose his progress until he came upon the borders of *Tibet*. Here he was compelled to halt for near a fortnight by a heavy fall of snow, that commenced upon his arrival, and continued incessantly for the space of six days, covering the face of the country to so great a depth as totally to put a stop to all travelling, and render it impracticable for him to proceed until a thaw succeeded to open the communication. During the time
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of his confinement at *Pbari*, he says, such was the severity of the cold, and the injurious effect so rapid a transition from a temperate climate had on the health of himself and his companions, that it left him little room to doubt if an early change had not fortunately taken place and permitted his advance, that they must all have fallen victims to the inclemency of the weather.

However, as early as it was possible for him to leave *Pbari*, he proceeded by long stages on his journey, and without encountering any further difficulty, on the 8th of May following, reached *Teshoo Lomboo*, the capital of *Tibet*. Immediately upon entering the Monastery, he went to the Durbar of the Regent PUNJUR INTINNEE NEMOHEIN to announce his arrival and the purpose of his commission. Quarters were then allotted for his residence, and an hour fixed for him to wait upon TESHOO LAMA; who he was informed the following morning intended to leave the palace to occupy one of his gardens, situated on the plain within sight of the Monastery, where it was visible a considerable encampment had been formed. The LAMA quitted his apartment at the first dawn of day, and was lodged in the tents pitched for his accommodation before the sun had risen.

In the course of the morning, at the hour appointed for his admission, POORUNGEER went down to the LAMA's tents. He heard, on entering the gates of the enclosure, that the young LAMA was taking his recreation in the garden, ranging about, which became with him a very favourite amusement. As it was at this time in *Tibet* the warmest part of the year, that he might enjoy the benefit of the air, his attendants had chosen a spot where the trees afforded a complete shade to place an elevated seat of cushions, for the young LAMA, after his exercise, to rest upon. In this situation POORUNGEER found him, when summoned to his presence, attended by the Regent, his parents, SOOPOON CHOOMBOO, the cup bearer, and the principal officers of the court. After making three obeisances at as remote a distance as it was possible, POORUNGEER approached, and presented to the LAMA, according to the custom of *Tibet*, a piece of white pelong, and then delivered the letters and presents with which he had been charged. The packages were all immediately opened before the LAMA, who had every article brought near to him, and viewed them separately one by one. The letter he took into his own hand, himself broke the seal, and taking from under the cover a string of pearls, which it enclosed, ran them over between his fingers, as they read their rosaries, and then with an arch air placed them by his side, nor would, while the narrator was in his presence, permit any one to take them up. POORUNGEER says, the young LAMA regarded him with a very kind

and significant look, spoke to him in the *Tibet* language, and asked him if he had had a fatiguing journey. The interview lasted more than an hour, during all which time the LAMA sat with the utmost composure, not once attempting to quit his seat, nor discovering the least forward uneasiness at his confinement. Tea was twice brought in, and the LAMA drank a cup each time. When ordered to accept his dismissal, POORUNGEER approached the LAMA, and bowing before him, presented his head uncovered to receive his blessing, which the young LAMA gave by stretching out his hand and laying it on his head. He then ordered him for as long as he resided at *Teeboo Loomboo* to come to him once every day.

The following morning POORUNGEER waited upon the regent at his apartments in the palace, to whom, after observing the customary forms of introduction, he delivered his dispatches. After this he visited SOOPON CHOOMBOO, the LAMA's parents, and others to whom he was before known, and says he experienced from all quarters the most cordial and kind reception; for they had been long used to consider him as an agent of the Government of *Bengal*. He found no change whatever to have ensued in the administration since his attendance upon me in *Tibet*. The country enjoyed perfect tranquillity, and the only event that had taken place of importance in their annals was the inauguration of the infant LAMA, which happened the preceding year; and as this constitutes a concern of the highest moment, whether considered in a political or religious point of view, being no less than the recognition in an infant form of their re-generated immortal sovereign and ecclesiastical supreme, I was induced to bestow more than common pains to trace the ceremonies that attended the celebration of such a great event, conceiving that the novelty of the subject might render the account curious, if even it should be found to contain no information of real utility. I shall therefore, without further apology, subjoin the result of my enquiries, premising only that my authority for the description is derived principally from POORUNGEER, and confirmed, with some additional particulars, by the concurring reports of a *Gossyen*, who was at the time himself present on the spot.

The Emperor of *China* appears on this occasion to have assumed a very conspicuous part, in giving testimony of his respect and zeal for the great religious father of his faith. Early in the year 1784, he dismissed ambassadors from the court of *Pekin* to *Teeboo Loomboo*, to represent their sovereign in supporting the dignity of the high priest, and do honour to the occasion of the assumption of his office. DALAI LAMA and the Viceroy of *Lassa*, accompanied by all the court, one of the *Chinese* Generals,

rals, stationed at *Lassa* with a part of the troops under his command, two of the four magistrates of the city, the heads of every Monastery throughout *Tibet*, and the Emperor's ambassadors, appeared at *Teesboo Loomboo* to celebrate this epocha in their theological institutions. The 28th day of the seventh moon, corresponding nearly, as their year commences with the vernal equinox, to the middle of October, 1784, was chosen as the most auspicious for the ceremony of inauguration: a few days previous to which the LAMA was conducted from *Terpaling*, the Monastery in which he had passed his infancy, with every mark of pomp and homage that could be paid by an enthusiastick people. So great a concourse as assembled either from curiosity or devotion was never seen before, for not a person of any condition in *Tibet* was absent who could join the suite. The procession was hence necessarily constrained to move so slow, that though *Terpaling* is situated at the distance of twenty miles only from *Teesboo Loomboo*, three days expired in the performance of this short march. The first halt was made at *Tfondue*; the second at *Summaar*; about six miles off whence the most splendid parade was reserved for the LAMA's entry on the third day; the account of which is given me by a person who was present in the procession. The road, he says, was previously prepared by being whitened with a wash, and having piles of stones heaped up, with small intervals between, on either side. The retinue passed between a double row of priests, who formed a street extending all the way from *Summaar* to the gates of the palace. Some of the priests held lighted rods of a perfumed composition, that burn like decayed wood, and emit an aromattick smoke; the rest were furnished with the different musical instruments they use at their devotions, such as the gong, the cymbal, haut-boy, trumpets, drums, and sea shells, which were all sounded in union with the hymn they chanted. The croud of spectators were kept without the street, and none admitted on the high road but such as properly belonged to or had a prescribed place in the procession, which was arranged in the following order.

The van was led by three military commandants or governors of districts at the head of 6 or 7000 horsemen armed with quivers, bows, and matchlocks. In their rear followed the ambassador, with his suite, carrying his diploma, as is the custom of *Cbina*, made up in the form of a large tube, and fastened on his back. Next the *Cbinese* General advanced with the troops under his command, mounted and accoutred after their way with fire arms and sabres; then came a very numerous group bearing the various standards and insignia of state; next to them moved a full band of wind and other sonorous instruments; after which were led two horses richly caparisoned, each

each carrying two large circular stoves disposed like panniers across the horse's back and filled with burning aromattick woods. These were followed by a senior priest, called a *Lama*, who bore a box containing books of their form of prayer and some favourite idols. Next nine sumptuary horses were led loaded with the LAMA's apparel; after which came the priests immediately attached to the LAMA's person for the performance of daily offices in the temple, amounting to about 700; following them were two men each carrying on his shoulder a large cylindrical gold insignium embossed with emblematical figures (a gift from the Emperor of *Cbina*). The *Dubunniars* and *Soopoons*, who were employed in communicating addresses and distributing alms, immediately preceded the LAMA's bier, which was covered with a gaudy canopy, and borne by eight of the sixteen *Cbinese* appointed for this service. On one side of the bier attended the Regent, on the other the LAMA's father. It was followed by the heads of the different Monasteries, and as the procession advanced, the priests who formed the street fell in the rear and brought up the suite, which moved at an extremely slow pace, and about noon was received within the confines of the Monastery amidst an amazing display of colours, the acclamations of the croud, solemn music, and the chanting of their priests.

The LAMA being safely lodged in the palace, the Regent and SOOPON CHOOMBOO went out, as is a customary compliment paid to visitors of high rank on their near approach, to meet and conduct DALAI LAMA and the Viceroy of *Lassa* who were on the way to *Teesboo Loomboo*. Their retinues encountered the following morning at the foot of *Painom* castle, and the next day together entered the Monastery of *Teesboo Loomboo*, in which both DALAI LAMA and the Viceroy were accommodated during their stay.

The following morning, which was the third after TEESHOO LAMA's arrival, he was carried to the great temple, and about noon seated upon the throne of his progenitors; at which time the Emperor's ambassador delivered his diploma, and placed the presents with which he had been charged at the LAMA's feet.

The three next ensuing days, DALAI LAMA met TEESHOO LAMA in the temple, where they were assisted by all the priests in the invocation and publick worship of their Gods. The rights then performed completed, as I understand, the business of inauguration. During this interval all who were at the capital were entertained at the publick expence, and alms were distributed without reserve. In conformity likewise to previous notice circulated every where for the same space of time, universal rejoicings prevailed throughout *Tibet*. Banners were unfurled on all their fortresses, the

the peasantry filled up the day with musick and festivity, and the night was celebrated by general illuminations. A long period was afterwards employed in making presents and publick entertainments to the newly-inducted LAMA, who at the time of his accession to the Musnud, or, if I may use the term, pontificate, of *Teesboo Loomboo*, was not three years of age. The ceremony was begun by DALAI LAMA, whose offerings are said to have amounted to a greater value, and his publick entertainments to have been more splendid, than the rest. The second day was dedicated to the Viceroy of *Lassa*. The third to the *Chinese* General. Then followed the Cullong or Magistrates of *Lassa*, and the rest of the principal persons who had accompanied DALAI LAMA. After which the Regent of *Teesboo Loomboo*, and all that were dependent on that government, were severally admitted, according to pre-eminence of rank, to pay their tributes of obeisance and respect. As soon as the acknowledgements of all those were received who were admiffible to the privilege, TEESHOD LAMA made, in the same order, suitable returns to each, and the consummation lasted forty days.

Many importunities were used with DALAI LAMA, to prolong his stay at *Teesboo Loomboo*, but he excused himself from encumbering the capital any longer with so numerous a concourse of people as attended on his movements, and deeming it expedient to make his absence as short as possible from the seat of his authority, at the expiration of forty days he withdrew with all his suite to *Lassa*, and the Emperor's ambassador received his dismissal to return to *China*; and thus terminated this famous festival.

With respect to the lately-established commercial intercourse, POORUNGEER informs me that though so early, he found himself not the first person who had arrived at *Teesboo Loomboo* from *Bengal*. Many merchants had already brought their commodities to market, and others followed before he left it. He heard from no quarter any complaint of impediment or loss, and concludes therefore that all adventurers met the same easy access and ready aid as he himself had every where experienced. The markets were well stocked with *English* and *Indian* articles, yet not in so great a degree as to lower the value of commodities below the prices of the two or three last preceding years. Bullion was somewhat reduced in worth in comparison with the year 1783. A pootree, or bulse of gold dust, the same quantity that then sold for twenty-one Indermillees, was procurable of a purer quality for nineteen and twenty Indermillees. A talent of silver, which was then 500, was 450 Indermillees; so that the exchange was much in favour of the trader.

POORUNGEER, during his residence at *Teeshoo Loomboo*, had very frequent interviews with the Regent and the ministers, and assures me he found the heartiest dispositions in them to encourage the commercial intercourse established under the auspices of the late Governor General, whose departure, however, the Regent regretted as the loss of the first friend and ally he became connected with, of, I believe it may be said, any foreign nation; in whom was acknowledged also the original means of opening the communication and of commencing a correspondence between the Governments of *Bengal* and *Tibet*; and although it may be observed that, in consequence of his having from the beginning been used exclusively to address himself to, and acknowledge alone the agents of, Mr. HASTINGS, his attachments to the *English* nation had grown not without a great degree of personality, yet, free from an unworthy capriciousness of temper, he descended not to take advantage of the opening offered by his friend's departure to close the new connection. For such was the respect he had learnt to entertain for our national integrity of character, that, under the apparent conviction our views tended to no scheme of ambition, but were confined merely to objects of utility and curiosity. POORUNGEER assures me he expressed an anxious desire for continuing with the succeeding Governor General the exercise of those offices of friendship so long supported by his predecessor; and in the hope that his would be met with equal wishes, determined to invite you to join him in preserving the same intercourse of commerce and correspondence so essentially calculated for the benefit of both countries. In consequence of which the LAMA and the Regent addressed the letters POORUNGEER had the honour to deliver to you, translations of which having, in obedience to your directions, been applied for to your *Persian* translator, I now subjoin them.

Copy of a Letter from TEESHOO LAMA.

“ God be praised, that the situation of these countries is in peace and happiness,
 “ and I am always praying at the altar of the Almighty for your health and preserv-
 “ ation. This is not unknown: you are certainly employed in protecting and assisting
 “ the whole world, and you promote the good and happiness of mankind. We have
 “ made no deviation from the union and unanimity, which existed during the time
 “ of the first of nobles Mr. HASTINGS and the deceased LAMA, and may you also
 “ grant friendship to these countries, and always make me happy with the news
 “ of your health, which will be the cause of ease to my heart and confirmation to
 “ my soul. At this time, as friendly offerings of union and unanimity, I send one
 “ handker-

“ handkerchief, one ketoo of silver, and one piece of cochin. Let them be accepted.”

From the RAJAH of Teeshoo Loomboo.

“ God be praised, that the situation of these countries is in peace and happiness, and I am always praying at the altar of the Almighty for your health and preservation. This is not unknown: I am constantly employed in promoting the advantage of the subjects and the service of the newly-seated LAMA, because the newly-seated LAMA is not distinct from the deceased LAMA, and the light of his countenance is exalted. Grant your friendship to POORUNGEER Goffeyn.

“ Maintain union and unanimity and affection, like the first of nobles, and every day make me happy with the news of your health and prosperity, and bestow favours like the first of nobles, and make me happy with letters, which are causes of consolation. At this time, as friendly offerings of union and affection and unanimity, I send one handkerchief, three tolah of gold, and one piece of cochin. Let them be accepted.”

POORUNGEER, having received these dispatches in the beginning of October, after a residence of five months at *Teeshoo Loomboo*, took leave of the LAMA and the Regent, and set out on his return, by the same route he came, to *Bengal*. The weather at this season of the year being most extremely favourable for travelling, he experienced no delay or interruption in the course of his journey through *Tibet* and *Bootan*, but arrived at *Rungpore* early in December, whence he proceeded as expeditiously as possible to the Presidency; where, to his great mortification and concern, he finds upon his arrival his affairs involved in great distress: the little territory, his adopted Chela was left in charge of, having during his absence been violently invaded by RAJA CHUND, a neighbouring Zemeendar, and to the amount of fifty begas forcibly taken out of his hands. Prevailed on by his earnest repeated solicitations, I am induced to say for him, that in your justice and favour are his only hopes of relief from his embarrassments, and he humbly supplicates your protection in restoring and securing him in the possession of his invaded right. The liberty of this intercession, I am confident to think, would be forgiven, were it not in favour of one who has rendered to this Government various useful services; but as, though of trivial importance, it affords an authentick instance of the encroaching disposition of inferior Zemeendars. Yet another circumstance it may not be improper to point out.

out. The ground alluded to is a part of the land situated upon the western bank of the river opposite Calcutta, that was formerly granted under a Sunnud of this Government to TEESHOO LAMA, for the foundation of a temple of worship, and as a resort for such pilgrims of their nation, as might occasionally make visits to the consecrated Ganges.

Having, in conformity to your desires, done my best endeavours literally to translate all the information POORUNGEER could give me, I have now only to apologize for the prolixity of the account, which I have been induced to be particularly minute in, as I conceived every circumstance, however trivial, might be in some degree interesting, that tends to illustrate any trait in the national character of a people we are but recently become acquainted with, and with whom in its extended views it has been an object of this Government to obtain a closer alliance.

I will not now presume to intrude longer on your time by adding any observations on conjectures deducible from the elevated importance your young ally seems rising to, in consequence of the signal respect paid him by the most exalted political characters known to his nation; but beg leave to repeat that it is with infinite satisfaction, I learn from the reports of POORUNGEER the flourishing state of the lately projected scheme of trade, to promote which, he assures me, not any thing had been wanting in facility of intercourse: that the adventurers, who had invested their property, had experienced perfect security in conducting their commerce, carried their articles to an exceeding good market, and found the rate of exchange materially in their favour.

Those advantages authorize the inference, that it will no doubt encourage more extensive enterprize; and permit me to add, I derive a confidence from the success of this infant essay, that inspires me with the strongest hopes, that the commission which your Honourable Board was pleased to commit to my charge, will eventually be productive of essential benefits to the political and commercial interests of the Company.

I have the honour to be,

Honourable Sir,

With the greatest respect,

Your most obedient, faithful,

And most humble Servant,

SAMUEL TURNER.

Calcutta, February 8, 1786.

IX.

ON THE GODS OF GREECE, ITALY, AND INDIA.—*See the Works of Sir William Jones, Vol. I. p. 229.*

X.

A DESCRIPTION OF A CAVE NEAR GYA.

By JOHN HERBERT HARRINGTON, Esq.

A KNOWLEDGE of the antiquities of *Hindoſtan* forming one of the ſeveral objects propoſed by the institution of our Society, with the hope of communicating ſomething acceptable on this head, I took the opportunity of a late excursion up the country to ſee the *Cave* which Mr. HODGKINS a few years ſince attempted to viſit, at the deſire, I believe, of the late Governor General, but was aſſaſinated in his way to it by the followers of one of the rebellious Allies of CHYT SING. On my deſcribing it to the Preſident, whom I had the pleaſure to accompany, I was encouraged by him to think that a particular account of it would be curious and uſeful; and in conſequence made a ſecond viſit to it from *Gyá*, when I took the following meaſurements, and, by the means of my *Moonshee*, a copy of the inſcription on it, which I had deſpaired of preſenting to you, but in its original language (a *Pundit* at *Benáris* having attempted in vain to get it read, during theſe laſt three months), till the kind aſſiſtance of Mr. WILKINS enabled me to add the accompanying tranſlation and remarks to what would otherwiſe have given little ſatisfaction.

The Hill, or rather Rock, from which the Cavern is dug, lies about fourteen miles North of the ancient city of *Gyá*, and ſeems to be one of the South Eastern Hills of the Chain of mountains called by RENNEL *Caramſhab*, both being a ſhort diſtance to the Weſt of the *Pbulgá*.

It is now diſtinguiſhed by the name of *Nágurjenee*; but this may, perhaps, be a modern appellation; no mention of it being made in the inſcription. Its texture is a kind of Granite, called by the MOHUMMEDAN natives *Sung Kháreb*, which compoſes the whole Rock, of a moderate height, very craggy and uneven, and ſteep in its aſcent.

The *Cave* is situated on the Southern declivity, about two thirds from the summit: a tree immediately before it prevents its being seen from the bottom. It has only one narrow entrance, from the South, two feet and a half in breadth, six feet high, and of thickness exactly equal. This leads to a room of an oval form, with a vaulted roof, which I measured twice, and found to be forty-four feet in length from East to West, eighteen feet and a half in breadth, and ten feet and a quarter in height at the centre. This immense cavity is dug entirely out of the solid rock, and is exceedingly well polished, but without any ornament. The same stone extends much farther than the excavated part, on each side of it, and is altogether, I imagine, full a hundred feet in length. The inhabitants near know nothing of its history or age, but I learnt from the chief of a neighbouring village, that a tradition is extant of a MOHUMMEDAN, named MINHA'J-U-DEEN, having performed his *Cheeleh*, or forty days devotion, in this Cavern; and that he was cotemporary with MUKHDOOM SHERF-U-DEEN, a venerated *Welee*, who died in *Behar* in the 590th year of the *Hijree*; and he even went so far as to aver that he himself was descended from MINHA'J-U-DEEN, and had records at *Patna* of his family's genealogy to the present time. What credit is due to this I will not pretend to say, but the room is certainly now frequented by MOHUMMEDANS, and has been for some time, as there are the remains of an old mosque close before it, and within, a raised terrace, such as the MOHUMMEDAN devotees are used to construct for their religious retirement. There are two inscriptions, one on each side of the interior part of the entrance; impressions of both which my *Moonshee* took off in the course of three days, with much trouble, and sufficient accuracy to enable Mr. WILKINS to understand and explain the whole of one, though many *Pundits*, I was informed, who had seen the original engraving, had attempted in vain to decypher it. The other, which consists of one line only, is unfortunately of a different character, and remains still unintelligible.

The following letter and remarks, which Mr. WILKINS has favoured me with, make it unnecessary for me to say any thing of the contents of the inscription: I can only regret with him that the date is yet undiscovered; as what is now but a gratification of curiosity might then have been a valuable clue to the illustration of obscure events in ancient history. There are, however, several other *Caves* in the adjoining hills, which I likewise visited, but had not time to take the inscriptions: and from these, I hope, a date will be discovered:

Were any other testimony besides the inscription wanted, to shew that these

Caves

ॐ नमो भगवते वासुदेवाय ॥

ॐ नमो भगवते वासुदेवाय ॥

ॐ नमो भगवते वासुदेवाय ॥

ॐ नमो भगवते वासुदेवाय ॥

ॐ नमो भगवते वासुदेवाय ॥

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ॐ नमो भगवते वासुदेवाय ॥

ॐ नमो भगवते वासुदेवाय ॥

LETTER FROM CHARLES WILKINS, ESQ.

Temples were religious temples, the remains of three defaced images near another which I visited, called *Gurram Choffar*, would be sufficient proof of it. A third, the name of which I could not learn, has its entrance very curiously wrought with Elephants and other ornaments, of which, I hope, in a short time, to present a Drawing to the Society.

LETTER FROM CHARLES WILKINS, ESQ. TO THE SECRETARY.

DEAR SIR,

HAVING been so fortunate as to make out the whole of the very curious inscription you were so obliging as to lend me, I herewith return it, accompanied by an exact copy, in a reduced size, interlined with each corresponding letter in the modern *Devanagari* character; and also a copy of my translation, which is as literal as the idiom would admit it to be.

The character is undoubtedly the most ancient of any that have hitherto come under my inspection. It is not only dissimilar to that which is now in use, but even very materially different from that we find in inscriptions of eighteen hundred years ago. But though the writing be not modern, the language is pure *Sanskrit*, written in a long verse, called *Sardoola-vekrereeta*, and consists of four paues of nineteen syllables each, in this form:

The metre was so small as to require the vowels

The first lines of the first verse allude to the story of *Brahma's* killing the evil spirit *Mabhasoor*, who, in the disguise of a Buffalo, as the name imports, had fought with *Hendran* and his celestial bands for a hundred years, defeated him and usurped his throne. The story is to be found at large in a little book called *Chandee*. The vanquished spirit, being banished to the heavens and doomed to wander the earth, after a while assemble, with their chief *Eendran* at their head, and resolve to lay their grievances before *Vesbhoo* and *Siva*. Conducted by *Brahma*, they repair

into the presence of those Deities, who heard their complaints with compassion; and their anger was so violent against *Mābēśśāsōor*, that a kind of flame issued from their mouths, and from the mouths of the rest of the principal Gods, of which was formed a Goddess of inexpressible beauty with ten arms, and each hand holding a different weapon. This was a transfiguration of *Bhāwānēē* the consort of *Sēēv*, under which she is generally called *Dōōrgā*. She is sent against the usurper. She mounts her lion, the gift of the mountain *Hēēmālāy* (snowy), and attacks the Monster, who shifts his form repeatedly; till at length the Goddess *planteth her foot upon his head*, and cuts it off with a single stroke of her sword. Immediately the upper part of a human body issues through the neck of the headless Buffalo and aims a stroke, which being warded off by the lion with his right paw, *Dōōrgā* puts an end to the combat by piercing him through the heart with a spear. I have in my possession a statue of the Goddess with one foot on her lion, and the other on the monster, in the attitude here lastly described.

The want of a date disappointed my expectations. I had some hopes that it was contained in the single line, which you informed me was taken from another part of the *Cave*; but although I have not yet succeeded in making out the whole, I have discovered enough to convince me that it contains nothing but an invocation. If you should be so fortunate as to obtain correct copies of the rest of the inscriptions, that are to be found in the *Caves* of those mountains, I make no doubt, but that we shall meet with some circumstance or other, that will guide us to a discovery of their antiquity.

I have the pleasure to subscribe myself,

Dear Sir,

Your very sincere friend,

And obedient humble Servant,

CHARLES WILKINS.

Calcutta, 17th March, 1785.

A TRANSLATION OF A SANSKRIT INSCRIPTION.

WHEN the foot of the Goddess (1) was, with its tinkling ornaments, planted upon the head of *Mābēśbāsōor* (2), all the bloom of the new-blown flower of the fountain (3) was dispersed, with disgrace, by its superior beauty. May that foot, radiant with a fringe of refulgent beams issuing from its pure bright nails, endue you with a steady and an unexampled devotion, offered up with fruits, and shew you the way to dignity and wealth!

The illustrious *Yāgnā Vārmā*, was a Prince whose greatness consisted in free-will offerings. His reputation was as unfulfilled as the Moon. He was renowned amongst the Martial Tribes; and, although he was, by descent, by wisdom, courage, charity and other qualities, the fore-leader of the royal line; yet, from the natural humility of his temper, he disturbed not the powerful ocean.

His auspicious son, *Sārdoolā Vārmā*, a Prince whose magnificence flowed, as it were, from the tree of imagination (4), displayed the ensign of royalty in sacrifices, and the world was subdued by his infinite renown. He gratified the hopes of relations, friends and dependants; and honour was achieved from the deed of death (5) near the uprising ocean.

By his pious son, called *Ānāntā Vārmā* because of his infinite renown, the holy abode of us contemplative men, who are always studious for his good and employed in his service, hath been increased and rendered famous as long as the earth, the sun and moon, and starry heaven, shall endure; and *Kātyāyānēē* (6) having taken sanctuary, and being placed, in this cavern of the wonderful *Veen'dyā* (7) mountains.

The holy Prince gave unto *Bbāwānēē*, in perpetuity, the village ————— (8) and its hilly lands, by whose lofty mountain-tops the sunny beams are cast in shade: its filth and impurities are washed away by the precious stores of the

(1) *Bbāwānēē* the wife of *Sēo*.

(2) The name of an evil spirit.

(3) Epithet of the lotus.

(4) In the original *Kālpā-tārō*, a fabulous tree which yielded every thing that was demanded.

(5) He was probably carried to *Gāngā-Sāgar* to die.

(6) One of the names of *Dōrgā* or *Bōwanēē*.

(7) The name of the chain of mountains which commences at *Cbunar*.

(8) The name, which consisted of two long syllables, is wanting in the original.

Māhānādā (1), and it is refreshed by the breezes from the waving *Prēyāngōōs* (2) and *Bākōōlās* (3) of its groves.

 XI.

TRANSLATION OF A SANSKRIT INSCRIPTION, COPIED FROM A STONE AT BÖÖD-DHĀ-GĀYĀ, BY MR. WILMOT, 1785.

Translated by CHARLES WILKINS, *Esq.*

IN the midst of a wild and dreadful forest, flourishing with trees of sweet-scented flowers, and abounding in fruits and roots; infested with Lions and Tigers; destitute of human Society, and frequented by the *Moonees*, resided *Bööd-dhā*, the Author of Happiness, and a portion of *Narayan*. This Deity *Hārēē*, who is the Lord *Hārēēsa*, the possessor of all, appeared in this ocean of natural Beings at the close of the *Devāpārā*, and beginning of the *Kālēē Yōog*: he who is omnipresent and everlastingly to be contemplated, the Supreme Being, the Eternal One, the Divinity worthy to be adored by the most praise-worthy of mankind, appeared here with a portion of his divine nature.

Once upon a time the illustrious *Āmārā*, renowned amongst men, coming here, discovered the place of the Supreme Being, *Bööd-dhā*, in the great forest. The wise *Āmārā* endeavoured to render the God *Bööd-dhā* propitious by superior service; and he remained in the forest for the space of twelve years, feeding upon roots and fruits, and sleeping upon the bare earth; and he performed the vow of a *Moonee*, and was without transgression. He performed acts of severe mortification, for he was a man of infinite resolution, with a compassionate heart. One night he had a vision and heard a voice saying: "Name whatever boon thou wantest." *Āmārā Deva*, having

(1) Probably the river called the *Mabonab* in RENNEL's Map of South *Babar*.

(2) Probably the *Champa*.

(3) *Moulserree*.

heard

heard this, was astonished, and with due reverence replied, "First, give me a visitation, and then grant me such a boon." He had another dream in the night, and the voice said: "How can there be an apparition in the *Kālē Yooḡ*? the same reward may be obtained from the sight of an image, or from the worship of an image, as may be derived from the immediate visitation of a deity." Having heard this he caused an image of the Supreme Spirit *Bōōd-dbā* to be made, and he worshipped it, according to the law, with perfumes, incenses, and the like; and he thus glorified the name of that Supreme Being, the incarnation of a portion of *Veesbnoo*; "Reverence be unto thee in the form of *Bōōd-dbā*! Reverence be unto the Lord of the Earth! Reverence be unto thee, an incarnation of the Deity and the Eternal One! Reverence be unto thee, O God, in the form of the God of Mercy;—the dispeller of pain and trouble, the Lord of all things, the Deity who overcometh the sins of the *Kālē Yooḡ*, the Guardian of the Universe, the Emblem of Mercy towards those who serve thee—*ōm*! the possessor of all things in vital form! Thou art *Brābmā*, *Veesbnoo*, and *Mābēsa*! Thou art Lord of the Universe! Thou art, under the proper form of all things moveable and immovable, the possessor of the whole! and thus I adore thee. Reverence be unto the bestower of salvation, and *Resbeekēsā*, the ruler of the faculties! Reverence be unto thee (*Kēsavā*), the destroyer of the evil spirit *Kēsee*! O *Dāmōrdārā*, shew me favour! Thou art he who resteth upon the face of the milky ocean, and who lyeth upon the serpent *Sēsā*, Thou art *Trēēviēkrāmā* (who at three strides encompassed the Earth!) I adore thee, who art celebrated by a thousand names, and under various forms in the shape of *Bōōd-dbā* the God of Mercy! Be propitious, O most high God!"

Having thus worshipped the guardian of mankind, he became like one of the just. He joyfully caused a holy temple to be built of a wonderful construction, and therein were set up the divine foot of *Veesbnoo* for ever purifier of the sins of mankind, the images of the *Pāndōōs* and of the descents of *Veesbnoo*, and in like manner of *Brābmā*, and the rest of the divinities.

This place is renowned; and it is celebrated by the name of *Bōōd-dbā-Gāyā*. The forefathers of him who shall perform the ceremony of the *Sradba* at this place shall obtain salvation. The great virtue of the *Sradba* performed here, is to be found in the book called *Vāyōō-pōōrānā*; an epitome of which hath by me been engraved upon stone.

Vēēkrāmādēētyā was certainly a king renowned in the world. So in his court there

there were nine learned men, celebrated under the epithet of the *Nāvā-ratnāṅgā* or nine jewels; one of whom was *Amāra Dēvā*, who was the King's Chief Counsellor, a man of great genius and profound learning, and the greatest favourite of his prince. He, it certainly was, who built the holy temple which destroyeth sin, in a place in *Jambhūdweep*, where, the mind being steady, it obtains its wishes, and in a place where it may obtain salvation, reputation, and enjoyment, even in the country of *Bhārātā*, and the province of *Kēśkātā*, where the place of *Bōddhā*, purifier of the sinful, is renowned. A crime of an hundred fold shall undoubtedly be expiated from a sight thereof, of a thousand fold from a touch thereof, and of a hundred thousand fold from worshipping thereof. But where is the use of saying so much of the great virtues of this place? even the hosts of heaven worship with joyful service both day and night.

That it may be known to learned men, that he verily erected the house of *Bōddhā*, I have recorded, upon a stone, the authority of the place, as a self-evident testimony, on Friday, the fourth day of the new moon in the month of *Madhoo*, when in the seventh or mansion of *Gāniśā*, and in the year of the *Era* of *Vēekrāmādētyā* 1005.

 XII.

TO

SECRETARY to the ASIATICK SOCIETY:

SIR,

BEFORE I left *Calcutta*, a gentleman, with whom I chanced to be discoursing of that sect of people who are distinguished from the worshippers of *Brāhm* and the followers of MAHOMMED by the appellation *Seek*, informed me that there was a considerable number of them settled in the city of *Patna*, where they had a college for teaching the tenets of their philosophy. As *Patna* was in my way to *Banaris*, I no sooner arrived there than I inquired after the college, and I was presently conducted to it; and I now request you will please to lay before the Society, the few observations and inquiries which a single visit of about two hours would admit of my making. If, such as they are, they should hereafter be found useful either as a

clue

clue to guide another in his researches in the same path, or to add to some future account to render it more complete, my end in troubling you to lay it before the Society is fully answered.

I have the honour to subscribe myself,

Sir,

Your most obedient humble Servant,
CHARLES WILKINS.

Banaris, 1st March, 1781.

I FOUND the college of the *Seeks*, situated in one of the narrow streets of *Patna*, at no very considerable distance from the Custom-house. I was permitted to enter the outward gate, but, as soon as I came to the steps which led up into the chapel, or publick hall, I was civilly accosted by two of the society. I asked them if I might ascend into the hall: They said it was a place of worship open to me and to all men; but, at the same time, intimated that I must take off my shoes. As I consider this ceremony in the same light as uncovering my head upon entering any of our temples dedicated to the Deity, I did not hesitate to comply, and I was then politely conducted into the hall, and seated upon a carpet, in the midst of the assembly, which was so numerous as almost to fill the room. The whole building forms a square of about forty feet, raised from the ground about six or eight steps. The hall is in the center, divided from four other apartments by wooden arches, upon pillars of the same materials, all neatly carved. This room is rather longer than it is broad. The floor was covered with a neat carpet, and furnished with six or seven low desks, on which stood as many of the books of their law; and the walls, above the arches, were hung with European looking glasses in gold frames, and pictures of *Mussulman* princes, and *Hindoo* deities. A little room, which, as you enter, is situated at the left hand end of the hall, is the chancel, and is furnished with an altar covered with a cloth of gold, upon which was laid a round black shield over a long broad-sword, and, on either side, a *chowry* of peacocks' feathers, mounted in a silver handle. The altar was raised a little above the ground, in a declining position. Before it stood a low kind of throne plated with silver; but rather too small to be useful; about it were several silver flower pots and rose-water bottles, and on the left hand stood three small *urns* which appeared to be copper, furnished with notches to receive the donations of the charitable. There stood also near the altar, on a low desk, a great book of a folio size, from which some por-

tions are daily read in their divine service. It was covered over with a blue mantle, on which were printed, in silver letters, some select passages of their law.

After I had had a long conversation with two of the congregation, who had politely seated themselves, on each side of me, on the carpet, and whom I found very intelligent, notice was given, that it was noon and the hour of divine service. The congregation arranged themselves upon the carpet, on each side of the hall, so as to leave a space before the altar from end to end. The great book, desk, and all, was brought, with some little ceremony, from the altar, and placed at the opposite extremity of the hall. An old man, with a reverend silver beard, kneeled down before the desk with his face towards the altar; and on one side of him sat a man with a small drum, and two or three with cymbals. The book was now opened, and the old man began to chant to the time of the drum and the cymbals; and, at the conclusion of every verse, most of the congregation joined chorus in a response, with countenances exhibiting great marks of joy. Their tones were by no means harsh; the time was quick; and I learnt that the subject was a hymn in praise of the Unity, the Omnipresence, and the Omnipotence, of the Deity. I was singularly delighted with the gestures of the old man: I never saw a countenance so expressive of infelt joy, whilst he turned about from one to another, as it were, bespeaking their assents to those truths which his very soul seemed to be engaged in chanting forth. The hymn being concluded, which consisted of about twenty verses, the whole congregation got up and presented their faces with joined hands towards the altar, in the attitude of prayer. A young man now stood forth; and, with a loud voice and distinct accent, solemnly pronounced a long prayer or kind of liturgy, at certain periods of which all the people joined in a general response, saying *Wā Gooroo!* They prayed against temptation; for grace to do good; for the general good of mankind; and a particular blessing to the *Seeks*: and for the safety of those who at that time were on their travels. This prayer was followed by a short blessing from the old man, and an invitation to the assembly to partake of a friendly feast. The book was then closed and restored to its place at the altar, and the people being seated as before, two men entered bearing a large iron caldron, called a *curray*, just taken from the fire, and placed it in the center of the hall upon a low stool. These were followed by others with five or six dishes, some of which were of silver, and a large pile of leaves sewed together with fibres in the form of plates. One of these plates was given to each of the company without distinction, and the dishes being filled from the caldron, their contents were served out till every

one

one had got his share: myself was not forgotten; and, as I was resolved not to give them the smallest occasion for offence, I ate up my portion. It was a kind of sweetmeat, of the consistence of soft brown sugar, composed of flour and sugar mixed up with clarified butter, which is called *Gbee*. Had not the *Gbee* been rancid I should have relished it better. We were next served with a few sugar plums; and here ended the feast and the ceremonies of the day. They told me the religious part of the ceremony was daily repeated five times. I now took my leave, inviting some of the principal men amongst them, who were about to return to their own country through *Banaris*, to pay me a visit.

In the course of the conversation I was engaged in with the two *Seeks* before the service, I was able to gather the following circumstances. That the founder of their faith was called *Nāneek Sab*, who flourished about four hundred years ago at *Punjab*, and who, before his apostasy, was a *Hindoo* of the *Kshetry*, or military tribe; and that his body disappeared as the *Hindoos* and the *Mussulmans* were disputing for it; for upon their removing the cloth which covered it, it was gone. That he left behind him a book, composed by himself, in verse and the language of *Punjab*, but a character partly of his own invention; which teaches the doctrines of the faith he had established. That they call this character, in honour of their founder, *Gooroo-Mookbee: from the mouth of the preceptor*; that this book, of which that standing near the altar, and several others in the hall, were copies, teaches that there is but one God, omnipotent and omnipresent; filling all space, and pervading all matter; and that he is to be worshipped and invoked. That there will be a day of retribution, when virtue will be rewarded and vice punished (I forgot to ask in what manner); that it not only commands universal toleration, but forbids disputes with those of another persuasion. That it forbids murder, theft, and such other deeds as are, by the majority of mankind, esteemed crimes against society; and inculcates the practice of all the virtues, but particularly an universal philanthropy, and a general hospitality to strangers and travellers. This is all my short visit would permit me to learn of this book. It is a folio volume, containing about four or five hundred pages.

They told me further, that some years after this book of *Nāneek Sab* had been promulgated, another made its appearance, now held in almost as much esteem as the former. The name of the author has escaped my memory; but they favoured me with an extract from the book itself in praise of the Deity. The passage had struck my ear on my first entering the hall, when the students

were

were all engaged in reading. From the similitude of the language to the *Hindoovee*, and many *Sanskrit* words, I was able to understand a good deal of it, and I hope, at some future period, to have the honour of laying a translation of it before the Society. They told me I might have copies of both their books, if I would be at the expence of transcribing them.

I next inquired why they were called *Seeks*, and they told me it was a word borrowed from one of the commandments of their founder, which signifies "*Learn thou*;" and that it was adopted to distinguish the sect soon after he disappeared. The word, as is well known, has the same import in the *Hindoovee*.

I asked them what were the ceremonies used in admitting a profelyte. A person having shewn a sincere inclination to renounce his former opinions, to any five or more *Seeks* assembled together, in any place, as well on the highway as in a house of worship, they send to the first shop where sweetmeats are sold, and procure a small quantity of a particular sort, which is very common, and as I recollect, they call *Batāfā*, and having diluted it in pure water, they sprinkle some of it on the body, and into the eyes of the convert, whilst one of the best instructed repeats to him, in any language with which he is conversant, the chief canons of their faith, exacting from him a solemn promise to abide by them the rest of his life. This is the whole of the ceremony. The new convert may then choose a *Gooroo*, or preceptor, to teach him the language of their scriptures, who first gives him the alphabet to learn, and so leads him on, by slow degrees, until he wants no further instruction. They offered to admit me into their society; but I declined the honour; contenting myself with the alphabet which they told me to guard as the apple of my eye, as it was a sacred character. I find it differs but little from the *Dewnagur*: the number, order, and powers, of the letters are exactly the same. The language itself is a mixture of *Persian*, *Arabick*, and some *Sanskrit*, grafted upon the provincial dialect of *Punjab*, which is a kind of *Hindoovee*, or, as it is vulgarly called by us, *Moors*.

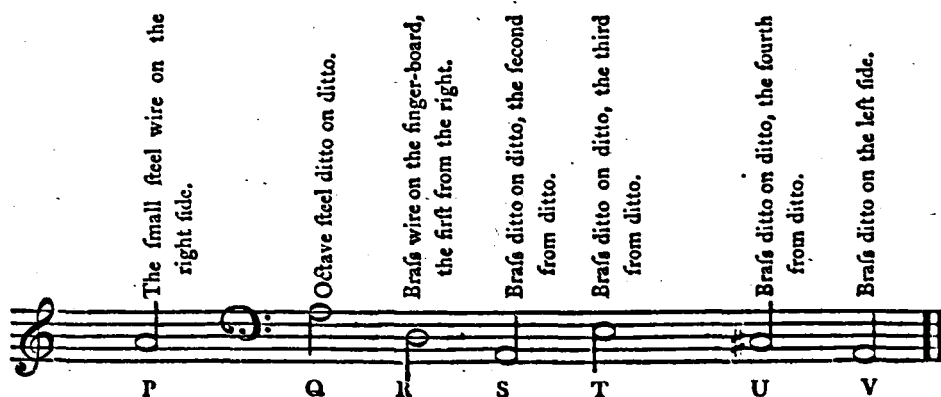
XIII.

AN EXTRACT OF A LETTER FROM FRANCIS FOWKE, ESQ.
TO THE PRESIDENT.

THE drawings of JEEWUN SHAH and the *Been*, will be dispatched in a small boat to-morrow. You wished to have had the two attendant musicians in the same drawing with JEEWUN SHAH; but the draftsman was not equal to the perspective of this: he would have run all the figures one into the other: and as he has succeeded tolerably well with the principal figures, I thought it was better to be sure of that, especially as the other figures can easily be added by an *European* artist. I have a double pleasure in sending you the enclosed account of the *Been*. In obliging you I look forward to the instructive amusement I shall share with the public at large in the result of your researches into this subject of *Indian* music; and I am exceedingly happy by furnishing you with facts, highly necessary indeed, but the mere work of care and observation, to give you greater leisure for the contemplation of the whole. You may absolutely depend upon the accuracy of all that I have said respecting the construction and scale of this instrument. It has all been done by measurement: and with regard to the intervals I would not depend upon my ear, but had the *Been* tuned to the harpsichord, and compared the instruments carefully note by note more than once. What I myself am aware of, will certainly not escape your penetration, that there may be a little of the bias of hypothesis, or an opinion pretty strongly established in what I have said of the confined modulation of the *Indian* music. But it is easy to separate my experiments and conjectures, and my prejudices cannot mislead you, though they may possibly suggest an useful hint, as half errors often do.

THE *Been* is a fretted instrument of the guitar kind. The finger-board is 21 $\frac{1}{2}$ ths inches long. A little beyond each end of the finger-board are two large gourds, and beyond these are the pegs and tail-piece which hold the wires. The whole length of the instrument is three feet seven inches. The first gourd is fixed at ten inches from the top, and the second at about two feet 11 $\frac{1}{2}$. The gourds are very large, about fourteen inches diameter, and have a round piece cut out of the bottom about five inches in diameter. The finger-board is about two inches wide. The wires

wires are seven in number, and consist of two steel ones very close together in the right side, four brass ones on the finger-board, and one brass one on the left side. They are tuned in the following manner.



The great singularity of this instrument is the height of the frets; that nearest the nut is one inch $\frac{1}{4}$, and that at the other extremity about $\frac{1}{16}$ ths of an inch, and the decrease is pretty gradual. By this means the finger never touches the finger-board itself. The frets are fixed on with wax by the performer himself, which he does entirely by ear. This was asserted by PEAR CAWN, the brother of JEEWUN SHAH, who was ill at the time, but PEAR CAWN is a performer very little, if at all, inferior to JEEWUN SHAH. The frets of PEAR CAWN's instrument were tolerably exact; any little difference is easily corrected by the pressure of the finger: indeed, the performers are fond, on any note that is at all long, of pressing the string very hard, and letting it return immediately to its natural tension, which produces a sound something like the close shake on the violin, but not with so agreeable an effect, for it appears sometimes to alter the sound half a tone.

The frets are nineteen in number. The notes that they give will appear on the following scale. I have added below the names which the performer himself gives to the notes in his own language. It is very observable, that the semitones change their names on the same semitone as in the *European* scale.

On the wires R and S, which are those principally used, there is an extent of two octaves, a whole note with all the half notes, complete in the first octave, but the $g\sharp$ and $b\flat$ wanting in the second. The performer's apology for this was that he could easily get those notes by pressing the string a little hard upon the frets $f\sharp$ and $a\sharp$, which is very true from the height of the frets, but he asserted that this was no defect in his particular instrument but that all *Beens* were made so. The wires TU are seldom used except open.

The *Been* is held over the left shoulder, the upper gourd resting on that shoulder, and the lower one on the right knee.

The frets are stopped with the left hand, the first and second fingers are principally used. The little finger of the hand is sometimes used to strike the note V. The third finger is seldom used, the hand shifting up and down the finger board with great rapidity. The fingers of the right hand are used to strike the strings of this hand, the third finger is never used. The two first fingers strike the wires on the finger-board, and the little finger strikes the two wires. The two first fingers of this hand are defended by a piece of wire put on the tops of them in the manner of a thimble, when the performer plays strong this causes a very jarring disagreeable sound, whereas when he plays softly the tone of the instrument is remarkably pleasing.

The style of music on this instrument is in general that of great execution. I could hardly ever discover any regular air or subject. The music seems to consist of a
number

number of detached passages, some very regular in their ascent and descent, and those that are played softly are most of them both uncommon and pleasing.

The open wires are struck from time to time in a manner that, I think, prepares the ear for a change of modulation to which the uncommonly full and fine tones of these notes greatly contribute; but the ear is I think always disappointed: and, if there is ever any transition from the principal key, I am inclined to think it is very short. Were there any other circumstances respecting the *Indian* musick, which led to suppose that it has at some period been much superiour to the present practice, the style, scale, and antiquity of this instrument, would I think greatly confirm the supposition.

XIV.

A DESCRIPTION OF THE MAHWAW TREE.

By Lieutenant CHARLES HAMILTON.

THESE is a very curious and useful tree called by the Natives of *Babar*, and the neighbouring countries, the *Mahwah* or *Mawee*; its name, as written by them, being *ooy*; but the *Sanscrit* name is *Madbucā* or *Madbudrumā*.

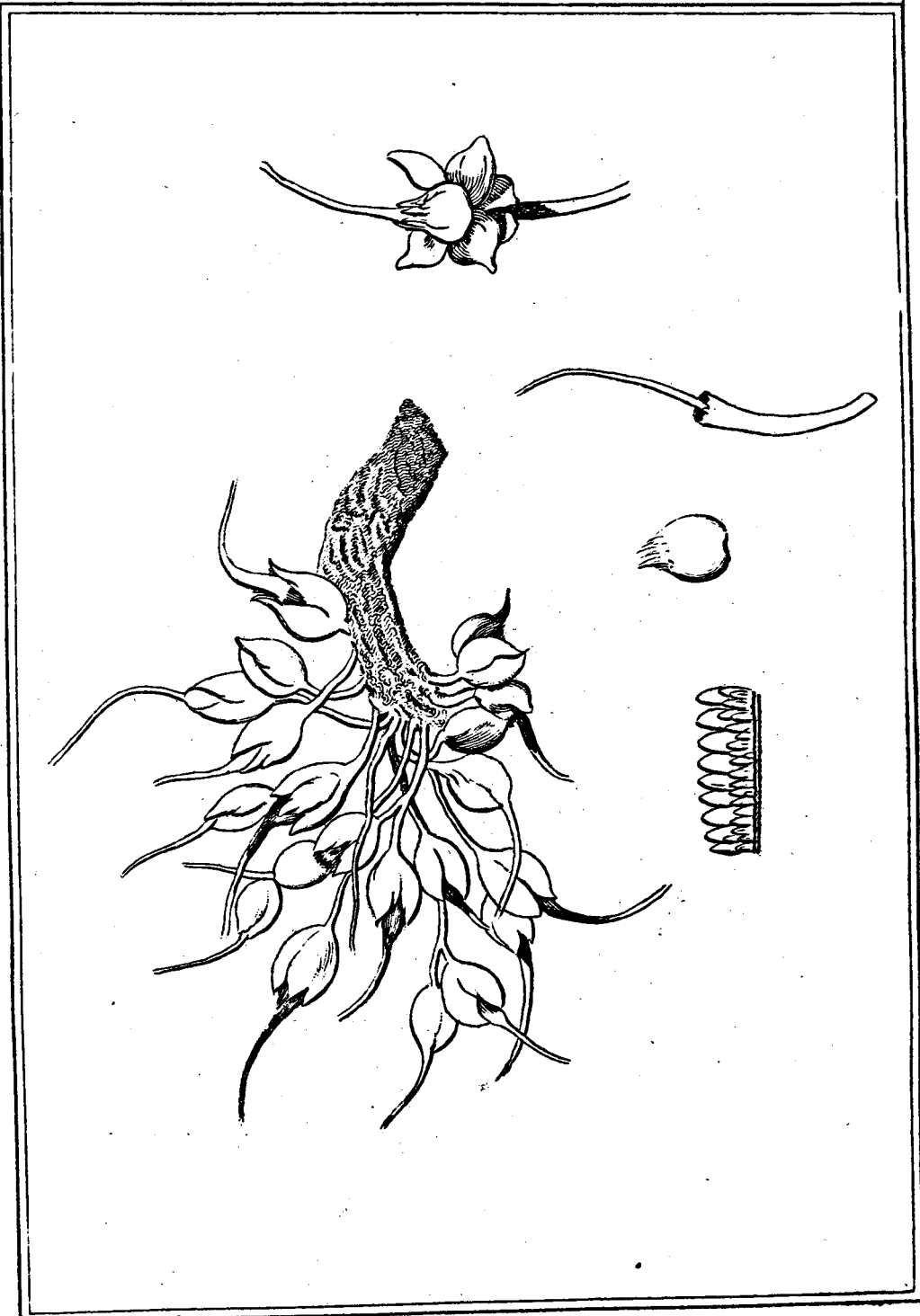
It is of the class of the *Polyandria monogynia*, of *Linnæus*, but of a genus not described by him.

The *Calix* is monophyllous, quadrifid, half divided, and imbricated in its divided part; the two opposite and outer covering, in part, the two opposite and inner parts.

The *Corolla* is monopetalous, having an inflated tube for its lower part, of near an inch long, thick, fleshy, and of a cream colour: from this arise nine small leaves, as it were, like petals from a *Calyx*, that are imbricated and twisted, one over the other, from right to left, clasping the lower part of the style in a point; by which they seem to serve, in some respect, like a forceps, to detach the whole *Corolla* at the season of its dropping.

There are no filaments; but the *Anthera*, which are in number most commonly twenty-six, long, scabrous, and spear-headed, are inserted in rows, on the inside and upper part of the tube of the *Corolla*.

The



The Madhuca.

The style is long, round, and tapering, and projects about an inch beyond the *Corolla*; it is succeeded by a drupe, with a thick pericarpium, bilocular, containing two seeds or kernels covered with a dark brown skin: there are often, however, *three* of these, in three separate divisions.

The flowers rise in bunches, from the extremities of the smaller branches: and have each a pedicle of about an inch and a half long: these are mostly turned downwards, whence the *Corollas* more easily drop off.

The tree, when full grown, is about the size of a common *Mango-tree*, with a bushy head and oval leaves, a little pointed; its roots spreading horizontally, are sunk but little in the earth: the trunk, which is often of a considerable thickness, rises seldom to any great height, without giving off branches; it is, however, not uncommon, to see it shoot up clear to the length of eight or ten feet: the wood itself is moderately hard, fine grained, and of a reddish colour.

By incision, the tree affords a resinous *Gum*, from the bark.

The flowers are of a nature very extraordinary, differing essentially from those of any other plant with which I am acquainted, as they have not in any respect, the usual appearance of such, but rather resemble *berries*, and I, like many others, had long conceived them to be the *fruit* of the *Mdbwah*; the tree drops its leaves in the month of February, and early in March these flowers begin to come out in clusters of thirty, forty, or fifty, from the extremity of every small branch; and, from this period till the latter end of April, as the flowers come to maturity (for they never open or expand) they continue falling off, with their *Antherae*, in the mornings, a little after sun-rise, when they are gathered; and afterwards dried by an exposure of a few days in the sun: when thus prepared, they very much resemble a dried *Grape*, both in taste and flavour.

Immediately after the flowers drop off fresh shoots are made for the new leaves, which soon make their appearance; coming presently to their full growth.

The fruit (*properly* so called) is of two sorts in shape; the one resembling a small *Walnut*; the other somewhat larger and pointed: it is ripe towards the middle of May, and continues dropping from the tree till the whole fall; which is generally about the beginning or towards the middle of June. The outer covering, or *Pericarpium*, which is of a soft texture, commonly bursts in the fall, so that the seeds are very easily squeezed out of it: the seeds are somewhat of the shape, but longer than an *Olive*.

These

These seeds are replete with a thick *Oil*, of the consistence of *Butter* or *Ghee*, which is obtained by expression.

From this description it may easily be conceived that the *Mábwah tree* and its productions are of singular and general use, especially in those dry and barren countries, which, from the nature of their situation, are not so well calculated for producing in plenty or perfection the other necessaries of life.

The *Corolla* or flowers, after being dried as before described, are eaten by the natives raw, or dressed with their *Curries*; and, when even simply boiled with rice, they afford a strengthening and wholesome nourishment. They are, indeed, often applied to a less laudable purpose; for being fermented, they yield, by distillation, a strong spirit, which the people here sell so very cheap, that for *one pice* (about a half-penny), may be purchased no less than a *Cutchá-Seer* (above a pint *English*), with which any man may get completely drunk. These flowers make an article of trade; being exported from this country to *Patna* and elsewhere, in no inconsiderable quantities.

The *Oil* yielded by the fruit, as before mentioned, resembles *Ghee* so much, that, being cheaper, the natives often mix it with that commodity. They use it, the same as *Ghee*, in their victuals, and in the composition of some sorts of sweetmeats; and burn it in their lamps: it is also regarded as a salutary remedy, applied exteriorly, to wounds, and all cutaneous eruptions. It is, at first, of the consistence of common *Oil*, but soon coagulates; after being kept for some time, it acquires a bitterish taste and rancid smell, which renders it somewhat less agreeable, as an article of food: but this is an inconvenience which, by the *Oil* being properly clarified and prepared at first, might be perhaps avoided. This *Oil* is also exported, both in its adulterated and original state, to *Patna*, and other parts of the low country.

I do not know any purpose to which the *Gum* has ever been applied; but if found, upon trial, to be of use, it might be collected in large quantities: the best season for this would be in the months of March and April, about the time the flowers come out, when the tree seems to be most replete with it; such an operation, indeed, would probably diminish its produce in the fruit and flower; but, where it was sufficiently cultivated, the loss in those could be but little felt.

The wood, from what has been already said of it, cannot be expected to be often had in beams of any considerable length, so as to make it so very useful in building as it would otherwise be from its not being liable to be eat by the white ants: Mr. KEIR, however, tells me, that when he was at *Chowsee* (a village upon the *Caram-*
nassa,

nassa, near *Buxar*), he had beams of it which were, to the best of his remembrance, above twenty feet long : but, in many other respects, it is a most useful wood ; and, as it is tough, and of a strong texture, it might perhaps be employed to advantage in ship building, in which case, if properly cultivated, in many grounds that seem well adapted for it, and fit for little else, it might thus, in time, become a valuable article in that branch at *Calcutta*, whither it could easily be transported during the rainy season, from almost any part of these countries, by several rivers that are then sufficiently full to float it down.

The tree, I am told, will grow in the most barren ground, even amongst stones and gravel, where there is the least appearance of a soil ; and it seems to destroy all the smaller trees and brushwood about it : yet it does not refuse a *rich* soil either ; Mr. KEIR having observed to me that the few he had seen about *Buxar*, where it is certainly very good, were both taller, and seemed to thrive much better than any he had ever met with in *Ramgur*. It does not require much *moisture*, seeming to produce nearly as well in the driest as in most favourable years ; and in every situation ; and is therefore admirably fitted for the convenience of the inhabitants of these hilly countries, which are peculiarly subject to long and severe droughts during the hot months.

Yet, notwithstanding its utility, and the immense quantity of ground that seems so well adapted to the growth of it, both here, and in the neighbouring provinces of *Catak*, *Pacheet*, *Rotas*, &c. (greatest part of which, indeed, seems fit for no other useful production). I have myself never observed, nor can I find any of my acquaintance who ever have remarked, one single tree in its infant state : we can see, every where, *full-grown* trees in great abundance ; but, never meeting with any young plants, both I and all whom I have spoken to on the subject, are at some loss to conceive how they should have come here : neither can the country people themselves, of whom I have enquired, give any rational account of this : although it appears pretty evident, that numbers of them must have been cultivated some time or other, every village having many of them growing about it.

This is a circumstance which sufficiently marks the true character of the lower order of natives, in their most supine indolence and sloth ; owing chiefly, perhaps, to the ignorant and stupid rapacity of their *Rajabs*, *Zimeendars*, and other *Landholders*, and their total inattention to the welfare of those dejected wretches, from whom they derive their consequence and power : of their base indifference to the interests of those whom they thus affect to hold beneath their regard many striking instances occurred

curred to me in the course of my enquiries upon this very subject; and it was not long ago that, asking some questions concerning the *Mábwab* of a *Zimeendar* in this neighbourhood, he answered that “it was the food of the *poor* people, and “how should *he* know any thing about it!”

It was this strange neglect of the culture of it, and a knowledge of its usefulness, which first led me to enquire into the nature of this tree, from which the bulk of the people hereabouts already draw such great benefit; in order to know whether they might not increase it without any great trouble to themselves; and whether thereby the revenue might not also be increased, and a certain provision be made against famines, from which the Natives often suffer severely in these higher districts.

To effect this, it would be necessary to give the *Ryots* every possible encouragement to raise the tree from the seeds; but as the torpid apathy of these people, whether natural or acquired, will ever prevent their being moved to any exertion by a prospect, however alluring, of *distant* advantage, I apprehend the only way of bringing this about would be making the planting and raising of a certain number of *Mábwabs* (in proportion to the value of the tenure) an article in their *Kabooleats* or Agreements.

The tree, as has been already observed, will grow almost any where: it ought to be sown about the beginning of the rains, either in beds (to be afterwards transplanted), or, at about thirty or forty feet distance, in the ground designed for it. It is said that, in seven years, the trees will give flowers and fruit; in ten, they will yield about half their common produce; and that, in twenty years they come to their full growth; after which, if my information be good, they will last near one hundred years. This account, I acknowledge, must necessarily be very vague and uncertain; as I never have met with a single person who appeared to have had either opportunity or inclination to observe its progress: such, however, is what the country people say of it.

I am told that a good tree will easily give four *puckba Maunds* (about three hundred weight avoirdupois) of dried flowers, which will sell here for about two *Rupees*; and of seeds it will afford about two *Maunds*; and this, of *Oil*, will yield twenty-six *seers puckba* weight (near 60lb.) which, in a year like this, when *Oil* is cheap, will sell at this place for two *Rupees* more. It is to be observed, however, that *every* tree will not give so much, neither are the flowers and *Oil* so clear in any part of the hills as at *Chitra*; but, allowing only a *half* of this or less, to be the product of each tree (though it might be rendered still much greater by the very least

care

care and industry in the cultivation of it) within the space of twenty years, a subsistence might be raised to the inhabitants and a considerable revenue to the proprietors of the lands, throughout an immense tract of country; the greatest part of which, in its present state, is little better than a barren waste, and cannot pay one single *anna* to the *Zimeendar* or the Government. That such an advantage might be derived from it, may be proved by the most moderate calculation; for, supposing the trees to be sown at forty feet distance from each other, on each *Begab* (about the third of an acre) might stand eight trees; and supposing the product of each tree to be only *half a Rupee*, there would be *four Rupees* of annual value on a *Begab* of ground; half of which going to the proprietor; it would thus give a far better rent than the generality of the best grounds in these parts; and the labourer would have a produce, without any other trouble than that of sowing the seed; and fencing the ground whilst the trees were young; and that of annually gathering the flowers, and preparing the *Oil*, when they arrive at their proper size: and they would probably begin to give a produce within less than ten years after the sowing.

As this tree will yield nearly its usual quantity of flowers and fruit in seasons when, for want of rain, every other crop fails; if thus cultivated, it would afford the inhabitants a sure and certain resource, under the most dreadful, and what has hitherto been, to them, the most destructive, of all calamities, famine. It is well known that the rice and other sorts of grain which form the chief part of their sustenance, require a considerable degree of moisture to bring them to perfection; an unusually dry season destroys the harvest in those articles, and reduces the *Ryots* in general to the utmost misery; a predicament into which they could hardly fall, even in the severest dearth of grain, whilst they had plenty of the flowers and fruit of the *Máhwah* to depend upon.

It may be here not improper to observe that Mr. KEIR is now sowing a few acres with the seed of this useful tree, and means to fence it; which may, perhaps, in time, tempt others to follow so good an example.

Chatra, Ramgur, July 6, 1785.

XV.

OF THE METHOD OF DISTILLING, AS PRACTISED BY THE NATIVES AT CHATRA IN RAMGUR, AND IN THE OTHER PROVINCES, PERHAPS, WITH BUT LITTLE VARIATION.

By ARCHIBALD KEIR, Esq.

THE body of the Still they use, is a common, large, unglazed, earthen, water Jar, nearly globular, of about twenty-five inches diameter at the widest part of it, and twenty-two inches deep to the neck, which neck rises two inches more, and is eleven inches wide in the opening. Such, at least, was the size of the one I measured; which they filled about a half with fomented *Mábwab-flowers*, that swam in the liquor to be distilled.

The Jar they placed in a Furnace, not the most artificial, though seemingly not ill adapted to give a great heat with but a very little fuel. This they made by digging a round hole in the ground, about twenty inches wide, and full three feet deep; cutting an opening in the front, sloping down to the bottom, on the sides perpendicular, of about nine inches wide, and fifteen long, reckoning from the circle where the Jar was to come, to serve to throw in the wood at, and for a passage to the air. On the side too, they cut another small opening, of about four inches by three, the Jar, when placed, forming one side of it, to serve as a Chimney for the smoke to go out at. The bottom of the earth was rounded up like a cup. Having then placed the Jar in this, as far as it would go down, they covered it above, all round, with clay, except at the two openings, till within about a fifth of its height; when their furnace was completed.

In this way, I reckon, there was a full third of the surface of the body of the Still or Jar, exposed to the flame, when the fire came to be lighted; and its bottom, not reaching to within two feet of where the fuel was, left a capacious hollow between them, whence the wood, that was short and dry, when lighted, being mostly converted into flame, and circulating on so great a surface of the Still, gave a much stronger heat than could else have been produced from so very little fuel; a consideration well worth the attention of a manufacturer, in our country more especially, where firing is so dear. There indeed, and particularly as coal is used,

it

it would be better, no doubt, to have a grate; and that the air should enter from below. As to the benefit resulting from the body of the Still being of earthen ware, I am not quite so clear in it. Yet, as lighter substances are well known to transmit heat more gradually and slowly, than the more solid, such as metals; may not earthen vessels, on this account, be less apt to burn their contents, so as to communicate an empyreumatick taste and smell to the liquor that is distilled, so often, and so justly complained of, with us. At any rate, in this country, where pots are made so cheap, I should think them greatly preferable, as, at least, much less expensive than those which the Gentlemen, engaged in this manufacture, most commonly employ: though of this they are best able to judge.

Having thus made their Furnace, and placed the body of the Still in it, as above described, they to this luted on, with moistened clay, to its neck at the opening, what they here call an *Adkur*; forming with it, at once, a cover for the body of the Still, with a suitable perforation in it to let the vapour rise through; and the under part of the Alembick. The *Adkur* was made with two earthen pans, having round holes in their middles, of about four inches diameter; and, their bottoms being turned opposite the one to the other, they were cemented together with clay; forming a neck of junction thus, of about three inches, with the small rising on the upper pan. The lowermost of these was more shallow, and about eleven inches wide, so as to cover exactly the opening at the neck of the Jar, to which they luted it on with clay. The upper and opposite of these was about four inches deep, and fourteen inches wide, with a ledge round its perforation in the middle, rising, as is already said, from the inner side of the neck, of about half an inch high, by which a gutter was formed to collect the condensed spirit as it fell down; and from this there was a hole in the pan to let it run off by; to which hole they occasionally luted on a small hollow *Bamboo*, of about two feet and a half in length, to convey it to the receiver below. The upper pan had also another hole in it, of about an inch square, at near a quarter of its circumference from the one below just spoken of, that served to let off the water employed in cooling; as shall be mentioned presently.

Their *Adkur* being thus fitted to the Jar, they completed the Alembick by taking a copper pot, such as we use in our kitchens, of about five inches deep, eight wide at the mouth, and ten at the bottom, which was rather flattish; and turning its mouth downward, over the opening in the *Adkur*, luted it down on the inside of the Jar with clay.

For their cooler they raised a seat, close upon, and at the back part of the furnace, about a foot higher than the bottom of the copper-pot; on this they placed a two or three gallon pot, with a round hole, of about half an inch in the side of it; and to this hole, before they lighted their fire, they luted on a short tube of a like bore; placing the pot, and directing its spout so as that, when filled with water, it threw a constant and uniform stream of it, from about a foot high, or near the center of the bottom of the copper-pot; where it was diffused pretty completely over its whole surface; and the water falling down into the upper part of the pan of the *Adkur*, it thence was conveyed through the square hole already mentioned, by a trough luted on to it for that purpose, to a cooling reservoir a few feet from the furnace; from which they took it up again to supply the upper pot as occasion required.

As their stock of water, however, in this sort of circulation, was much smaller than it seemingly ought to have been, being scarcely more than six or eight gallons, it too soon became hot; yet in spite of this disadvantage, that so easily might have been remedied, and the shortness of the conducting tube, which had nothing but the common air to cool it, there ran a stream of liquor from the Still; and but very little vapour rising from it; beyond any thing I had ever seen from stills of a much larger size, fitted with a worm and cooler. In about three hours' time, indeed, from their lighting of the fire, they drew off full fifteen bottles of spirit; which is more, by a great deal, I believe, than could have been done in our way from a Still of twice the dimensions.

The conveniences of a worm and cooler, which are no small expence either, I have myself often experienced; and if these could be avoided in so simple a way, that might easily be improved, the hints that are here offered may be of some use. The thin metal head is certainly well adapted, I think, to transmit the heat to the water, which is constantly renewed; and which, if cold, as it ought to be, must absorb the fastest possible: whereas, in our way, the water being confined in a tub, that, from the nature of its porous substance, in a great degree rather retains than lets the heats pass away, it soon accumulates in it, and becomes very hot, and though renewed pretty often, never answers the purpose of cooling the vapour in the worm, so expeditiously, and effectually, as is done by their more simple and less expensive apparatus. In this country more especially, where labour and earthen wares are so cheap, for as many *rupees* and less, twenty furnaces with stills and every thing belonging to them, independent of the copper pots, might very well be erected, that would yield above a hundred gallons of spirits a day; allowing each

still

still to be worked only twice; so very cheap, indeed, is arrack here, to the great comfort of my miners, and of many thoughtless people beside, that for one single *peysa*, not two farthings sterling, they can get a whole *Gutcha-fer* of it in the *Bazar*, or above a full *Englisch* pint, and enough to make them completely intoxicated; objects often painful to be seen.

Of the superiour excellence of metal in giving out heat from itself, and from vapour contained in it, we have a very clear proof, in what is daily performed on the cylinder of the steam engine: for cold water being thrown on it when loaded, the contained vapour is constantly condensed; whence, on a vacuum being thus formed, and the weight of the atmosphere acting on the surface of the piston, attached to the arm of the balance, it is made to descend, and to raise the other arm that is fixed to the pump; while this being somewhat heavier, immediately sinks again, which carries up the piston, while the cylinder is again filled: and thus alternately by cooling and filling it, is the machine kept in motion: the power exerted in raising the pump arm being always in proportion to the diameter of the cylinder, or to the surface of the piston, which is exactly fitted to it, and on which the pressure acts.

The contrivance too, of having the under part of the Alembick, where the condensed vapour is collected, or upper part of what they call the *Adkur*, of earthenware, of so great a thickness, and of course at so great a distance from the heat in the body of the still, is well imagined to keep the spirits the coolest possible when collected and running off.

By thus cooling and condensing the vapour likewise so suddenly as it rises, there is in a great measure a constant vacuum made, or as much as possible can be, but, that both steam rises faster, and that water boils with much less heat, when the pressure is taken away from its surface, is an axiom in Chymistry too well known to need any illustration: it boiling in vacuum, when the heat is only ninety or ninety-five by Fahrenheit's thermometer, whereas in the open air, under the pressure of the atmosphere, it requires no less than that of two hundred and twelve, ere it can be brought to the boiling point.

I must further observe, that the superiour excellence of condensing the vapour so effectually and speedily in the Alembick to our method of doing it on a worm and cooler, is greatly on the side of the former; both from the reasons I have already adduced, and because of the small stream of vapour that can be only forced into the worm, where it is condensed gradually as it descends: but above all, from the

nature of vapour itself, with respect to the heat contained in it; which of late has been proved by the very ingenious Doctor BLACK to be greater by far than, before his discoveries, was imagined. For vapour he has shewn to be in the state of a new fluid, where water is dissolved by heat; with the assistance perhaps, if I may be allowed a conjecture, of the air which it contains: and all fluids, as he has clearly demonstrated, on their becoming such, absorb a certain quantity of heat, which becomes what he very properly calls latent heat, it being heat not appearing either to the senses or to the thermometer, while they remain in that liquid state; but showing itself immediately by its effects on whatever is near it, upon their changing their form from fluid to solid; as on water becoming ice, or metals fixing, and the like. In the solution of Salts also, there is an absorption of heat, as we daily experience in the cooling of our liquors by dissolving Salt-petre in water; and this he has found to be the case with water itself, and other fluids, when passing into a state of vapour by boiling. From the most accurate and judicious experiments, indeed, he infers, and with the greatest appearance of truth, that the heat thus concealed in vapour raised by boiling, from any given bulk of water, would be fully sufficient, if collected in a piece of iron of the like size, to make it perfectly red hot. What then must be the effect of so much heat, communicated in our way of distilling to the worm, and to the water in the tub, will be sufficiently evident from what has been said to prove, I think, that we have hitherto employed a worse and more defective method than we might have done with respect to cooling at least, both in making of spirits, and in other distillations of the like kind, where a similar mode is adopted.

The poor ignorant *Indian* indeed, while he with wonder surveys the vast apparatus of *European* distillers, in their immense large stills, worms, tubs, and expensive furnaces, and finds that spirits thus made by them are more valued, and sell much dearer than his own, may very naturally conclude, and will have his competitors join with him in opinion, that this must alone surely be owing to their better and more judicious manner of distilling with all those ingenious and expensive contrivances, which he can no wise emulate, but in this it would appear, they are both equally mistaken; imputing the effects, which need not be controverted perhaps, to a cause from which they by no means proceed: the superiority of their spirits, not at all arising from the superiour excellence of these stills and furnaces, nor from their better mode of conducting the distillation in any respect; but chiefly rather from their greater skill and care in the right choice, and proper management,

of

of the materials they employ in fermentation; and above all, as I apprehend, from the vast convenience they have in casks, by which, and from their abilities in point of stock, they are enabled, and do in fact in general keep their spirits for a certain time, whence they are mellowed, and improved surprizingly both in taste and salubrity.

With respect to the latter improvement, I mention it more particularly here, and the more willingly also, as in general it seems to have been but too little attended to where a due attention to it might be of the greatest use. For of all things that have been found grateful to the human palate, there was none ever used I believe, more hurtful to the body, and to the nerves especially, than fresh-drawn ardent spirits: and this owing evidently to the principle of inflammability, of which with water they are mostly made up, being then, in a more loose and detached state, less assimilated with the other principles than it afterwards becomes with time. By time, indeed, it is gradually not only more assimilated, but at length changes its nature altogether; so as to become, what was at first so pernicious, a benign, cooling liquor: when the spirit is strong, the change it is true goes on more slow and imperceptibly; yet as a partial alteration is only wanted to mellow it for use, a few years keeping would be sufficient to answer the purpose here: and whether or no it could be possible to prevent any other from being sold, than that which had been kept a certain time, is well worth the consideration of the legislature.

That the great noxious quality of fresh-drawn spirits, is chiefly owing to the cause I have assigned, a little attention, and comparing of the effects that are uniformly produced by the principle of inflammability, wherever it is met with in a loose and weakly combined state, as it is in them, will easily convince us of: whereas, when fully assimilated either in spirits, or with any other body, it becomes entirely inert, and useful, more or less, either for food or physick, according to what it happens to be united with. Thus we find it in putrid animal substances, where it lately formed part of a healthy body, being now detached, or but weakly united with air, exhibiting a most offensive, and pernicious poison: though this absorbed again by a living plant is presently changed into good and wholesome nourishment; to the vegetable immediately, and to any animal who may afterwards choose to eat it. In like manner sulphur, which is a compound of this principle alone, united to a pure acid, the most destructive to all animal and vegetable substances, yet, it being here perfectly inert also, may be taken into the body with safety: when, if loosened either by heat or by an alkaline salt uniting with the acid;

acid, its noxious quality is presently made perceivable to whoever comes within its reach.

Many other instances of a like nature might easily be added, and some too more apposite perhaps than those I have here mentioned; but every one's own experience, with what I have already said, will sufficiently evince the propriety, and utility of putting an entire stop, if possible, to the sale of what ought to be so justly prohibited; and this in its consequences, may even help to lead to other more effectual means of correcting, in a great measure, the cruel abuse of spirits in general, that has been long so loudly and so justly complained of, amongst the soldiers, lower *Europeans*, and our servants in this country; where the very worst and indeed poisonous sort of them, is daily sold at so very cheap a rate.

All I need further add with respect to distillation, and on the superiour advantages in the mode of conducting it here to that we have been in use to employ, for the raising of spirits, simple waters, and the like, is only to observe, I have no sort of doubt but that the intelligent chymical operators at home, if ever they should get a hint of it, will make no manner of scruple to use it also, and to improve upon it greatly by a few ingenious contrivances, which their knowledge and experience will so easily suggest. The principles on which it seems founded indeed, especially with regard to their way of cooling, are so striking and just, that in many other distillations besides those of spirits and waters, they may be employed, I apprehend, with very great profit, and advantage. I shall now however confine myself to mention only the benefit that may result from a like process in the raising of the finer aromatics, while the heat contrived, as in our way, besides impeding the distillation, must from its long action on such subtile bodies, probably injure them greatly in the essential quality on which their excellence depends; and upon this very account I am apt to imagine that the greater quantity obtained, and the superior quality of the *oil of roses* made in this country, to that made from *roses* with us, is owing chiefly, if not entirely, to their better and more judicious manner of extracting it here. For, with us, the still, being made of metal, may in the first instance, impart too great and too sudden a degree of heat, and next, the *oil* continuing so long in the vapour, and that much compressed, may, in so delicate a subject, not only entirely almost unite it with the water, so as to render the separation impracticable, but may at the same time alter its essence, so completely, as that it can no longer appear in the state it otherwise might have been found in, had the operation been better conducted, or in the way they do here. A very few trials how-

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ever would much better certify this than all I can possibly say on the subject, or in fact than all the reasoning in the world. Therefore as to my own particular opinion of the flavour and quality of the *roses* at home being equal if not superiour to that of those in this country, I may be entirely silent. The rules and reasoning in chymistry, though serving greatly to enlarge and improve our understanding, being what of themselves can never be depended upon till confirmed by facts and experiments; where many things often turn out very different, from what, from our best and most plausible arguments, we had the greatest reason to expect. Or, if it should be found to be really true, what I have often heard asserted, by those however who had it only from others, but not of their own particular knowledge, that, in distilling their *oil of roses* at the places where they make it the best, they use also, with their *roses*, *sandal-wood*, and some other aromatics, *no roses*, whatsoever, it is plain, could ever of themselves be made to afford a like *oil*; nor without such an addition as they employ. A circumstance, by the bye, that might possibly easily be certified by some one of the many ingenious correspondents of the society, who may happen to reside where it is made: and a knowledge of the real truth of it would certainly be of use.

Chatra, December 24, 1786.

XVI.

A METHOD OF CALCULATING THE MOON'S PARALLAXES, IN
LATITUDE AND LONGITUDE.

By Mr. REUBEN BURROW.

IN the Nautical Almanack for 1781, among other problems published by authority of the Board of Longitude, there is one for calculating the place of the nonagesimal degree; which is expressly recommended to astronomers as "superior to all other methods for calculating eclipses of the sun and occultations of the stars:" now as a considerable part of that method is erroneous, and particularly in south latitudes, and between the tropicks (which include the most of *India*) the error may therefore

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be of consequence, and the more so as it is published under the sanction of Doctor MASKELYNE, the Astronomer Royal: I have therefore taken the liberty of giving the following rule to supply its place, and in imitation of the methods of the *Hindoes*, have endeavoured to express it so plainly, that any person may calculate by it, without knowing much of the subject.

PROBLEM.

(Given the apparent time at any given place; to find the longitude and altitude of the nonagesimal degree, and also the parallaxes in latitude and longitude.)

1. Turn the difference of longitude from *Greenwich* into time, and add it to the apparent time, if the place be to the west of *Greenwich*; but subtract if the place be to the east, and the sum, or remainder, will be the apparent time at *Greenwich*.

2. To this time calculate the sun's right ascension in time, and add it to the apparent time at the given place; the sum is the right ascension of the meridian in time.

3. From the latitude of the place by observation subtract the correction taken from page LXXV of MAYER'S Tables; the remainder is the latitude in the spheroid.

4. Call the right ascension of the meridian in degrees AR; and, if the right ascension of the meridian

Be between $\left\{ \begin{array}{l} 0^\circ \text{ and } 90^\circ \\ 90^\circ \text{ and } 270^\circ \\ 270^\circ \text{ and } 360^\circ \end{array} \right\}$ then in $\left\{ \begin{array}{l} \text{AR} + 90^\circ \\ 270^\circ - \text{AR} \\ \text{AR} - 270^\circ \end{array} \right\}$ is an arc A $\left\{ \begin{array}{l} \text{but in} \\ \text{south} \\ \text{latitude,} \end{array} \right\} \left\{ \begin{array}{l} 90^\circ - \text{AR} \\ \text{AR} - 90^\circ \\ 450^\circ - \text{AR} \end{array} \right\}$ is the arc A.

5. Let half the sum of the colatitude of the place and the obliquity of the ecliptick be called C; and half their difference D; then add the secant of C, the cosine of D, and the cotangent of half A, together; the sum (rejecting twice radius) is the tangent of an arc M; then add the cosecant of C, the sine of D, and the cotangent of half A, together; the sum (rejecting twice radius) is the tangent of an arc N: then if the colatitude of the place be greater than the obliquity of the ecliptic, the sum of M and N is an angle, whose complement call B₁; but, if the colatitude be less than the obliquity, let the complement of the difference of M and N be called B₂.

6. Add the secant of B, the sine of A, and the cosine of the latitude of the place, together; the sum (rejecting twice radius) is the sine of the altitude of the nonagesimal degree.

7. Add

7. Add the tangent of the latitude to the tangent of the obliquity of the ecliptick; the sum is the sine of an angle, which call X.

8. When the right ascension of the meridian is

$$\text{Between } \left\{ \begin{array}{l} 360 - X \text{ and } 90 \\ 90 \text{ and } 180 + X \\ 180 + X \text{ and } 270 \\ 270 \text{ and } 360 - X \end{array} \right\} \begin{array}{l} \text{in} \\ \text{N.} \\ \text{lat.} \end{array} \left\{ \begin{array}{l} \text{between} \\ \left\{ \begin{array}{l} X \text{ and } 90 \\ 90 \text{ and } 180 - X \\ 180 - X \text{ and } 270 \\ 270 \text{ and } X \end{array} \right\} \end{array} \right\} \begin{array}{l} \text{in} \\ \text{S.} \\ \text{lat.} \end{array} \left\{ \begin{array}{l} B \\ 180 - B \\ 180 + B \\ 360 - B \end{array} \right\} \text{ is the longitude}$$

of the nonagesimal degree.

9. Add the moon's latitude to 90° when it is of a contrary name to the latitude of the place; but subtract it from 90° when it is of the same name; the sum or remainder, is the moon's polar distance: also take the difference between the moon's longitude and the longitude of the nonagesimal degree; which difference call P: also let half the sum of the moon's polar distance and altitude of the nonagesimal degree, be called Q; and half their difference, R.

10. Add the secant of Q, the cosine of R, and the cotangent of half P, together; the sum is the tangent of an arc m; also add the cosecant of Q, the sine of R, and the cotangent of half P together; the sum is the tangent of an arc n.

11. If the altitude of the nonagesimal degree be greater than the moon's polar distance, take the sum of the arcs m and n for the parallactick angle; but if it be less, take their difference.

12. Add the cosecant of the parallactick angle, the sine of P, and the sine of the altitude of the nonagesimal degree, together; the sum (rejecting twice radius) is the sine of the moon's true zenith distance.

13. To the sine of the moon's true zenith distance add the logarithm of the horizontal parallax; the sum (rejecting radius) is the logarithm of the parallax in altitude nearly; add the parallax, thus found, to the true zenith distance, and the sum will be the corrected zenith distance.

14. Add the sine of the corrected zenith distance, the cosine of the parallactick angle, and the logarithm of the horizontal parallax, together; the sum (rejecting twice radius) is the logarithm of the parallax in latitude.

15. Add the logarithm of the parallax in latitude, the tangent of the parallactick angle, and the secant of the moon's latitude, together; the sum (rejecting twice radius) is the logarithm of the parallax in longitude.

EXAMPLE.

“What is the altitude and longitude of the nonagesimal degree at Ludlow, whose lat.

lat. is $52^{\circ} 23'$ north, and longitude 11° west of *Greenwich*, 7th February, 1778, at 10h. 56'. 11" app. time, being the time of an occulation of μ geminorum 2"

Not having the Almanack for 1778, I shall assume the moon's latitude to be $0^{\circ} 51'$ S. and her longitude $91^{\circ} 57'$.

$\begin{array}{r} b \quad . \quad a \\ 10 \ 56 \ 11 \text{ app. time} \\ 0 \ 11 \ 0 \text{ diff. long.} \\ \hline 11 \ 7 \ 11 \text{ app. t. } \textit{Greenwich}. \\ \hline \circ \\ 52 \ 23 \text{ latitude.} \\ 0 \ 14 \text{ correction.} \\ \hline 52 \ 9 \text{ reduced lat.} \\ 37 \ 51 \text{ colat.} \\ \hline 18 \ 55 \text{ half colat.} \\ 11 \ 44 \text{ half obliq.} \\ \hline \end{array}$	$\begin{array}{r} h \\ 21 \ 27 \ 14 \ \odot \text{ AR} \\ 10 \ 56 \ 11 \\ \hline 8 \ 23 \ 25 \text{ AR of meridian.} \\ \hline \circ \\ 125 \ 51 \ 15 = \text{AR} \\ 270 \\ \hline 144 \ 8 \ 45 = A \end{array}$
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Tang. of latitude 10.11319
Tang. of obliquity 9.63761

Sine of $34^{\circ}.18' = X$ 9.75080

C = 30 39	secant	10.06535	cosecant	10.29261
D = 7 11	cosine	9.99658	sine	9.09706
$\frac{1}{2}$ A = 72 4	cotang.	9.51005	cotang.	9.51005
M = 20 28	tang. M.	9.57198	tang. N.	8.89972
N = 4 32				

$\begin{array}{r} 25 \ 0 \\ B = 65 \ 0 \\ 180 \ 0 \\ \hline \end{array}$	$\begin{array}{r} A = 144 \ 9 \ \text{fin.} \quad 9.76765 \\ \text{Lat. } 52.9 \ \text{col.} \quad 9.78788 \\ B \ 65.0 \ \text{fec.} \quad 10.37405 \\ \hline \end{array}$
--------------------------------------------------------------------------	----------------------------------------------------------------------------------------------------------------------------------------------------------------------------

115' 0 long. nonagesimal degree.

Altitude of do. 58 15 S. 9.92958

half a 's polar dist. = 45 26

half alt. non. deg. = 29 8

Q = 74 34	secant	10.57493	cosecant	10.01595
R = 16 18	cosine	9.98218	sine	9.44819
$\frac{1}{2}$ P = 11 32	cotang.	10.69025	cotang.	10.69025
m = 86 46	tang. m.	11.24736	tang. n.	10.15439
n = 54 58				

Parallax

THE MOON'S PARALLAXES.

157

Parallaſtick angle =	31 48	coſecant	10.27823
Alt. non. degree	58 15	- fine	9.92958
P =	23 3	- fine	9.59277
<hr/>			
Moon's true zen. d.	39 11	- fine	9.80058
Horizon. parallax	3488	- log.	3.54258
<hr/>			
Par. in alt. nearly	2204	- log.	3.34316
<hr/>			
Corrected zen. diſt.	39 47 44	fine	9.80628
Hor. par.		log.	3.54258
Parallaſtick angle		coſine	9.92936
<hr/>			
Parallax in latitude =	1898	log.	3.27822
Parallaſtick angle	-	tangent	9.79241
Moon's latitude	- 0 51	ſecant	10.00023
<hr/>			
Parallax in long.	1177	- log.	3.07086

When the moon is very near the ecliptick as in eclipſes, the following method will be nearly exact.

1. Add the coſine of the altitude of the nonageſimal degree to the logarithm of the horizontal parallax; the ſum (rejeſting radius) is the logarithm of the parallax of latitude nearly: Add this parallax to the complement of the altitude of the nonageſimal degree, and call the ſum the complement of the altitude of the nonageſimal degree corrected.

2. Add the coſecant of the complement of the altitude of the nonageſimal degree; the fine of the complement of the altitude of the nonageſimal degree corrected, and the logarithm of the parallax of latitude nearly, together; the ſum (rejeſting twice radius) is the logarithm of the parallax in latitude corrected.

3. Add the logarithm of the parallax in latitude corrected; the fine of P, and the tangent of the altitude of the nonageſimal degree, together; the ſum (rejeſting twice radius) is the logarithm of the parallax in longitude.

SCHOLIUM. The method of applying the parallaxes uſually given requires no other correction than the following: When the pole of the ecliptick of the ſame name as the latitude is under the horizon, to the cotangent of the altitude of the nonageſimal degree add the cotangent of the moon's latitude; the ſum is the coſine

of an angle; which added to, and subtracted from, the longitude of nonagesimal degree gives two longitudes; between which the Moon's latitude of a contrary name to the elevated pole is to be increased for the apparent latitude; but beyond those longitudes the Moon's true latitude is to be increased by the parallax in latitude to have the apparent latitude.

REMARKS ON THE ARTIFICIAL HORIZONS, &c.

By Mr. REUBEN BURROW.

THE utility of a perfect horizon and the liability of Quicksilver to be disturbed by the least wind, have induced numbers of people to invent artificial horizons of different kinds, and many of them very complicated. Some time ago having occasion to determine the situation of several places by Astronomical Observations, and there being no Astronomical Quadrant belonging to the Company in the Settlement, I was under a necessity of determining the Latitudes by a Sextant; and that at a time when the Sun passed so near the Zenith as to make it impossible to get meridian altitudes: I therefore collected all the different artificial horizons and glass roofs and other contrivances for that purpose I could meet with; but, though they appeared correct, the results were very erroneous. I examined them by bringing the two limbs of the Sun, seen by direct vision, to touch apparently in the telescope of a Sextant, and then observed the reflected images in Quicksilver, which still appeared to touch as before; but, on examining the reflected images in the rest of the artificial horizons, none of them appeared to touch; and the error in many was very considerable. I tried a number of other methods with little success; as they were, mostly, combinations of glasses: at last, accidentally hearing some officers speaking of "Tents that would neither turn Sun nor Rain," I considered that the rays of the Sun would pass through Cloth unrefracted; and in consequence of this idea I applied some thin mosquito * curtain as a covering to the Quicksilver, and

* A kind of Silk Gauze as close as Book-muslin, and perfectly transparent: it is to be stretched over a hoop which stands without touching the vessel containing the Mercury.

found

found it effectually excluded the wind and admitted the Sun; and what is of equal consequence in this country, it totally kept away those minute insects that disturb the surface of the quicksilver in observing; in short it formed so complete a horizon that I could not before have hoped for any thing so perfect; and it is equally applicable to the sun and stars.

For taking very great or very small elevations of the Sun (which with the common Horizon Sextants are impracticable in the direct method), a polished metal-line instrument might be made in the form of part of a hollow obtuse cone: this might have its axis set perpendicular to the Horizon at any time *by means of screws* in a variety of methods; and observations might be made by it with great exactness.

In finding the latitude, when meridian observations cannot be taken, either there is an opportunity of taking Altitudes on both sides of the meridian, or not: when there is not, the best method is to calculate the latitude from two altitudes and the time between, exactly by spherical trigonometry (first correcting the declination to the beginning and end of each interval), as the approximating methods of DOWES and others are totally insufficient: when observations can be taken both before and after noon, it is best to take a number of altitudes in both, and then make out the equal altitudes by proportion; then having found the true time of noon by the usual method, correct the two intervals and the declination to each time, and the latitude may be found as follows:

Add the *Cosine of the angle from noon*, to the *Cotangent of the declination*; the sum is the *Cotangent of an arch A*.

Add the *sine of A*, the *sine of the altitude*, and the *arithmetical complement of the sine of the declination*, together; the sum is the *Cosine of an arch B*.

Then the *sum or difference of A and B* is the *Latitude*.

As every single altitude gives an independent Latitude, it is evident the Latitude may be thus found to great exactness.

An instrument might easily be contrived to measure the Sun's angle of position to great exactness, from whence the Latitude might readily be deduced; a small addition to the common theodolite would be sufficient. The variation of the azimuth near the meridian may also be advantageously applied for the same purpose.

DEMONSTRA-

DEMONSTRATION OF A THEOREM CONCERNING THE INTERSECTIONS OF CURVES.

By REUBEN BURROW, *Esq.*

IN STONE'S Mathematical Dictionary is the following paragraph: "Two geometrical lines of any order will cut one another in as many points as the number expresses which is produced by the multiplication of the two numbers expressing those orders:" and Mr. BRAIKONRIDGE in the preface to his *Exercitatio Geometrica de descriptione Curvarum* says: "Mr. GEORGE CAMPBELL, now Clerk of the Stores at *Woolwich*, has got a neat demonstration of the same, which he hopes he will publish." As it does not appear that CAMPBELL ever published any thing except a paper on the roots of equations, and a small treatise on the plagiarisms of MACLAURIN, it is very probable his demonstration is lost, and therefore it may not be improper to publish the following.

The equation of a line of the first order has one root, or function of the Absciss, for the Ordinate; of the second order, two; and so on.

In equations for two right lines the roots may so vary and accommodate themselves to each other, that the quantities expressing the ordinates may be equal; and as there is only one case where this can happen, therefore two right lines can only intersect in one point.

If a line of the first order be compared with a line of the second; or an equation of one root with an equation of two; the root of the first and a single root of the second may so vary as to become equal to each other, or to form an intersection; by the same reason, the single root of the first and the remaining root of the second may each so vary as to become equal, or to form another intersection, and therefore a right line cuts a line of the second order in two points.

If a line of the first order be compared with a line of the n order, it is also evident that the single root of the first line, may in the same manner be so varied with each of the n roots of the second line as to become equal; and therefore a right line may cut a line of the n order in n points.

Let a line of the m order be now compared with a line of the order n ; then as each single root of the first line may become equal, in the same manner, to every root in the second; it therefore follows that for every unit in m there may be n inter-

n intersections, and as there are m units, there consequently will be mn intersections.

The same method may be applied to the determination of the points, line, and surfaces, that arise from the intersections of lines, surfaces, and solids; by considering that the number of times that p may be taken from m , and q at the same time from n , will be $m.m-1 \dots p$, \times $n.n-1 \dots q$

$$\frac{m \cdot (m-1) \cdot \dots \cdot p \times n \cdot (n-1) \cdot \dots \cdot q}{1 \cdot 2 \cdot 3 \cdot \dots \cdot p \times 1 \cdot 2 \cdot 3 \cdot \dots \cdot q}$$

XVII.

THE PROCESS OF MAKING ATTAR, OR ESSENTIAL OIL OF ROSES.

By Lieutenant Colonel POLIER.

THE *Attar* is obtained from the Roses by simple distillation, and the following is the mode in which I have made it. A quantity of fresh Roses, for example forty pounds, are put in a Still with sixty pounds of water, the Roses being left as they are with their Calyxes, but with the stems cut close. The mass is then well mixed together with the hands, and a gentle fire is made under the Still; when the water begins to grow hot, and fumes to rise, the cap of the Still is put on, and the pipe fixed; the chinks are then well luted with paste, and cold water put on the refrigeratory at top: the receiver is also adapted at the end of the pipe; and the fire is continued under the Still neither too violent nor too weak. When the impregnated water begins to come over, and the Still is very hot, the fire is lessened by gentle degrees, and the distillation continued till thirty pounds of water are come over, which is generally done in about four or five hours; this Rose-water is to be poured again on a fresh quantity (forty pounds) of Roses, and from fifteen to twenty pounds of water are to be drawn by distillation, following the same process as before; the Rose-water thus made and cohobated, will be found, if the Roses were good and fresh, and the distillation carefully performed, highly scented

scented with the Roses. It is then poured into pans either of earthen ware or of tinned metal, and left exposed to the fresh air for the night. The *Attar* or *Essence* will be found in the morning congealed, and swimming on the top of the water; this is to be carefully separated and collected either with a thin shell or a skimmer, and poured into a vial. When a certain quantity has thus been obtained, the water and feces must be separated from the clear essence, which, with respect to the first, will no be difficult to do, as the essence congeals with a slight cold, and the water may then be made to run off. If, after that, the Essence is kept fluid by heat, the feces will subside, and may be separated, but, if the operation has been neatly performed these will be little or none. The feces are as highly perfumed as the Essence, and must be kept, after as much of the Essence has been skimmed from the Rose-water as could be. The remaining water should be used for fresh distillations, instead of common water, at least as far as it will go.

The above is the whole process of making genuine *Attar* of Roses. But, as the Roses of this country give but a very small quantity of Essence, and it is in high esteem, various ways have been thought of to augment the quantity, though at the expence of the quality. In this country, it is usual to add to the Roses when put in the Still, a quantity of Sandal-wood raspings, some more, some less (from one to five *tolabs*, or half ounces). The Sandal contains a deal of Essential Oil which comes over freely in the common distillation, and mixing with the Rose-water and Essence, becomes strongly impregnated with their perfume: the imposition however cannot be concealed; the Essential Oil of Sandal will not congeal in common cold, and its smell cannot be kept under, but will be apparent and predominate, spite of every art. In *Cashemire* they seldom use Sandal to adulterate the *Attar*, but I have been informed, to encrease the quantity, they distil with the Roses a sweet-scented grass, which does not communicate any unpleasent scent, and gives the *Attar* a high clear green colour: this Essence also does not congeal in a slight cold as that of Roses.

Many other ways of adulteration have been practised, but all so gross and palpable that I shall say nothing of them.

The quantity of Essential Oil to be obtained from the Roses, is very precarious and uncertain, as it depends not only on the skill of the distiller, but also on the quality of the Roses, and the favourableness of the season: even in Europe where the Chemists are so perfect in their business, some, as TACHENIUS, obtained only half an ounce of Oil from one hundred pounds of Roses.—HAMBERG obtained

one

one ounce from the same quantity; and HOFFMAN above two ounces. (N. B. the Roses in those instances were stripped of their calyxes and only the leaves used.) In this country nothing like either can be had, and to obtain four *Masbas*. (about one drachm and half) from eighty pounds, which, deducting the calyxes, comes to something less than three drachms per hundred pounds of Rose-leaves, the season must be very favourable and the operation carefully performed.

In the present year, 1787, I had only sixteen *Tolas*. of *Attar* from fifty-four *Maunds*, twenty-three *Seers*, of Roses, produced from a field of thirty-three *Biggabs*, or eleven *English* acres; which comes to about 2 dr. per 100 pounds. The colour of the *Attar* of Roses is no criterion of its goodness, quality, or country. I have had, this year, *Attar* of a fine emerald green, of a bright yellow, and of a reddish hue, from the same ground, and obtained by the same process, only of Roses collected at different days.

The calyxes do not in any shape diminish the quality of the *Attar*; nor impart any green colour to it; though perhaps they may augment the quantity: but the trouble necessary to strip them must, and ought to, prevent its being ever put in practice.

Lucknow, May, 1787.

BY MR. MACDONALD, WITH A SPECIMEN OF GOLD.

THE country of *Limong*, on the Island of *Sumatra*, immediately contiguous to the presidency of *Fort Marlborough*, and between seventy and eighty miles inland, produces the finest gold and gold-dust on that island. The *Limong* gold merchants repair, annually, to *Marlborough*, for the purchase of *Opium*, and such other articles as they may be in want of; in exchange for which, they give gold, of so pure a nature, as to contain little or no alloy. The gold is found sometimes in dust, and often lodged in a very hard stone. It is of a whitish colour, and resembles that in which the veins run in the gold mines of *Tiltil* in *Cbili*. The gold is extracted by beating the compound mass in order to disengage it from the stone, which flies off in splinters, and leaves the gold cleared of it. This is the mode used by a rude people;

people; by which a part of the gold must be lost in the splinters of the stone, which fly off in beating the mass. They are totally ignorant of the advantage of grinding it to a gross powder, mixing it with quicksilver, and separating the earthen and stony particles from those of the gold, by the action of a stream of water on this paste, carrying off the former, and leaving the latter precipitated to the bottom by their greater weight. They are almost entirely ignorant of the principles of assaying and amalgamation, but are extremely expert in separating particles of foreign metals from gold-dust, by a very superior acuteness of vision, no doubt arising from experience, and not a peculiar gift. They have people among them, who are gold-cleaners by occupation. The gold is found in a species of earth composed of a clayish red loam. On digging the earth, it is found to consist of strata (under the loam of the surface, commonly called soil) of irregular-shaped stones of a mouldering nature, mixed with a red clay, and hard pebbles mixt with a pale red clay, of a more dense consistency than that of the first stratum. The first stratum extends to a depth of three feet and a half, and the second to somewhat less. The consistency under these strata is formed of either hard rock, or of gravel nearly approaching to it. The gold is found mixed with a stone of a hard nature, and capable of sustaining a polish. It is found near the surface, and, generally, in a soil free from solid rock.

The merchants, who bring the gold for sale, are not themselves the finders or gatherers of it, but receive it, for merchandise, from the *Malays* inhabiting the interior parts of the country. The native indolence of the *Malay* disposition prevents them from collecting more than is sufficient to supply the few and simple wants of a race of men, as yet, unenlightened by civilization and science, and ignorant of the full extent of the advantages of the country inhabited by them. We have not, to this hour, explored a country, which, we have reason to suppose, produces more, or as much gold as either *Peru* or *Mexico*. This may be attributed, partly, to the difficulties incident to the undertaking, and partly, to a want of curiosity, that, indulged, might have been productive of great national and private advantages. The roads leading to this golden country are almost impervious; affording only a scanty path to a single traveller, where whole nights must be passed in the open air, exposed to the malignant influence of a hostile climate, in a country infested by the most ferocious wild beasts. These are circumstances that have hitherto checked curiosity, but perseverance and contrived precaution will surmount the obstacles they furnish, and such discoveries might be made, as would amply compensate for the difficulties leading to them. The gold-merchants who come from the
neigh-

neighbouring and less rich countries, give us such accounts of the facility of procuring gold, as border nearly on the marvellous, and would be altogether incredible, if great quantities of that metal produced by them did not, in a great measure, evince the certainty of their accounts. I have seen an imperfect chart of a part of the interior country, made by an intelligent native, on the scale of the rate of his walking, and from the respective situations of the sun in regard to his position. It contained a chain of what he called Gold Mines, extending in latitude, nearly, not much less than three degrees. This chart is in the possession of Mr. MILLER of the council of *Fort Marlborough*, who did me the favour of explaining it. After making allowances for the licence of a traveller, some credit may be given to this chart, more especially, as we are well assured, that that part of *Sumatra* produces large quantities of fine gold. The result of the whole is, that it would be a very laudable object to explore those rich countries, and to establish the working of gold-mines in them, as it could be done under a certain prospect of advantage. The expence arising from clearing the country, procuring intelligence, making roads, establishing and forming posts of communication, and of employing professional men, would, undoubtedly, be at first very considerable, but the resulting advantages would defray these, and render it a matter of surprize, that a measure attended with such obvious utility, had not been adopted at an earlier period.

It is more than probable, that *Sumatra* must have been the *Ophir* of SOLOMON'S time. This conjecture derives no small force from the word *Ophir*'s being really a *Malay* substantive of a compound sense, signifying a mountain containing gold. The natives have no oral or written tradition on the subject, excepting, that the island has in former times afforded gold for exportation: whether to the eastward or westward, remains an uncertainty. We have certain accounts, that the vessels, that imported this article, were long detained, or did not return in much less than a year; it is therefore probable that they wintered, during the violence of the S. W. monsoon, either at Ceylon, or on the N. E. coast; and completed their voyages during the moderate part of the other monsoon.

 XVIII.

ON THE LITERATURE OF THE HINDUS, FROM THE SANSKRIT.
 (COMMUNICATED BY GOVERDHAN CAUL.) WITH A SHORT
 COMMENTARY.—See the *Works of Sir William Jones*, Vol. I. p. 349.

TO THE PRESIDENT.

MY DEAR SIR,

I HEREWITH send you six ancient copper-plates, fastened together by a ring in two parcels, each containing three. They were found in digging foundations for some new works at the fort of *Tanna*, the capital of *Sasset*. The Governor of *Bombay* informed me none of the *Gujerat Bramins* could explain the inscriptions. I obtained permission to bring them round with me, being desirous of submitting them to the investigation of the ASIATICK SOCIETY, under the promise of restoring them to the proprietor.

I have the honour to be with great respect,

Dear Sir William,

Your most faithful humble servant,

J. CARNAC.

February 15, 1787.

XIX.

AN INDIAN GRANT OF LAND IN Y. C. 1018, LITERALLY TRANSLATED FROM THE SANSKRIT, AS EXPLAINED BY RA'MALO'-CHAN PANDIT, COMMUNICATED BY GENERAL CARNAC.—

See the Works of Sir William Jones, Vol. I. p. 529.

TO THE PRESIDENT.

DEAR SIR,

I DO myself the honour to send you a few remarks on *Tagara*, and beg leave to submit them to your judgement: inquiries of that kind are generally very dry; and unluckily I have no talent for amplification. I have collected all I could find in the ancient authors, and endeavoured, by bringing the whole together, to elucidate a subject, which must be interesting to the ASIATICK SOCIETY; and this, I hope, will secure me their indulgence. I have been as sparing as possible of *Greek* quotations: I am not fond of them; however, I have ventured a few, which I thought absolutely necessary. With respect to the historical part, you will find, I am not conversant with the *Hindu* antiquities: indeed, I have no time to study languages.

I am,

Dear Sir,

Your most obedient humble servant,

Ruffapugla, June 10, 1787.

F. WILFORD.

XX. RE-

REMARKS ON THE CITY OF TAGARA.

By Lieutenant FRANCIS WILFORD.

THE expedition of ALEXANDER having made the *Greeks* acquainted with the riches of *India*, they soon discovered the way by sea into that country, and, having entered into a commercial correspondence with the natives, they found it so beneficial, that they attempted a trade thither.

PTOLEMY PHILADELPHUS, king of *Egypt*, in order to render the means easy to merchants, sent one DIONYSIUS into the southern parts of *India*, to inquire into the nature of that country, its produce, and manufactures.

It was then *Tagara* began to be known to the *Greeks*, about 2050 years ago.

ARRIAN, in his *Periplus Maris Erythraei*, says it was a very large city, and that the produce of the country, at that early period, consisted chiefly of coarse *Dungarees* (*Othonium vulgare*), of which vast quantities were exported; muslins of all sorts (*Sindones omnis generis*), and a kind of cotton stuff dyed of a whitish purple, and very much of the colour of the flowers of mallows, whence called *Molochyna*.

All kinds of mercantile goods, throughout the *Deccan*, were brought to *Tagara*, and from thence conveyed on carts to *Baroach* (*Barygaza*).

ARRIAN informs us, that *Tagara* was about ten days' journey to the eastward of another famous mart, called *Plúthana* or *Plúthana*.

That *Plúthana* was twenty days' journey to the southward of *Baroach*; also,

That the road was through the *Balagout* mountains.

And here we must observe, that the *Latin* translation of the *Periplus** by STUCKIUS is very inaccurate and often erroneous; as in the following passage, where ARRIAN speaking of *Tagara*, says

“ Κατάγεται δὲ ἐξ αὐτῶν πορείαις ἀμαξίων καὶ ἀνοδίαις μεγίσταις εἰς τὴν Βαρύγαζαν.”

which STUCKIUS translates thus,

“ Ex his autem emporiis, per loca invia et difficillima, res Barygazam plaustris convehuntur.”

But it should be,

* Geographiæ veteris Scriptores Græci minores. Vol. I.

“ Ex his autem emporiis, *per maximos ascensus*, res Barygazam *deorsum feruntur.*”

Κατάγω signifies *deorsum ferre* (to bring down) not *convehere*.

Ἀνοδίας μεγίσαι should be translated *per maximos ascensus*: Ἀνοδία or ἄνοδος in this place signifies *an ascent, a road over hills*; and this meaning is plainly pointed out by the words *κατάγεται* and *μεγίσαις*.

In short *ἀνοδίας μεγίσαις* is the true translation of the *Hindoo* word *Bala-gaut*, the name of the mountains, through which the goods from *Tagara* to *Baroach* used to be conveyed.

This passage in *ARRIAN* is the more interesting, as it fixes the time when the *Bala-gaut* mountains were first heard of in *Europe*.

The bearing from *Tagara* to *Pluthana* is expressly mentioned by *ARRIAN* (ἀπὸς ἀνατολῆν) but is left out by *STUCKIUS*.

PLUTHANA is an important point to be settled, as it regulates the situation of *Tagara*.

It still exists, and goes nearly by the same name, being called to this day *Pultanab*: it is situated on the southern bank of the *Godavery*, about 217 British miles to the southward of *Baroach*.

These 217 miles, being divided by twenty, the number of days travellers were between *Pultanab* and *Baroach* according to *ARRIAN*, give nearly eleven miles per day, or five cofs, which is the usual rate of travelling with heavy loaded carts.

The *Onyx* and several other precious stones are still found in the neighbourhood of *Pultanab*, as related by *ARRIAN*; being washed down by torrents from the hills during the rains, according to *PLINY*.

ARRIAN informs us that the famous town of *Tagara* was about ten days' journey to the eastward of *Pultanab*.

According to the above proportion, these ten days (or rather somewhat less *) are equal to about 100 British miles, and consequently *Tagara*, by its bearing and distance from *Pultanab*, falls at *Deogir*, a place of great antiquity, and famous through all *India* on account of the *Pagodas* of *Eloura*. It is now called *Doulet-abad* and about four cofs N.W. of *Aurungabad*.

PTOLEMY agrees very well with *ARRIAN*, with respect to distances and bearings, if we admit that he has mistaken *Baitbana* or *Paitbana* for *Plitbana*; and this, I am pretty sure, is really the case, and may be easily accounted for, as there is very little difference between ΠΑΙΘΑΝΑ and ΠΑΙΘΑΝΑ in the *Greek* character.

* Ως ἡμερῶν δέκα quasi dies decem.

Paitbana, now *Pattan* * or *Putten*, is about half way between *Tagara* and *Plithana*.

According to PTOLEMY, *Tagara* and *Pattan* were situated to the northward of the Baund-Ganga (*Binda* or *Bynda* river), commonly called *Godavery*: and here PTOLEMY is very right.

In Mr. BUSSY's marches, *Pattan* is placed to the southward of the *Godavery*; but it is a mistake.

It appears from ARRIAN's *Periplus*, that, on the arrival of the *Greeks* into the *Deccan*, above 2000 years ago, *Tagara* was the *Metropolis* of a large district called *Ariaca*, which comprehended the greatest part of Subah *Aurangabad* and the southern part of *Concan*; for the northern part of that district, including *Damaun*, *Callian*, the island of *Salfet*, *Bombay*, &c. belonged to the *Rajah* of *Larikeb* or *Lar*, according to ARRIAN and EBN SAÏD AL MAGREBI.

It is necessary to observe here, that, though the author of the *Periplus* is supposed to have lived about the year 160 of the present era, yet the materials, he made use of in compiling his directory, are far more ancient: for, in speaking of *Tagara*, he says that the *Greeks* were prohibited from landing at *Callian*, and other harbours on that coast. Now it is well known, that, after the conquest of *Egypt*, the *Romans* had monopolized the whole trade to *India*, and would allow no foreigner to enter the Red Sea; and consequently this passage has reference to an earlier period, previous to the conquest of *Egypt* by the *Romans*.

About the middle of the first century, *Tagara* was no longer the capital of *Ariaca*, *Rajah* SALBAHAN having removed the seat of the empire to *Pattan*.

PTOLEMY informs us, that *Paitbana* or *Pattan* had been the residence of a prince of that country, whose name the *Greeks* have strangely disfigured: we find it variously spelt, in different MSS. of PTOLEMY, *Siripolemæus*, *Siropolemæus*, *Siroptolemæus*, &c.

Yet when we consider, that, whenever *Pattan* is mentioned by the *Hindoos*, they generally add, it was the residence of *Rajah* SALBAHAN†, who in the dialect of the *Deccan* is called *Salivanam* or *Salibanam*, I cannot help thinking, that the *Greeks* have disfigured this last word *Salibanam* into *Saripalam*, from which they have made *Siripolemæus*, *Siropolemæus*, &c.

BICKERMAJIT ruled for some time over the northern parts of the *Deccan*; but the *Rajahs*, headed by SALBAHAN, having revolted, they gave him battle, and he

* *Patina* Tab. Peutinger. *Patina* Anonym. Ravenn. † (Making use of the very words of Ptolemy.)

was slain. *Tagara* became again the *Metropolis* of *Ariaca*; at least it was so towards the latter end of the eleventh century, as it appears from a grant of some lands in *Concan*, made by a *Rajah* of *Tagara*: this grant still exists, and was communicated to the ASIATICK SOCIETY by General CARNAC.

When the *Mussulmans* carried their arms into the *Deccan* about the year 1293, *Tagara* or *Deogbir* was still the residence of a powerful *Rajah*, and remained so till the time of SHAH-JEHAN, when the district belonging to it became a *Subah* of the *Mogul* empire. Then *Tagara* was deserted, and *Kerkbi*, four coss to the south-east of it, became the capital: this place is now called *Aurungabad*.

Thus was destroyed the ancient kingdom or *Rajaship* of *Tagara*, after it had existed with little interruption above 2000 years: that is to say, as far as we can trace back its antiquity.

It may appear astonishing, that though the *Rajah* of *Tagara* was possessed of a large tract on the sea coast, yet all the trade was carried on by land.

Formerly it was not so. On the arrival of the *Greeks* into the *Deccan*, goods were brought to *Callian*, near *Bombay*, and then shipped off. However, a *Rajah* of *Larikeh*, or *Lar*, called *Sandanes*, according to ARRIAN, would no longer allow the *Greeks* to trade either at *Callian*, or at the harbours belonging to him on that coast, except *Baroach*; and whenever any of them were found at *Callian* or in the neighbourhood, they were confined and sent to *Baroach* under a strong guard. ARRIAN, being a *Greek* himself, has not thought proper to inform us what could induce the *Rajah* to behave in this manner to the *Greeks*; but his silence is a convincing proof that they had behaved amiss; and it is likely enough that they had attempted to make a settlement in the island of *Salfet*, in order to make themselves independent, and facilitate their conquests into the *Deccan*.

The fears of the *Rajah* were not groundless; for the *Greek* kings of *Bactriana* were possessed of the *Punjab*, *Cabul*, &c. in the north of *India*.

There were other harbours, to the south of *Callian*, belonging to the *Rajah* of *Tagara*, but they were not frequented, on account of *Pirates*, who, according to PLINY, ARRIAN and PTOLEMY, infested these countries, in the very same manner they do now.

XX.

ON THE PANGOLIN OF BAHAR. *See the Works of Sir William Jones, Vol. I. p. 545.*

XXI.

INSCRIPTIONS ON THE STAFF OF FIRUZ SHAH. TRANSLATED FROM THE SANSKRIT, AS EXPLAINED BY RADHA'CANTA SARMAN. *See the Works of Sir William Jones, Vol. I. p. 539.*

XXII.

A CONVERSATION WITH ABRAM, AN ABYSSINIAN, CONCERNING THE CITY OF GWENDER AND THE SOURCES OF THE NILE BY THE PRESIDENT. *See the Works of Sir William Jones, Vol. I. p. 515.*

ON THE COURSE OF THE NILE. *See the Works of Sir William Jones, Vol. I. p. 519.*

XXIII. ON

XXIII.

ON THE TRIAL BY ORDEAL, AMONG THE HINDUS,—BY ALI
IBRAHIM KHAN, CHIEF MAGISTRATE AT BANARES.

Communicated by WARREN HASTINGS, Esq.

THE modes of trying offenders by an appeal to the Deity, which are described at large in the *Mitácberá*, or Comment on the *Dherma Sastra* in the *Chapter of Oaths*, and other ancient books of *Hindu law*, are here sufficiently explained, according to the interpretation of learned *Pandits*, by the well-wisher to mankind, ALI IBRAHIM KHAN.

The word *Divya* in *Sanscrit* signifies the same with *paricshá*, or *parikbyá* in *Bháshá*, *kasam* in *Arabick*, and *saucand* in *Persian*; that is, an *oath*; or the form of invoking the supreme Being to attest the truth of an allegation; but it is generally understood to mean the trial by *Ordeal*, or the form of appealing to the *immediate* interposition of the divine power.

Now this trial may be conducted in *nine ways*: first, by the *balance*; secondly, by *fire*; thirdly, by *water*; fourthly, by *poison*; fifthly, by the *Cósha*, or water in which an idol has been washed; sixthly, by *rice*; seventhly, by *boiling oil*; eighthly, by *red-hot iron*; ninthly, by *images*.

I. Ordeal by the balance is thus performed. The beam having been previously adjusted, the cord fixed, and both scales made perfectly even, the person accused and a *Pandit* fast a whole day; then, after the accused has been bathed in sacred water, the *bóma*, or *oblation* presented to *fire*, and the deities worshipped, he is carefully weighed; and, when he is taken out of the scale, the *Pandits* prostrate themselves before it, pronounce a certain *mentra* or *incantation*, agreeably to the *Sástras*; and, having written the substance of the accusation on a piece of paper, bind it on his head. Six minutes after, they place him again in the scale; and, if he weigh more than before, he is held guilty; if less, innocent; if exactly the same, he must be weighed a third time; when, as it is written in the *Mitácberá*, there will certainly be a difference in his weight. Should the balance, though well fixed, break down, this would be considered as a proof of his guilt.

II. For

II. For the *fire-ordeal*, an excavation, nine hands long; two spans broad, and one span deep, is made in the ground, and filled with a fire of *pippal* wood: into this the person accused must walk bare-footed; and, if his foot be unhurt, they hold him blameless; if burned, guilty.

III. WATER-ORDEAL is performed by causing the person accused to stand in a sufficient depth of water, either flowing or stagnant, to reach his navel; but care should be taken, that no ravenous animal be in it, and that it be not moved by much air: a *Bráhma*n is then directed to go into the water, holding a staff in his hand; and a soldier shoots three arrows on dry ground from a bow of cane: a man is next dispatched to bring the arrow which has been shot farthest; and, after he has taken it up, another is ordered to run from the edge of the water; at which instant the person accused is told to grasp the foot or the staff of the *Bráhma*n, who stands near him in the water, and immediately to dive into it. He must remain under water, till the two men, who went to fetch the arrows, are returned; for, if he raise his head or body above the surface, before the arrows are brought back, his guilt is considered as fully proved. In the villages near *Bendres* it is the practice for the person, who is to be tried by this kind of *Ordeal*, to stand in water up to his navel, and then, holding the foot of a *Bráhma*n, to dive under it as long as a man can walk fifty paces very gently: if, before the man has walked thus far, the accused rise above the water, he is condemned; if not, acquitted.

IV. There are two sorts of trial by *poison*; first, the *Pandits* having performed their *bóma*, and the person accused his ablution, two *retti's* and a half, or seven barley-corns, of *visbanága*, a poisonous root, or of *sanc'kyá*, that is, white arsenick, are mixed in eight *másha's*, or sixty-four *retti's*, of clarified *butter*, which the accused must eat from the hand of a *Bráhma*n: if the poison produce no visible effect, he is absolved; otherwise, condemned. Secondly, the hooded snake, called *nága*, is thrown into a deep earthen pot, into which is dropped a ring, a seal, or a coin: this the person accused is ordered to take out with his hand; and, if the serpent bite him, he is pronounced guilty; if not, innocent.

V. Trial by the *Cósha* is as follows: the accused is made to drink three draughts of the water, in which the images of the *Sun*, of *Dévi*, and other deities, have been washed for that purpose; and if, within fourteen days, he has any sickness or indisposition, his crime is considered as proved.

VI. When several persons are suspected of theft, some dry rice is weighed, with the sacred stone, called *Sálgrám*; or certain *Slokas* are read over it; after which the

the suspected persons are severally ordered to chew a quantity of it: as soon as they have chewed it, they are to throw it on some leaves of *pippal*, or, if none be at hand, on some *b'úrja patra*, or bark of a tree from *Népál* or *Cashmir*. The man, from whose mouth the rice comes dry or stained with blood, is holden guilty; the rest are acquitted.

VII. The ordeal by *hot oil* is very simple: when it is heated sufficiently, the accused thrusts his hand into it; and if he be not burned, is held innocent.

VIII. In the same manner, they make an *iron ball*, or the *head of a lance*, red-hot, and place it in the hands of the person accused; who if it burn him not, is judged guiltless.

IX. To perform the ordeal by *adbarmárcb*, which is the name of the *stóca* appropriated to this mode of trial, either an image, named *Dbarma*, or the Genius of Justice, is made of silver, and another, called *Adbarma*, of clay or iron, both of which are thrown into a large earthen jar, and the accused, having thrust his hand into it, is acquitted, if he bring out the silver image, but condemned, if he draw forth the iron; or, the figure of a deity is painted on white cloth, and another on black; the first of which they name *dbarma*, and the second *adbarma*: these are severally rolled up in cow-dung, and thrown into a large jar without having ever been shown to the accused: who must put his hand into the jar, and is acquitted or convicted, as he draws out the figure on white, or on black, cloth.

It is written in the comment on the *Dbarma Sástra*, that each of the four principal casts has a sort of ordeal appropriated to it; that a *Bráhma*n must be tried by the *balance*, a *Cshatriya* by *fire*, a *Vaisya* by *water*, and a *Súdra* by *poison*; but some have decided, that any ordeal, except that by poison, may be performed by a *Bráhma*n, and that a man of any cast may be tried by the *balance*: it has been determined, that a woman may have any trial except those by poison and by water.

Certain months and days also are limited in the *Mitácshera* for the different species of ordeal, as *Agraban*, *Pausb*, *Mágb*, *P'hálgun*, *Sráwan*, and *B'hádr* for that by *fire*, *A'swin*, *Cártic*, *Jaisbt*, and *A'shádb*, for that by *water*, *Pausb*, *Mágb*, and *P'hálgun*, for that by *poison*; and regularly there should be no *water-ordeal* on the *Ashlemi*, or *eightb*, the *Cheturdash*, or *fourteentb*, day of the new or full moon, in the intercalary month, in the month of *B'hádr*, on *Sanaishber*, or *Saturday*, and on *Mangal*, or *Tuesday*; but, whenever the magistrate decides that there shall be an ordeal, the regular appointment of months and days needs not be regarded.

The

The *Mitácsherd* contains also the following distinctions; in cases of theft or fraud to the amount of a *hundred* gold mohrs the trial by *poison* is proper; if *eighty* mohrs be stolen the suspected person may be tried by *fire*; if *forty*, by the *balance*; if from *thirty* to *ten*, by the *image-water*; if two only, by *rice*.

An inspired legislator, named *Cátyáyana*, was of opinion, that, though a theft or fraud could be proved by witnesses, the party accused might be tried by ordeal: he says too, that, where a thousand *pana's* are stolen or fraudulently withheld, the proper trial is by *poison*; where *seven hundred and fifty*, by *fire*; where *six hundred and sixty-six*, and a fraction, by *water*; where *five hundred* by the *balance*; where *four hundred*, by *hot oil*; where *three hundred*, by *rice*; where an *hundred and fifty*, by the *Cósha*; and where *one hundred*, by the *dbarmárbh*, or images of silver and iron.

The mode of conducting the ordeal by red-hot *balls*, or *heads of spears*, is thus particularly described in the commentary on *Yágyawelcya*.

At daybreak, the place, where the ceremony is to be performed, is cleared and washed in the customary form; and at sun-rise, the *Pandits*, having paid their adoration to GANESA, the God of Wisdom, draw nine circles on the ground with cow-dung, at intervals of sixteen fingers; each circle containing sixteen fingers of earth, but the ninth either smaller or larger than the rest: then they worship the deities in the mode prescribed by the *Sástra*, present oblations to the Fire, and, having a second time worshipped the Gods, read the appointed *mentra's*. The person to be tried then performs an ablution, puts on moist clothes, and, turning his face to the East, stands in the *first* ring, with both his hands fixed in his girdle: after this the presiding magistrate and *Pandits* order him to rub some rice in the husk between his hands, which they carefully inspect; and, if the scar of a former wound, a mole, or other mark, appear on either of them, they stain it with a dye, that, after the trial, it may be distinguished from any new mark. They next order him to hold both his hands open and close together; and, having put into them seven leaves of the *trembling tree*, or *pippal*, seven of the *sami* or *jend*, seven blades of *darbba* grass, a little barley moistened with curds, and a few flowers, they fasten the leaves on his hand with seven threads of raw cotton. The *Pandits* then read the *stócas*, which are appointed for the occasion; and, having written a state of the case and the point in issue on a palmyra-leaf, together with the *mentra* prescribed in the *Véda*, they tie the leaf on the head of the accused. All being prepared, they heat an iron ball or the head of a lance, weighing two *ser* and a half, or five *pounds*, and throw

throw it into water; they heat it again, and again cool it in the same manner: the third time they keep it in the fire till it is red-hot; then they make the person accused stand in the first circle; and, having taken the iron from the fire and read the usual incantation over it, the *Pandits* place it with tongs in his hands. He must step gradually from circle to circle, his feet being constantly within one of them, and when he has reached the *eighth*, he must throw the iron into the *ninth*, so as to burn some grass, which must be left in it for that purpose. This being performed, the magistrate and *Pandits* again command him to rub some rice in the husk between both his hands, which they afterwards examine; and, if any mark of burning appear on either of them, he is convicted; if not, his innocence is considered as proved. If his hand shake through fear, and by his trembling any other part of his body is burned, his veracity remains unimpeached; but if he let the iron drop before he reach the *eighth* circle, and doubt arise in the minds of the spectators, whether it had burned him, he must repeat the whole ceremony from the beginning.

In the year of the MESSIAH, 1783, a man was tried by the *hot ball* at *Benâres*, in the presence of me ALI IBRA'HIM KHA'N, on the following occasion. A man had appealed one SANCAR of larceny, who pleaded that he was not guilty; and, as the theft could not be proved by legal evidence, the trial by fire-ordeal was tendered to the appellee, and accepted by him. This well-wisher to mankind advised the learned magistrates and *Pandits* to prevent the decision of the question by a mode not conformable to the practice of the Company's Government, and recommended an oath by the water of the *Ganges* and the leaves of *tulasi* in a little vessel of brass, or by the book *Herivansa*, or the stone *Sâlgrâm* or by the hallowed ponds or basons; all which oaths are used at *Benâres*. When the parties obstinately refused to try the issue by any one of the modes recommended, and insisted on a trial by the hot ball, the magistrates and *Pandits* of the court were ordered to gratify their wishes; and, setting aside those forms of trial, in which there could be only a distant fear of death, or loss of property, as the just punishment of perjury by the sure, yet slow, judgment of heaven, to perform the ceremony of ordeal agreeably to the *Dherma Sâstra*: but, it was not till after mature deliberation for four months, that a regular mandate issued for a trial by the red-hot ball; and this was at length granted for four reasons; first, because there was no other way of condemning or absolving the person accused; secondly, because both parties were *Hindus*, and this mode of trial was specially appointed in the *Dherma Sâstra* by the ancient lawgivers;

lawgivers; thirdly, because this ordeal is practised in the dominions of the *Hindu Rájás*; and fourthly, because it might be useful to inquire how it was possible for the heat of fire to be resisted, and for the hand, that held it, to avoid being burned. An order was accordingly sent to the *Pandits* of the court and of *Benáres* to this effect: "Since the parties accusing and accused are both *Hindus*, and will not consent to any trial but that by the hot ball, let the ordeal desired be duly performed in the manner prescribed by the *Mitácsherd*, or commentary on *YA'GYA-WALCYA*."

When preparations were made for the trial, this well-wisher to mankind, attended by all the learned professors, by the officers of the court, the *Sipábís* of Captain HOGAN's battalion, and many inhabitants of *Benáres*, went to the place prepared, and endeavoured to dissuade the appellor from requiring the accused to be tried by fire, adding: "If his hand be not burned, you shall certainly be imprisoned." The accuser, not deterred by this menace, persisted in demanding the trial. The ceremony, therefore, was thus conducted in the presence of me ALI IBRAHÍM KHA'N.

The *Pandits* of the court and the city, having worshipped the God of Knowledge, and presented their oblation of clarified butter to the Fire, formed nine circles of cow-dung on the ground; and, having bathed the appellee in the *Ganges*, brought him with his clothes wet; when, to remove all suspicion of deceit, they washed his hands with pure water: then, having written a state of the case and the words of the *mentra* on a palmyra-leaf, they tied it on his head: and put into his hands, which they opened and joined together, seven leaves of *pippal*, seven of *jend*, seven blades of *darbba* grass, a few flowers, and some barley moistened with curds, which they fastened with seven threads of raw white cotton. After this they made the iron ball red-hot, and, taking it up with tongs, placed it in his hands: he walked with it step by step, the space of three *gaz* and a half, through each of the seven intermediate rings, and threw the ball into the *nintb*, where it burnt the grass, that had been left in it. He next, to prove his veracity, rubbed some rice in the husk between his hands; which were afterwards examined, and were so far from being burned, that not even a blister was raised on either of them. Since it is the nature of fire to burn, the officers of the court, and people of *Benáres*, near five hundred of whom attended the ceremony, were astonished at the event; and this well-wisher to mankind was perfectly amazed. It occurred to his weak apprehension, that probably the fresh leaves and other things, which as it has been mentioned, were placed on the hands of the accused;

cused, had prevented their being burned; besides that the time was but short between his taking the ball and throwing it down: yet it is positively declared in the *Dberma Sástra*, and in the written opinions of the most respectable *Pandits*, that the hand of a man who speaks truth cannot be burned; and ALI IBRA'HIM KHA'N certainly saw with his own eyes, as many others also saw with theirs, that the hands of the appellee in this cause were unhurt by the fire: he was consequently discharged; but, that men might in future be deterred from demanding the trial by ordeal, the appellor was committed for a week. After all, if such a trial could be seen once or twice by several intelligent men, acquainted with natural philosophy, they might be able to assign the true reason, why a man's hand may be burned in some cases, and not in others.

Ordeal by the vessel of hot oil, according to the comment on the *Dberma Sástra* is thus performed: the ground, appointed for the trial, is cleared and rubbed with cow-dung, and, the next day at sun-rise, the *Pandit* worships GANE'SA, presents his oblations, and pays adoration to other deities, conformably to the *Sástra*: then, having read the incantation prescribed, he places a round pan of gold, silver, copper, iron, or clay, with a diameter of sixteen fingers, and four fingers deep; and throws into it one *ser*, or eighty *ficca* weight, of clarified butter or oil of *sesamum*. After this a ring of gold or silver, or iron, is cleaned and washed with water, and cast into the oil; which they proceed to heat, and, when it is very hot, put into it a fresh leaf of *pippala*, or of *bilwa*: when the leaf is burned, the oil is known to be sufficiently hot. Then, having pronounced a *mentra* over the oil, they order the party accused to take the ring out of the pan; and, if he take it out without being burned or without a blister on his hand, his innocence is considered as proved; if not, his guilt.

A *Bráhma*n, named RISHI'SWARA BHATTA accused one RA'MDAYA'L, a linen painter, of having stolen his goods: RA'MDAYA'L pleaded not guilty; and, after much altercation, consented to be tried, as it had been proposed, by the vessel of oil. This well-wisher to mankind advised the *Pandits* of the court to prevent, if possible, that mode of trial; but, since the parties insisted on it, an ordeal by hot oil, according to the *Sástra*, was awarded for the same reasons, which prevailed in regard to the trial by the ball. The *Pandits*, who assisted at the ceremony, were BHISHMA BHATTA, NA'NA'PAT'HAC, MANIRA'MA *Pát'aca*, MENIRA'MA BHATTA, SIVA, ANANTARA'MA BHATTA, CRIPA'RAMA, VISHNUHERI, CRISHNACHANDRA, RAME'NDRA, GO'VINDARAMA, HERICRISHNA BHATTA, CALI-
DA'SA:

DA'SA : the three last were *Pandits* of the court. When GANESA had been worshipped and the *bóma* presented, according to the *Sástra*, they sent for this well-wisher to mankind ; who, attended by the two *Dárógbas* of the *Díváni* and *Faujdarí* courts, the *Cotwál* of the town, the other officers of the court, and most of the inhabitants of *Benáres*, went to the place of trial ; where he laboured to dissuade RA'MDAYAL and his father from submitting to the ordeal ; and apprized them, that, if the hand of the accused should be burned, he would be compelled to pay the value of the goods stolen, and his character would be disgraced in every company. RA'MDAYAL would not desist : he thrust his hand into the vessel, and was burned. The opinion of the *Pandits* was then taken ; and they were unanimous, that, by the burning of his hand, his guilt was established, and he bound to pay RISHI'SWARA BHATTA the price of what he had stolen ; but, if the sum exceeded five hundred *asbrafi's*, his hand must be cut off by an express law in the *Sástra* ; and a mulct also must be imposed on him according to his circumstances.

The chief magistrate, therefore, caused RA'MDAYAL to pay RISHI'SWARA seven hundred rupees in return for the goods, which had been stolen ; but, as amercements in such cases are not usual in the courts of judicature at *Benáres*, the mulct was remitted, and the prisoner discharged.

The record of this conviction was transmitted to *Calcutta* in the year of the MESSIAH 1783 ; and, in the month of *April*, 1784, the Governor General, IMADU'DDAULAH JELADET JANG BEHA'DER, having seen the preceding account of trials by ordeal, put many questions concerning the meaning of *Sanscrit* words, and the cases here reported ; to which he received respectful answers. He first desired to know the precise meaning of *bóma*, and was informed that it meant the oblations made to please the deities, and comprised a variety of things : thus in the *agni bóma*, they throw into the fire several sorts of wood and grafs, as *palás* wood, *c'badira* wood, *raçta chandan* or red sandal, *pippal-wood*, *fami*, and *cusba* grafs, *dubba*, together with some sorts of grain, fruit and other ingredients, as black sesamum, *barley*, *rice*, *sugar-cane*, *clarified butter*, *almonds*, *dates*, and *gúgal* or *bdellium*. To his next question, " how many species of *bóma* there were ? " it was answered, that different species were adapted to different occasions : but that, in the ordeals by hot iron, and hot oil, the same sort of oblation was used. When he desired to know the meaning of the word *mentra*, he was respectfully told, that in the language of the *Pandits*, there were three such words, *mentra*, *yantra*, and *tantra* ; that the *first* meant a passage from one of the *Védas*, in which the names of certain deities occurred ; the second,

second, a scheme of figures, which they write with a belief that their wishes will be accomplished by it; and the third, a medical preparation, by the use of which all injuries may be avoided; for they are said to rub it on their hands, and afterwards to touch red-hot iron without being burned. He then asked, how much barley, moistened with curds, was put into the hands of the accused person; and the answer was, *nine grains*.

His other questions were thus answered: "that the leaves of *pippala* were spread about in the hands of the accused, not heaped one above another; that the man, who performed the fire ordeal, was not much agitated, but seemed in full possession of his faculties; that the person tried by hot oil was at first afraid, but persisted, after he was burned, in denying the theft; nevertheless, as he previously had entered into a written agreement, that, if his hand should be hurt, he would pay the value of the goods, the magistrate for that reason thought himself justified in compelling payment; that, when the before-mentioned ingredients of the *bóma* were thrown into the fire, the *Pandits*, sitting round the *hearth*, sung the *Shlokas* prescribed in the *Sástra*. That the form of the hearth is established in the *Véda* and in the *Dherma Sástra*; and this fire-place is also called *Védi*; that, for the smaller oblations, they raise a little ground for the *hearth*, and kindle fire on it; for the higher oblations, they sink the ground to receive the fire, where they perform the *bóma*, and this sacred hearth they call *cunda*." The Governor then asked, why the trials by fire, by the hot ball, and the vessel of oil, if there be no essential difference between them, are not all called fire-ordeals; and it was humbly answered, that, according to some *Pandits*, they were all three different, whilst others insisted, that the trial by fire was distinct from that by the vessel, though the trial by the hot ball and the head of a lance were the same; but that, in the apprehension of his respectful servant, they were all *ordeals by fire*.

THE INDIAN LAW OF ORDEAL, VERBALLY TRANSLATED FROM YA'GYAWALCYA.

1. **T**HE balance, fire, water, poison, the idol—these are the ordeals used here below for the proof of innocence, when the accusations are heavy, and when the accuser offers to hazard a mulct (if he should fail):

2. Or

2. Or one party may be tried, if he please, by ordeal, and the other must then risque an amercement; but the trial may take place even without any wager, if the crime committed be injurious to the prince.

3. The sovereign, having summoned the accused, while his clothes are yet moist from bathing at sunrise, before he has broken his fast, shall cause all trials by ordeal to be conducted in the presence of *Bráhmans*.

4. The balance is for women, children, old men, the blind, the lame, *Bráhmans*, and the sick; for the *Súdra*, fire or water, or seven barley-corns of poison.

5. Unless the loss of the accuser amount to a thousand pieces of silver, the accused must not be tried by the red-hot ball, nor by poison, nor by the scales; but, if the offence be against the king, or if the crime be heinous, he must acquit himself by one of those trials in all cases.

6. He, who has recourse to the balance, must be attended by persons experienced in weighing, and go down into one scale, with an equal weight placed in the other, and a groove (with water in it) marked on the beam.

7. "Thou, O balance, art the mansion of truth; thou wast anciently contrived by deities: declare the truth, therefore, O giver of success, and clear me from all suspicion."

8. "If I am guilty, O venerable as my own mother, then sink me down; but if innocent, raise me aloft." Thus shall he address the balance.

9. If he sink, he is convicted, or if the scales be broken; but, if the string be not broken, and he rise aloft, he must be acquitted.

10. On the trial by fire, let both hands of the accused be rubbed with rice in the husk, and well examined: then let seven leaves of the *Afwatt'ba* (the religious fig-tree) be placed on them, and bound with seven threads.

11. "Thou, O fire, pervadest all beings; O cause of purity, who givest evidence of virtue and sin, declare the truth in this my hand."

12. When he has pronounced this, the priest shall place in both his hands an iron ball, red hot, and weighing fifty * *pala's*.

13. Having taken it, he shall step gradually into seven circles, each with a diameter of sixteen fingers, and separated from the next by the same space.

14. If, having cast away the hot ball, he shall again have his hands rubbed with rice in the husk, and shall show them unburned, he will prove his innocence.

* A *pala* is four *carsha's*, and a *carsha*, eighty *rañicà's*, or seeds of the *Gungà* creeper, each weighing above a grain and a quarter, or, correctly, $1\frac{5}{8}$ gr.

Should the iron fall during the trial, or should a doubt arise (on the regularity of the proceedings), he must be tried again.

15. "Preserve me, O Varuna, by declaring the truth." Thus having invoked the God of waters, the accused shall plunge his head into the river or pool, and hold both thighs of a man, who shall stand in it up to his navel.

16. A swift runner shall then hasten to fetch an arrow shot at the moment of his plunging; and if, while the runner is gone, the priest shall see the head of the accused under water, he must be discharged as innocent.

17. "Thou, O poison, art the child of BRAHMA, steadfast in justice and in truth: clear me then from this heavy charge, and, if I have spoken truly, become nectar to me."

18. Saying this, he shall swallow the poison *Sárnga*, from the tree, which grows on the mountain *Himálaya*; and, if he digest it without any inflammation, the prince shall pronounce him guiltless.

19. Or the priest shall perform rites to the image of some tremendous deity, and, having bathed the idol, shall make the accused to drink three handfuls of the water, that has dropped from it:

20. If, in fourteen days after, he suffer no dreadful calamity from the act of the deity or of the king, he must indubitably be acquitted.

XXIV.

THE SECOND ANNIVERSARY DISCOURSE, DELIVERED 24 FEBRUARY, 1785. See the Works of Sir William Jones, Vol. I. p. 9.

XXV.

THE THIRD ANNIVERSARY DISCOURSE, DELIVERED 2 FEBRUARY, 1786. See the Works of Sir William Jones, Vol. I. p. 19.

XXVI. COR-

XXVI.

CORRECTIONS OF THE LUNAR METHOD OF FINDING THE
LONGITUDE.

By Mr. REUBEN BURROW.

THE intent of the following remarks is to point out an error in the usual practice of making the lunar observations, and another in the method of computation.

It is well known that a little before and after the conjunction, the whole hemisphere of the moon is visible, and the enlightened crescent seems to extend some distance beyond the dusky part. Now, having determined the longitude of a place from the eclipses of Jupiter's satellites, I took several sets of distances of the moon's limb from a star, near the time of the conjunction, both from the bright and the dusky parts of the circumference, and having calculated the results, I found that those taken from the dusky part were much nearer the truth than the others; the nature of the error evidently shewed, that the star had really been at some distance from the limb, when it appeared to be in contact with it; and, as the error was a considerable part of a degree, I saw it would be of consequence to discover the cause of it; which, however, was obvious enough from NEWTON'S principles, and may be explained as follows.

Let AD be the diameter of the moon, and A the centre of a star in contact with the moon's limb; now, as the enlightened part of the moon evidently appears to extend beyond the dusky part, let the concentric circle BC represent the moon's limb thus apparently magnified, and suppose the star to be equally magnified; then with the centre A, and the distance DC describe a circle, which consequently will touch the moon's apparent circumference inwardly; now as this last is a consequence of supposing the centre of the star to touch the circumference of the moon, exclusive of the deception, it follows, that *the proper method of taking the distance, is to make the star appear to touch the moon inwardly.*

But all the writers on this subject have particularly directed that the star be made to touch *outwardly*: let B, therefore, be the point of contact, and *a* the centre; the error then is Aa, or the sum of the apparent increase of the moon's radius and the apparent radius of the star: this quantity, it is evident, will make a considerable

considerable error in the result, and errors arising from this source are the more to be attended to, as they are not of a kind to be lessened by increasing the number of observations. The same reasoning is applicable to the sun and moon with very little alteration.

The distance of the moon from the sun or a star, at each three hours, is given in the Nautical Ephemeris, and the method of inferring the time, for any intermediate distance, is by simple proportion; this would be just if the moon's motion was uniform: but as that is not the case, the velocity should be taken into the account, as well as the space, in determining the time, taken by the moon to move any given distance; and the proper measure of the velocity is such a quantity, as has the same ratio to the space described, as three hours have to the time, that has been actually taken to move the given distance; to find this quantity correctly would require interpolation, but it will be sufficient in practice to find the time first by the common method, and then to correct the interval for three hours to that time, by taking a proportional part of the second difference of the moon's distance at the beginning of each three hours; supposing the first differences to answer to the middle of each interval.

The last correction, though not so considerable as the first, will often bring the result nearer to the truth by three, four, five, or six miles, and sometimes more, which in geographical determinations is of consequence; and, by paying attention to those and some other causes of error, which shall be pointed out hereafter, the results in general will be much nearer to the truth than is usually imagined. It is common to throw blame on the imperfections of the lunar tables, but it would be much more properly applied to bad instruments and bad observers.

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February, 1786.*

A METEOROLOGICAL JOURNAL.

Day.	Time.	Barometer.	Hygrometer.	Thermometer.		Clouds.		Wind.		Rain.	Miscellaneous.
				In.	Out.	Kind.	Quant.	Quarter.	Force.	Inches.	
	h. m.	D L. Q.									
3	22.49										
6	7.15 A	29,963		77		thin	3	SSW	1		(a)
7	3. P	29,915		79		thin	5	SSW	3		(b)
	6.30 P					thick thund.	10	SSW	3		(c)
8	7.30 A	30,00		76		ditto	9	SSW	2		(d)
	7. P					thick	10				
	8. P							NW			
9	7. A	30,032		75.5		thick thund.	8	NW	1		(e)
	1.55 P	29,97		79.5		none					
	16.27	D New									
10	4.50 P					thick thund.	9	NW	6		
	5.39 P					ditto	8	S	3		
	6.15 P	29,95		76.5		ditto	8	S	4	.142	(f)
11	7. A	30,00		70				S by W	1		
12	6.35 A	29,95		79				S	1		(g)
13	6. A	29,85		79		thin	2	S by E	1		(b)
	2. P					thick	4	S	3		
	4. P					thick thund.	8	S by E	3		
	5.2 P	29,77		80.5		ditto	9	S	5	.259	
	5.30 P										
14	7. A					thick	6	SSE	2		
	2.20 P	29,816		83		ditto	9	SSE	2		
15	6.45 A	29,854		79.5				S by E	1		(i)
	8.25 P					thick thund.	9	N	5		
16	7.40 A	29,873		78		ditto	10			.022	(k)
	2.20 P	29,813		82		thick loose	8	SSW	4		
	12.52	D F. Q.									
17	7.15 A	29,887		80		thick	5	SE	1	.039	(l)
	2.30 P	29,828		84		ditto	4	SSE	2		
Carried forward,											
											.462

(a) Last Friday the fog was excessive, and did not begin to clear till 9. Saturday the same. Sunday it began to clear about 7.

(b) The fog is gone off to-day already: it was but slight.

(c) Much lightning in the NW. and distant thunder.

(d) Much lightning in the NW. A puff from the NW. but without rain or thunder.

(e) There was a very small sprinkling of rain just now.

(f) In the morning we had a thick fog, which formed into clouds, and went over to the N. and at 2 masses were formed there: from whence at 4.50 we had a storm, which was over in half an hour; and at *Dumdum*, about 10 miles off, they had heavy hail.

(g) Fog so thick that an object at a 100 yards is invisible.

(h) 6. A. Foggy. A storm will come on in the evening. 4. P. Distant thunder. 5.2 P. We have had a furious storm of hail, with thunder and lightning, and SW to SSE 6. 5.30 P. Loud thunder still continues in the ENE. where the mafs now is.

(i) 6.45 A. Every thing hidden in fog, which will produce a storm at night. 8.25 P. Much lightning, and the expected storm coming on.

(k) 7.40 A. The thunder rolled all night: excessive lightning.

(l) 7.15 A. A storm began to gather about 5 P. and we had much lightning about 10. Between 12 and 1 it began, and the wind very violent. The thunder close, and so heavy, that it jarred the whole house like an earthquake. 2.30 P. It has been very gloomy at times all day.

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Day.	Time.	Barometer.	Hygrometer.	Thermometer.		Clouds.		Wind.		Rain.	Miscellaneous.
				In.	Out.	Kind.	Quant.	Quarter.	Force.		
18	6. A	29,915		80		thin		Brought forward,		.462	
	2. P	29,85		86		loose		S	1		
19	2.20 P	29,813		84				S	4		
								W by S	2		
20	1.30 P	29,833		85		thin		SSW	3		
								SW by S	2		
21	6.15 A	29,813		81		thin		SW by S	2		
	2. P	29,80		86		thick & thin		S by W	4		
22	6.30 A	29,825		82		thick loose		SW by S	3		(m)
	2. P	29,837		86		thick		SW by S	5		
23	2. P	29,784		85.5		thin		SW by S	3		(n)
	7.45					thick thund.		SSW	5		
24	8. A	29,87		81.5		thick					(o)
	2. P	29,825		85		thick thund.		W by S	2		
	9. P									.001	
	h. m.										
	16.02	D Full									
25	6.15 A	29,859		82		thick.		SSE	2		
	2. P	29,866		66		none		S	3		
26	5.45 A	29,915		82		thick loose		S	1		(p)
	2.15 P	29,87		86.2				S	4		
27	7.15 A	29,865		82		thick					
	2.15 P	29,785		87				S	2		
28	6.45 A	29,795		81				S	1		(q)
	2.10 P	29,798		87.5				SSW	4		
29	6.45 A	29,862		81.5		thin		S ¹ / ₂ W	1		(r)
	2.15 P	29,830		87.0				SSW ¹ / ₂ W	3		
30	6.45 A	29,822		81.5		thin		S ¹ / ₂ E	1		(s)
	1.30 P	29,848		83.5		thick		NE	1		
31	7.15 A	29,862		79.0		ditto		NNE	1		(t)
	2. P	29,797		83.0		ditto		NNW	1		
TOTAL IN MARCH, -										.554	

(m) Great appearance of approaching rain and storms.

(n) 8. A. The morning was very cloudy, and the wind strong; it prefiged a storm; and I still expect one before midnight. At sun-set it threatened, and at 7 P. the lightning began to be vivid in the WNW. It rained for about ten minutes. The thunder was very near.

(o) 8. A. The wind began about 11 P. and raged till past 1 o'clock with uncommon violence. 2. P. Excessively gloomy. 9. P. At 7 we had a thunder gust, which was soon over, with a sprinkling only.

(p) 5.45 A. The clouds began to collect at 8 last night and are very thick. 2.15 P. The clouds continued very thick till past 10, and were not dispelled till past 1.

(q) 6.45 A. Excessively thick fog. 2.10 P. The true along-shore wind, which disorders the whole frame.

(r) 6.45 A. Foggy. Last night the clouds were thick 10 at 11 P.

(s) 6.45 A. Foggy. It has been extremely gloomy ever since 7 o'clock, and about noon we had a few drops of rain.

(t) 7.15 A. We had a small shower of rain about sun-rise, and there has been more at a distance from the feel of air.

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Day.	Time.	Baromet.	Hygrometer.	Thermometer.		Clouds.		Wind.		Rain.	April 1785. Miscellaneous.
				In.	Out.	Kind.	Quant.	Quarter.	Force.		
1	6.45 A	29,866		79,5		thick thund.	10	WNW	2		(a)
	2.10 P	29,816		82		thick	10	SE	2		
D L. Q.											
2	6.45 A	29,828		77				E ½ S	1		
	2. P	29,777		83,7		thick scat.	3	WNW	3		
3	6.45 A	29,765		79				S by W	1		
	2. P	29,711		85,5		none		WNW	2		
4	7. A	29,785		80				SE by S	2		
	2. P	29,750		86				WNW	1		
5	6. A	29,763		78		thick	2	SE	2		(b)
	1.45 P	29,760		86,7		thick gather.	3	S by E	2		
6	6.30 A	29,76		80,5		thick	5	E	3		(c)
	2. P	29,748		88		ditto	1	SW ½ S	4		
7	7. A	29,82		80							
	2. P	29,79		87,5				SSW	5		
8	7. A	29,846		81,5		loose	4	S by E	2		(d)
	2. P	29,761		87,5	94			SW ½ S	4		
D New											
9	1.39										
	6.30				81	thick loose	10	S	2		
10	2. P	29,75		88,5	96,5			S by W	4		
	7.45 A	29,76		84		thick	9	SSW	5		
11	2. P	29,718		88	92,2			SSW	5		(f)
	5.30 P	29,708		87	88	thick	10	SSW	5		
12	6.40 A	29,788		85	81,5	thin	7	SSW	2		(g)
	2. P	29,766		89,5	96,0	ditto	8	SW by S	3		
13	6.15 P	29,779		88	83,15	thick thund.	8	SSW	3		(b)
	8. P									.016	
14	7.15 A	29,740		83				NE	2		
	2.30 P	29,765		90,5	100,5			SW by S	2		
15	6.30 A	29,783		82	81	thick & thin	10	N	1	.002	(i)
	10. P	29,818		84	83,5	thick	10	S by W	3		
16	7. A	29,820		83	85	ditto	9	S	2		(k)
	2.30 P	29,848		86	83	ditto	10	S ½ W	1		
17	7. A	29,915	28	82	81	ditto	10	SW	1		(l)
	1.45 P	29,90	22,5	85	92	ditto	10	NE	1		
Carried forward,										.018	

- (a) We had a sprinkling rain to-day of half an hour's duration.
- (b) Excessively thick haze.
- (c) Last night the clouds were so heavy that they seemed to threaten a storm.
- (d) There were flying clouds from 8 till 11 to-day, but all are gone.
- (e) Yesterday evening there was a mass over Calcutta, and much lightning and some thunder, and this morning we had a fog.
- (f) There will be a storm to-day. 5.30 P. Distant thunder. The bank is not yet formed.
- (g) The wind was tempestuous the greatest part of the night, but we had not any rain. It is now foggy, and threatens.
- (h) Yesterday there was every reason to expect a violent storm, but it went off from us. To-day there was but little expectation, and it now rains smartly, and there has been a great deal of thunder, and all this without any change of wind.
- (i) We had a small shower at 1, and another just now. The wind was NE all the afternoon.
- (j) The wind changed suddenly just after last observation to the S again, and we had a very windy night. 2.30 P. It has been gloomy all day.
- (k) A sprinkling rain in very distant drops. The wind of the night was of such a kind, that it prevented the possibility of sleeping.
- The morning rain, and a like sprinkling since, could not be measured.

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Day.	Time.	Barometer.	Hygrometer.	Thermometer.		Clouds.		Wind.		Rain.	Miscellaneous.
				In.	Out.	Kind.	Quant.	Quarter.	Force.		
16	7. A	29,95	15	80	82,5	thick	10	Brought forward,		.018	(m)
	8.15 A	29,99	17,5	80	74	ditto	10	N	4		
	2.15 P	29,893	29	80	80	ditto	10	NE by E	3	.087	
	3.44 P	D F. Q.						NE	4		
17	7.15 A	29,864	32	70,5	86	thick	10	E by N	4	1,314	(n)
	2.15 P	29,79	43	78	75	ditto	10	S by E	3	.763	
	8.20 P	29,828	44	78	74	thick loose	10	SE ½ E	3	.752	
18	6.15 A	29,80	46	79,5	76	thick	9	SSW ½ S	1	.284	(o)
	2.15 P	29,839	48,3	80,5	86	thick white fc.	4	NW	1		
19	7. A	29,913	50	80		thick loose	7				(p)
	2.15 P	29,813	43,5	83,5	90	thick white	7	SW ½ S	2		
	5.40 A	29,8	43,5	79,5	76	thin	4	S by W	2		
20	2.25 P	29,792	42	86	90	thick loose	4	S	4		(q)
	10. P	29,881	36,5	76,5	80,9	thick	10	NNE	3		
	6. A	29,812	40	76,9	73,5	ditto	3	SSE	3		
21	8. A	29,876	41	77	74	ditto	10	SW by S	3	.410	(r)
	2. P	29,785	36,5	82	89	scattered	2	SSW	3	.007	
22	5. A	29,750	50	79	77			SW	2		(s)
	2.15 P	29,760	46	86	93			S by W	2		
	7. A	29,748	54	82,5	84			S	2		
23	2. P	29,722	45	87,5	94	scattered	2	S by W	3		(t)
	8.8 P	D Full									
	6.30 A	29,71	53,5	83	83			SSE	2		
24	2. P	29,71	42	90,5	96,5	scattered	3	S ½ E	4		(u)
	7.15 A	29,740	47	84	85	ditto	3	S	2		
	2. P	29,735	39	89	94	thick	9	S by E	4		
25	7. A	29,705	47,5	84						.220	(v)
	2. P	29,697	43	87,5	91	thick	9	S by E	4		
	7. P	29,711	43	83	86	thick thund.	10	NNE to	7		
	8. P							NNW	9	.170	
	9.45 P							WNW	9	.270	
26	6.45 A	29,713	40	81,5	78	none		SW by S	2	.013	(w)
	2. P	29,723	44	87,5	93			SW by S	2		
	6. A	29,713	49	83,5	80,5	none		SW by S	2		
27	2. P	29,753	37	87,5	93			W by S	2		(x)
	7. A	29,79	50	83,5	84	none		SW by S	2		
28	2. P	29,79	37,5	91	97,5	thick small scat.	2	SSW	4		
	2. P										
TOTAL IN APRIL,										4,308	

(m) It has been a blowing cold night; wind northerly, and it sprinkles rain. 8.15 A. A heavy shower just over, and drizzling rain still continues. 2.15 P. We have had more sprinkling rain.

(n) About 6 yesterday it began to rain in drops; before 9 it was smart rain. It has continued all night, and still rains. 2.15 P. It has rained incessantly all day. It still rains hard, and now the clouds begin to break a little. 8.20 P. It still sprinkles.

(o) It began to thunder at a great distance about 8, and by 12 it was near us; and this put an end to the rain before 3. A.

(p) The morning was foggy.

(q) A small shower of rain, and the wind changed from the S. to NNE.

(r) At 12. P. a mass formed in the NW. came on; and in a short time we had a storm without thunder. It sprinkles to-day. 2. P. Produce of the sprinkling.

(s) Very hazy and foul air.

(t) Lightning last night; and very foul air to-day.

(u) A regular northwester last night at 8. P. 7. P. Sprinkling rain begun. 8. P. the produce of the storm, which is abated: distant thunder. 9.45 P. A very severe storm just over, which began about 8.20. It still thunders.

(v) This was, with produce of a small shower, about 10.30 P.

(w) The night very hot, and the air loaded with damp: the morning cool and pleasant.

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Day.	Time.	Barometer.	Hygrometer.	Thermometer.		Clouds.		Wind.		Rain.	May 1735.	Miscellaneous.
				In.	Out.	Kind.	Quant.	Quarter.	Force.			
1	7.40 A	29,813	47,5	84	86			SW	3			
	2.10 P	29,762	32,5	90	98,5			W	3			
	6.22 A	D L. Q.										
2	7.45 A	29,750	47,5	84	86	scattered	3	SW	4			
	2. P	29,710	38	89	98	ditto	1	SSW	3			
3	6. A	29,712	45	83,9	82			SSW	2			
	2. P	29,720	38	89	95	none		SSW	4			
4	6. A	29,735	39	83,3	82			S by W	2			
	2.20 P	29,780	36	88,5	93			SSW	4			
5	5.30 A	29,745	43.	83,5	81,5	loose	9	S by W	2			
	2. P	29,746	37	89	94	ditto	3	S by W	5			
6	5.30 A	29,808	37	82	79,5			S by W	2			(a)
	2. P	29,800	32,1	88	94,5	thin	2	S by W	5			
	8.45 P	29,997	28,5	82,5	78,5	thick thund.	10	NW by W	7			
7	9. P	30,000	32,5	82	72	ditto	10	NW by W	3	.328		
	5.30 A	29,840	31,5	81,5	76,5	thin	8	NNW	1			
	6. A	29,897	40	81	81	thick	5	S by W	1			
8	2.30 A	29,90	32,5	88	94	thick	3	SSW	4			
	10.25 P	D New										
	5.30 A	29,875	44	81,5	80	thin	7	S	1			
9	2. P	29,882	34	88	95,5	thick	6	SW by S	4			
	7. A	29,867	41	82,7	84,6	thin	3	SW by S	3			
10	2. P	29,843	32,5	88	95,5	thick	5	S by W	4			
	7. A	29,810	40	83,3		thick & thin	10					
11	2. P	29,783	31,5	89	97,5	thick scat.	2	SSW	4			
	7.30 P	29,744	35,5	87,5	86,7	thunder	4	SSW	3			(b)
	7.47 P	29,814		87		ditto	9	NW	5			
	7.55 P	29,814	31	87	82	thunder	9	NW	7			
	8.25 P	29,808	35	83	73	ditto	10	NW by W	2	.325		
	9. P	29,754	36	79,5	74	ditto	10	ENE	2			
12	5.40 A	29,718	41	82,5	81	thick	10	S by W	2			
	2.20 P	29,752	32	89	96			SSW	4			
13	7.30 A	29,753	42	85	85	thin	7	S	4			
	2.20 P	29,754	35,5	91,5	98,5	loose	8	S by E	3			(c)
14	5. A	29,785	35	82	78	thick	3	N by W	1			(d)
	5. A	29,797	39	81,9	81,3	thin		E by S	2			
15	2. P	29,765	26	90,5	96			NE	3			
	7.10 P	29,752	24	88,7	88,3	thick thund.	9	W by S	3			(e)
16	6.15 A	29,777	34	83	82,2	thin	2	NE	1			
	8.54 A	D F. Q.										
	2. P	29,740	17,5	89	95,5	thick thund.	4	WNW	2			
Carried forward,											.653	

(a) Much lightning last night, and a mafs in N and NW. from whence we had a blast of wind at 10. P. 8.45 P. Sprinkling rain begun. 9. P. Very heavy thunder; a smart shower just over.

(b) A heavy thunder mafs in NW. and much lightning, with distant thunder. 7.47 P. The wind just changed, and the mafs reached the zenith. 7.55 P. Small rain begun. 8.25 P. Heavy rain over, small rain continues.

(c) A very oppressive heat to-day. The air does not carry off perspiration, and makes the whole body clammy and comfortable.

(d) The heat produced thunder all the afternoon till near 10, with squalls of wind from every quarter in turn, but without rain.

(e) The wind shifted about a quarter of an hour ago.

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Day.	Time.	Barometer.	Hygrometer.	Thermometer.		Clouds.		Wind.		Rain.	May 1785. Miscellaneous.
				In.	Out.	Kind.	Quant.	Quarter.	Force.		
17	6.15 A	29,810	32,5	80,5	80,7	thick	7	Brought forward,		0,635	
	2.15 P	29,785	25	89,5	98,5			ENE	2		
18	7.30 A	29,868	37,5	82	84,5	loose	3	SW by W	4		(f)
	10.30 A	29,895	36	85,8	87,7	thunder	10	E by S	3	,057	(g)
	11.5 A	29,886	36	81,7	78	ditto	10	SSW	4		
	2.20 P	29,813	38	85	90	thick & thin	4	ENE	3	,558	
	7.10 A	29,850	37,0	80	78,5	ditto	5	SE	3		
19	2.15 P	29,763	30	85,7	94,5	scat. hard	2	NW by W	3	,003	(b)
	7.5 A	29,713	36	83,5	85,3			WSW	3		
22	2.10 P	29,677	28	90	95,5			NE	2		(i)
23	7.30 A	29,655	38	84	87	thick	7	E	3		
	2.10 P	29,613	27,5	89,3	95	thin	3	NE by E	2		(k)
	2.10 P	29,613	27,5	89,3	95	thick	6	NW	3		
24	7.55 A	29,563	37	88	92			SW by S	4		
	9.22 A	Full									
	2. P	29,515	22	92,3	101,0	scattered	4	WNW	3		
	6.40 P	29,502	21	91,5	91,5	thunder	8	N	3		(l)
	6.55 P					ditto	8	SSE	5	,240	
25	7.40 A	29,563	21	81,7	80,7	thin & thick	10	S by W	3	,303	(m)
	2. P	29,573	37	90	96	ditto	10	SSW	4		
	8.50 P	29,592	33	80,5	74,8	thu. remains	10	S by E	3	,562	
26	7.50 A	29,640	37,5	81	80	thin uniform	10	E by S	3	,026	(n)
	2.40 P	29,616	35	86,5	93	thin	10	SSW	3		
27	7. A	29,650	45	84	84	thin	10	SSW	3		
28	7.30 P									,336	(o)
	11. P	29,765	40	82	76	thunder	10	W by N	4		
29	8.30 A	29,742	38	84	86,5	scattered	2	SSW	3	,082	
	2.23 P	29,696	39	88,3	92,5	thick	7	SSW	5		
	8.10 P	29,703	43,5	86	86	thunder	10	S	0		
	8.25 P	29,757	43,5	86	86	ditto	10	N by E	1		
30	6.40 A	29,710	47	84	83,5	thin & thick	5	SW by W	2	,173	
	10.40 P	29,663	44	86,5	85,5	thunder	10	SSW	3		(p)
31	7.40 A	29,641	46	86,3	80	ditto	10	ESE	2	,697	(q)
	11.57 A	L.Q.									
	2.20 P	29,590	44	87	93	thick	7	SW	3		
TOTAL IN MAY,										3,690	

(f) The clouds were 6 about 10, but are all gone.

(g) A small thunder shower at 7. P. yielded the water. It came from ENE. 10.30 A. A thunder shower just over of about ten minutes duration. 11.5 A. A very heavy thunder storm just over: it began immediately after last observation.

(b) We had another storm in the night, with a sprinkling of rain.

(i) We had a mass of thunder clouds from NNW last night, without rain. 2.10 P. The heat very oppressive.

(k) We were almost suffocated last night. I could not close my eyes till past 4.

(l) It rains, and there has been distant thunder. 6.55 P. Thunder close and loud; heavy rain.

(m) Between 11 and 12 the storm came on again heavier than before. 2. P. The air does not carry off perspiration, and therefore leaves the body clammy. 8.50 P. At 7 we had a most furious storm from N 8: a torrent of rain, but of short duration; and all has been quiet this hour.

(n) After last observation, it began to rain small rain, which continued some time.

(o) We had in town a very violent northwester, and it reached the gardens, where it produced this rain. 1.11 P. The day has been hot, and the sky covered with thin clouds; since 8 they have collected, and we had much lightning in the WNW, and now the storm has reached us.

(p) Much lightning in the NNE, and distant thunder.

(q) It sprinkled rain soon after last observation, but at 5. A. we had a tremendous thunder-storm.

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Day.	Time.	Barometer.	Hygrometer.	Thermometer.		Clouds.		Wind.		Rain.	April 1785. Miscellaneous.
				In.	Out.	Kind.	Quant.	Quarter.	Force.		
1	7-10 A	29,570	47	84	86,5	thunder	5	SSW	3		(a)
	2.30 P	29,525	37	89	103,0			SSW	3		
	8.40 P	29,612	41	88,5	88	thunder	10	WNW	5		
2	9.15 P	29,637	38	85,2	77	ditto	10	SW $\frac{1}{2}$ W	4		(b)
	7. A	29,585	45	84	85	thick	8	S by E	3	.665	
	2.20 P	29,590	42	84	88	ditto	10	S by E	3		
3	6.40 A	29,565	46	82	83	thin	3	SE	3		
4										.168	(c)
5										.154	(d)
6	8. A	29,592	48	84	87	thick	6	ESE	2		(e)
	7.38 A	D New									
7	8.20 A	29,616	51	83	84,5	thunder	10	SSE	3	.100	(f)
8	8.20 A	29,621	52	83		thick	10	SE by S	4		(g)
	2.20 P	29,580	48	83,5	88	ditto	10	S by E	3	.503	
	8.40 A	29,657	47,5	80	77	thick loose thun.	10	SSW	3	.700	
9	1.50 P	29,625	50	81	79,5	ditto	10	SSE	4	.469	(b)
	8.15 A	29,655	55	83	87	thick cat. loose	5	S by E	4		
	2.15 P	29,617	52,5	83,5	86	ditto	10	S by W	4	.036	
11	7.30 A	29,655	57,5	83	88,5	scattered	4	S by E	3	.056	(k)
	2.20 P	29,633	48,5	88	95	ditto	6	S by E	4		
	7.30 A	29,633	53,0	84	87,5	loose	7	S by E	4		
12	2.23 P	29,580	45,0	86	96	ditto	5	S	4		(i)
	5.35 A	29,593	54	83	82	thin	5	S	2		
	5.25 A	29,500	50	83	81,5	ditto	5	S	2	.478	
14	2.28 A	D F.O.									(l)
15	7.25 A	29,420	51	83,5	82,5	thick & thin	9	NW	3	.006	(m)
	2.20 P	29,367	53	82,5	80,5	thick	10	NW	4	1,317	
	7.40 A	29,472	52,5	80,5	78	thick loose	10	WSW	3	1,700	
16	2.15 P	29,450	53	83	87	thick	10	SW by S	3	.188	(n)
	6.15 A	29,504	55	80	78	ditto	10	SW by S	3	.477	
	6.35 A									1,736	
18	8.15 A	29,630	55	79	75,8	thick loose	10	S by E	3	.200	(o)
	2.15 P	29,581	55	82,5	85	thick	10	S by E	3	.150	
Carried forward,										-10,104	

(a) There was a great deal of thunder last night. About 2 it was most oppressively sultry, being a dead calm. 8.40 P. After excessive lightning in the NW. the mass has reached us, and the storm is begun. 9.15 P. It still rains smartly: the thunder now approaches, but is very far off. This looks more like the rains than any thing we have yet had; and if the wind veer to the south we may reasonably expect them.

(b) Produce of last night's storm. (c) Produce of a thunder-storm at noon. (d) Do. and at noon also.

(e) There wa. a storm at noon, and at dinner time, and the evening was fine.

(f) It has rained this morning with thunder; this water is yesterday's and to day's.

(g) We had rain yesterday, and twice to-day, and this is the produce of all.

(h) It began to blow and thunder and lighten at 12.30, and before 1. A. we had a heavy shower. Ever since it has rained more or less, with much thunder. 1.50 P. It has rained without ceasing, more or less, ever since morning.

(i) We have had a thunder shower from SW.

(k) There was a shower at day-break.

(l) At 6 P. yesterday a heavy shower from NW gave this water: and there was only a sprinkling in town.

(m) There was a small shower about 3, and another about 9 P. 2.20 P. Heavy showers began about 9, and still continue with short intervals.

(n) It has rained ever since last observation; at times only sprinkling, at others smartly; and now moderately. 2.15 P. The rain abated gradually, and ceased before noon.

(o) At 9 P. a thunder storm from the W. brought on rain again, and it continued till morning.

(p) It was running out through the air-hole. How long it had done so I cannot tell; but it rained all day yesterday: drizzling and at times barely perceptible; heavily about 6 P. and drizzling till near day; then hard again; and now it rains smartly, as it did when the water was measured, and there is some in the measure besides. 2.15 P. The rain ceased about 10, and the sun shone at noon.

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Day.	Time.	Barometer.	Hygrometer.	Thermometer.		Clouds.		Wind.		Rain.	June 1785.	Miscellaneous.
				In.	Out.	Kind.	Quant.	Quarter.	Force.			
19	8. A	29,558	58	81,5	84,3	scattered	6	Brought forward,		10,104		
	2.20 P	29,528	52	83	82,8	thick	10	SSW	2	,375		(g)
20	8. A	29,567	50	81,5	84,5	thin & thick	7	W $\frac{1}{2}$ N	2	,156		(r)
	2.10 P	29,520	50	81,3	84,5	ditto	6	S $\frac{1}{2}$ E	4	,332		
21	7.35 A	29,549	53	80	78,5	loose low thick	10	S $\frac{1}{2}$ W	2	,132		(s)
	2.15 P	29,522	48	83	89,7	scattered	5	SW by S	4	,001		
22	7.25 A	29,552	53	81,5	81,5	thick	10	W	2	,007		(t)
	8-11 A	D. Full										
23	2.25 P	29,525	51,5	83	90,5	thick scat.	7	S by W	2			
	8.50 A	29,539	55	82	79,5	loose	10	NW	1	3,250		(v)
	2.20 P	29,521	56,5	82	82,8	loose	10	S	3	,076		
	6.20 P	29,498	56			thick	10	S by E.				
24	6.55 P	29,516	56	83		thick loose low	10	S by E				
	6.20 A	29,510	58,5	81,5	81,5	thin	10	SE	3	1,778		(w)
	11.45 P	29,524	58	82	81	thick scat.	8	SE	3	,068		
25	7.20 A	29,512	59	83	84,5	thick	8	ESE	4			
	2.40 P	29,472	53	83	92,5	thick scat.	5	SSW	2			
26	7.35 A	29,508	56,5	83,5	83,5	thick	7	WNW	2	,073		(x)
	2. P	29,482	52,5	84	87	thick	9	SW	2			
	6.20 P	29,471	56	83	83,5	thick	5	SW by S.	3	,507		
27	7.15 A	29,490	59,5	84	84,5	thick low	10	SSW $\frac{1}{2}$ W	3			(y)
	9. A	29,472	57	81,5	79,5	thick low loose	10	SE	3	1,000		(z)
28	2.15 P	29,428	58,5	83,5	87,5	thick low	10	SW by W	3	,367		
	7.20 A	29,446	56,5	83	86	thick loose gat.		S by W				(aa)
	2.25 P	29,406	51,5	85	91	thick	6	S by W $\frac{1}{2}$ W	3			
30	4-21 P	D L. Q.										
	7. A	29,224	50,5	83	82	thick	8	S $\frac{1}{2}$ W	3	,169		(bb)
										,213		
										18,611		
										7,450		(cc)
TOTAL IN JUNE,										26,061		

(g) Between 10 and 11 P. there was a heavy shower, that produced 2 of this quantity; the rest fell this morning. 2.20 P. A shower just over.

(r) This was the end of the last shower. 2.10 P. A heavy shower about 11 o'clock in the forenoon.

(s) Misty rain. 2.15 P. It cleared soon after last observation.

(t) A shower about 4 o'clock this morning.

(v) About 1 it began to rain in torrents. At $\frac{1}{2}$ past three 2 inches were measured. At 6 $\frac{1}{2}$ this morning a third; the rest fell since, and it still sprinkles. There was excessively heavy thunder, with most vivid lightning, at 3, though but little wind. 2.20 P. Drizzling rain all day. 6.55 P. A sprinkling about 6.55. Distant thunder.

(w) Soon after last observation it began to drizzle, and the mercury rose, but in a short time after fell again. The rain continued till 1 in the morning, and for about two hours was very heavy. 11.45 P. This fell in the course of the day, about 9 and again 2 P.

(x) A small shower at 7 P. yesterday, and another just over. 2 P. A shower in the forenoon, 6.20 P. A shower about 5 P. and the above produced this water.

(y) The night was clear, and stars bright.

(z) It was very gloomy at 9, with much lightning. About midnight it began to rain; towards morning more, and at 6 A. heavily, and ever since smartly, and so it still rains. 2.15 P. It rained till near noon, and is about to rain more.

(aa) The morning has been bright.

(bb) The rain fell about 8 P. last night in a smart shower from SW wind 5. ,213 This rain fell about 6 P. and was heavy for the time it lasted.

(cc) Add this for the overflowing on the 10, 18, 23 and 24, when the garden was all under water.

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Day.	Time.	Barometer.	Hygrometer.	Thermometer.		Clouds.		Wind.		Rain.	July 1855. Miscellaneous.
				In.	Out.	Kind.	Quant.	Quarter.	Force.		
1	2.50 P	29,436	53	85	92	thick	4	E½N	3		
2	7. A	29,483	55.5	83	85	thick	6	E½N	4	.148	(a)
	0.10 P	29,510	47.5	83	84	thick loose low	10	ESE	5		
3	9.20 A	29,512	55.5	83	84	thick loose	6	E½N	6	.300	(b)
	2.20 P	29,480	55.5	83.3	85	ditto	7	S by E	4	.450	
4	8.12 P	29,556	54.5	82	84	thick	10	SW	4	.069	(c)
5	9.30 A	29,586	56.5	83	81.5	thick loose	10	WNW	3	.900	(d)
	2.30 P	29,528	56	82	83	thick hard	10	SW by S	2	.017	
6	6-22 A	∇ New									
	7.10	29,486	57	81	78.5	thick loose	10	NW	2	.923	(e)
	2.45 P	29,415	58	82	80.5	loose	10	SW by S	3	.150	
	7. P					ditto	10	SW	7	.500	
7	6.40 A	29,40	58	81	78.7	ditto	9	SW½S	3	.359	(f)
9										.300	(g)
										.186	
10	8. A	29,60	61	82	84	thin	6	SE	2		
	7. A	29,654	62	82	83.5	thick thund. col.	5	S	4		
	0.15 P				94	ditto	7	S	4		
	2. P	29,610	62	83.5	88.7	thick thund.	8	SSE	4		(b)
11	7.30 A	29,662	59	83	88	thick scat.	8	S½E	2		(i)
12	2.30 P	29,556	56	83.5	90.7	thick	10	SW by S	3	.036	(k)
13	7.30 A	29,516	58	83	82	loose	10	SW by S	2	1,500	(l)
	2.30 P	29,460	58	83	86	thick	10	SSW	3	1,223	
14	6.40 A	29,944	55	81.3	80.7	thick	10	S by W	3	.016	(m)
	7-28 A	∇ F.Q.									
Carried forward,										7,077	

(a) The night very close and suffocating. After 3 in the morning, thunder and lightning, and a little wind with rain made it possible to sleep. 0.10 P. A heavy storm came on, the wind was NE the greatest part of the forenoon, now has changed.

(b) It rained all the afternoon, and till near 8. P. and is about to rain again. 2.20 P. Flying showers, five or six since last observation.

(c) The produce of several drizzling flying showers after last observation.

(d) About 6 it began to rain, and there were .400 at nine. It has rained almost all night, and there were .500 drawn off just now; it still drizzles. The lightning fell close to the bazar, that is about ¼ of a mile from the house, but did not hurt any body.

(e) Rain in the night with lightning. Heavy rain about day-break, and the shower but just over. 2.45 P. Showers all the forenoon, and now set in. 7. P. It has been a very rainy, windy afternoon, and it still continues so.

(f) It has been tempestuous at times, and rained in flying showers all night.

(g) The 7th in the evening. .186 The 8. to 2. P. when it ceased.

(h) It has thundered at a distance.

(i) There was lightning about 10. P. but not any rain.

(k) This rain fell yesterday about 4. P. It has not rained since.

(l) It rained heavily last night about 11, and it has just begun again gently. 2.30 P. The rain continued till past one.

(m) The rain fell in the evening about 6.

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Day.	Time.	Barometer.	Hygrometer.	Thermometer.		Clouds.		Wind.		Rain.	July 1785. Miscellaneous.
				In.	Out.	Kinds.	Quant.	Quarter.	Force.		
15	8.40 P	29.66Q	58.5	83	87	thick	9	Brought forward,		7.077	
16	2.40 P	29.586	54	85	91	thick	10	SW	4	.072	(n)
17	0.45 P	29.553	55	85	92	thick	7	SW by W	3	.184	(o)
18	2.20 P	29.442	54	83.3	85	thick	10	WSW	5	.340	(p)
19	7.20 A	29.468	57	81	78	thick loose	10	SW by W	3	.291	(q)
21	10.20 P	29.596	60.	83	82.5	thin	5	S½E	3	.430	(r)
22	5.20 A	Full									
	6.15 A	29.586	64	82	81	thick loose fog.	9	S	2		
24	7. A	29.682	61	80.9	81	thick	9	E by N	4	.110	(s)
	2.20 P	29.650	55	84	90	thick	3	ENE	2	.3014	
25	5.45 A	29.675	58.5	81	80	thick	3	SSE	2		
26	8.50 A	29.686	54	84	87.5	thick & thin	8	SSW	2		
	2.30 P	29.627	51	85.6	91.5	thick	9	SE by S	3		(t)
	8.25 P	29.636	54	84	80	thick	8	NW by N	2	1.700	
27	7.20 A	29.641	56.5	83	87	thick	5	S	1	0.007	(v)
	2.20 P	29.613	52.5	84	89.5	thunder	10	SE.	4	.025	
28	6.30 A	29.612	58.5	82	84.5	loose	3	S by E	2		
	9.11 A	Full									
29	1.20 P	29.562	52.5	86	91.5	thick	8	ENE	3		
30	8.10 A	29.580	56.5	83.9	87	thick	9	SSE	2		
	2.40 P	29.512	51.5	86.5	93	thick	8	S by W	3		
31	7.15 A	29.528	56	82.3	80.7	thick	9	NE½E	3		
	2. P	29.370	58.5	80	79	thick	10	S	4	.226	(w)
										.016	(x)
										10.392	(y)
										1.700	
										12.092	
TOTAL IN JULY,										12.892	

- (n) This rain fell the 14th. in the night, and not any since.
- (o) Rain yesterday evening, and in the night before 3 o'clock.
- (p) A very tempestuous night, and rain to-day also.
- (q) Sprinkling rain.
- (r) .4 fell on the 19th, the rest yesterday. Not any to-day. The forenoon was foggy and cloudy, very close and hot.
- (s) This fell the day before yesterday. 2.20 P. A thunder shower at 11. Excessively high tide to-day.
- (t) A shower just come on. 8.25 P. Two very heavy showers since 7. P. about which time it began with very heavy thunder from SE, and varied to NW.
- (v) The remainder of last night's storm, which was over when the last observation was entered. 2.20 P. A thunder shower about 12, and it now thunders, and more is coming on.
- (w) It rains hard. The wind has veered all round the compass at least twice since morning, with flying shower of small rain and distant thunder, of deep and heavy sound.
- (x) The wind increased to 8, and blew so for above an hour with rain, of which this is the produce.
- (y) Add this for overflowing on the 26th, and it could not be less.

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Day.	Time.	Barometer.	Hygrometer.	Thermometer.		Clouds.		Wind.		Rain.	August 1785. Miscellaneous.
				In.	Out.	Kind.	Quant.	Quarter.	Force.		
1	6. A	29,490	60	81	79,3	thick	3	S by E	3		
2	6.10 A	29,515	62	81,7	81,3	thin & thick	4	SSW	2	0,005	(a)
	2. P	29,515	57	83,2	88,7	thick thund.	9	SE by S	3		
3	5.40 A	29,561	65	81,5	81,5	thin	2	S by E	2	,715	(b)
	11. A										
4	8. P.	29,544	57	83	83	thick	5	SE by E	2		(c)
5	7.26 A	29,544	60	82,2	80,9	thin	6	SE	2	,719	(d)
	11. P	29,528	64,5	80,9	80,9	thick	6	E by N	2		
6	6.30 A	29,588	62	82,3	80,3	thin	5	SW by S	2	,271	(e)
	11. P	29,588	62	82,3	83	thick	10	W by N	2		
7	8.30 A	29,580	63	82,3	83	thick	10	W by N	2		
	2.15 P	29,520	61,5	83,7	90,2	thick	9	SSE $\frac{1}{2}$ E	3	,066	(f)
	11. P	29,600	64	83,5	81	thick	10	S by W	2	1,000	
8	6. A	29,592	62	80,5	78,5	thick	10	S $\frac{1}{2}$ W	2	,546	(g)
	7.30 A	29,750	63,5	80	79	thick	10	SW	2		(h)
	9.50 P	29,735	64	80	86	thick hard	8	S	2	,293	
10	6.20 A	29,700	64,5	80,5	81	thick	3	S by E	2		
	1.15 P	29,66	58,5	84,3	90,3	thick thund.	6	SSW	3		
11	9. A	29,638	67,5	83	86,3	thick	5	SSW	3		
	2.15 P	29,574	61,5	86	92,5	thunder	7	S by W	3		
12	7.50 A	29,608	66,5	83,6	87,3	thick	8	S $\frac{1}{2}$ E	2		
	2.15 P	29,564	56	86,5	91,5	thunder	10	S $\frac{1}{2}$ W	2	,070	(i)
13	7. A	29,606	65	81,5	82,2	thick	9	WNW	3	,014	(k)
	11-24 A	29,550	63,5	82,8	86,5	thick thund.	10	S by E	2	,400	
	2.15 P	29,550	63,5	82,8	86,5	thick thund.	10	S by E	2	,400	
14	7.45 A	29,544	64	81,5	82	thick	10	NW	2	,196	(l)
	2.20 P	29,466	67	84,5	89,5	thick	8	E $\frac{1}{2}$ N	1		
15	7.45 A	29,498	65	82,7	84	thick	6	SSE	3		
	2. P	29,468	61,5	83,5	86	thick thund.	10	E by N	2	,143	(m)
16	7.45 A	29,528	65	82,8	83,2	thick	5	NE $\frac{1}{2}$ E	3		
	2.15 P	29,460	57,5	85	87,3	thunder	10	NNE	4		(n)
17	7. A	29,472	64	81	80,2	thick loofe	10	NE	2	,475	(o)
	2.10 P	29,493	61,5	84,5	88,2	thick	8	SW by S	5	,025	
18	6.15 A	29,580	63	80,5	78,5	loofe	10	S	3	,583	(p)
Carried forward,										5,521	

- (a) About one P. it rained very heavily in town; and very little here: the quantity is noted. 2. P. Distant thunder.
- (b) This fell in a very short time. In town there was only a sprinkling.
- (c) It was very gloomy in town all the forenoon; and we had two small showers, but not any at the gardens.
- (d) Of the water 5 fell last night, the rest in the forenoon to-day.
- (e) It rained almost the whole day small rain.
- (f) Rain in the forenoon. 11. P. And still raining hard.
- (g) It has rained almost incessantly all night long; and still rains, though it is going off.
- (h) It rains very heavily. The mercury is in a falling state, so that it has been higher.
- (i) This fell in the night about 15. P. and we have had a sprinkling about 11 this forenoon besides.
- (k) This fell about 2 in the morning, with a gust of wind and some lightning. 2.15 P. Two or three thunder showers since 9, and it now thunders.
- (l) Yesterday afternoon and in the night it rained.
- (m) 2. P. Several small showers with thunder.
- (n) 2.15 P. Thunder at a distance.
- (o) Thunder showers yesterday afternoon, and in the night, and rain this morning. 2.10 P. Showers all the forenoon of very small rain, and short duration.
- (p) It has been a very tempestuous night, with frequent showers. It still rains, and the wind was in general 6 and 7 in the night.

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Day.	Time.	Barometer.	Hygrometer.	Thermometer.		Clouds.		Wind.		Rain.	August 1785. Miscellaneous.	
				In.	Out.	Kind.	Quant.	Quarter.	Force.			
								Brought forward,		5,521		
19	6.50 A	29,578	67	83	84	scattered	5	SSW	4	.142	(g)	
	2.30 P	29,564	49	88	90,5	thick	5	SW by W	2			
20	7. A	29,580	63	83	85	thin	9	SW by S	3			
	1.41 P	D. Full										
	2.20 P	29,566	40	90	93	thick	4	SW by W	4			
21	6.10 A	29,576	54	83	80	thick	5	N	1			
	1. P	29,625	52,5	85	85	thunder	10	NE by E	3		(p)	
	2.15 P	29,578	54	84	83	ditto	10	ESE	2	.015		
22	6. A	29,588	58	83	82	thick	9	W by N	1			
	2.15 P	29,556	54	85	90	thick	8	NE by N	4	.052	(i)	
23	6.30 A	29,570	61	83	81	thick thund.	9	N	1	.248	(r)	
	2.15 P	29,576	59	83,5	86,8	thick	8	S $\frac{1}{2}$ E	5	.053		
24	7. A	29,596	60	82	82	thick	7	E by S	3	.030		
	2.15 P	29,598	59,5	84	86	thunder	9	S by E	3	.084	(v)	
25	6.30 A	29,646	62	82,5	81,5	thick & thin	9	S by E	2			
	2.15 P	29,640	55	85	86,5	thick	9	SSW	2			
26	7. A	29,690	61	82,8	83	thin	9	ESE	2			
	2.15 P	29,642	58	84	81,9	thunder	9	S $\frac{1}{2}$ E	2	.186		
27	4.03 A	D L. Q.										
	6.15 A	29,700	61	82,5	80	thin & thick	7	SSE	3	.017	(w)	
	2.25 P	29,688	57,5	84,5	88,9	thick	9	S by E	3	.002		
28	7. A	29,758	61	82,0	80,9	loose	10	SE by E	2	.200	(x)	
29	7. A	29,696	61	81,8	81,8	thick	6	S by E	2	.214	(y)	
30	7.10 A	29,704	63	83	83,2	thin	10	S $\frac{1}{2}$ W by S	2	.055	(z)	
	2.35 P	29,628	58	85,4	88,5	thunder	9	S by W	2			
31	5.30 A	29,610	61	82	80,7	thick loose	10	WNW	1			
	2.25 P	29,600	63	82,5	81	thunder loose	10	WSW	2	1,707	(aa)	
	7. P							Overflow.		1,700	(bb)	
										.338	(cc)	
TOTAL IN AUGUST,										10,661		

(g) Rain about noon yesterday, and after it; and the conclusion of the shower yesterday morning.

(r) 1. P. Thunder at a distance; sprinkling rain began. 2.15 P. Thunder over.

(i) 2.15 P. Rain about 8 A.

(v) Thunder showers since last observation. 2.15 P. Several showers of short duration since last observation. Tides high.

(w) 2.15 P. Several small showers with thunder.

(x) Rain with thunder yesterday afternoon. 2.25 P. A small shower just over.

(y) Rain now falling, and some fell in the afternoon yesterday.

(z) Rain yesterday before sun-set.

(aa) Rain in the night. 2.35 P. It has thundered this forenoon; and being then dead calm, the heat was almost insupportable. 2.25 P. The gage cistern-holds only that quantity; how much fell I know not, but I think as much more.

(bb) The water measured to-day fell in about an hour. To-day I measured the cistern, and it holds only 1,707; and through the air-hole there runs out one-tenth in 40". It is impossible, therefore, to ascertain what did fall to-day; but that it had run out was evident; and from circumstances I judge the quantity was as much as was measured.

(cc) Add 1,700, it could not be less, as there was a great deal of water in the garden: and besides, I know from a canal that its water rose 3,4. Yesterday it was 1,5 below the drain; this afternoon the water ran through the drain two inches deep, and yet only three-tenths of rain fell in the afternoon.

(cc) This fell in the afternoon.

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Day.	Time.	Barometer.	Hygrometer.	Thermometer.		Clouds.		Wind.		Rain.	Sept. 1755. Miscellaneous.
				In.	Out.	Kind.	Quant.	Quarter.	Force.		
1	5.30 A	29,60	68	81,5	80	thick	5	S by W	2		
2	7.40 A	29,70	66,5	82	82,5	thick	5	S	3	,052	(a)
	2.30 P	29,67	68	83,5	85	thick	10	SSE	3	,156	
3	5.30 A	29,712	71	81,5	79,9	thick	3	SSE	1		
	2.20 P	29,700	65	83	86	thick	6	S by W $\frac{1}{2}$ W	3		
4	10.51 P	D New									
	6. A	29,748	69	82	79,9	thin	5	S by W	1		
6	2.20 P	29,730	50,5	85	92	thick	6	S by W	2		
	6.15 A	29,772	55,5	83,5	82	thick scatter.	6	SSW	2		
7	2.25 P	29,734	46,5	88	91	thunder	7	SW by W	4		(b)
	5.40 A	29,720	55	84	82,2	thin & thick	6	SSW	3		
8	2.30 P	29,714	45	87,5	89	thunder	9	SSW	3		(c)
	5.40 A	29,716	55	84	81	thin	3	S by W	2		(d)
9	5.40 A	29,740	55	83	82	thin	3	S $\frac{1}{2}$ W	1		
	2.10 P	29,730	45	87,5	92	thunder	5	SW by W	2		(e)
10	7.30 A	29,820	54	84,8	85	thin & thick	6	S by E	2		(f)
	2.25 P	29,784	48	88	92	thunder	9	SSW	3		
11	7. A	29,782	55,5	83	81,5	thick	9	N by E $\frac{1}{2}$ N	2		
	2. P	29,754	50,5	86	88,5	thunder	10	SW by S	3		(g)
12	1.55 A	D F. Q.									
	6.10 A	29,720	55	83,5	80,2	thunder	6	SW $\frac{1}{2}$ S	2	,582	(h)
13	2.10 P	29,668	53,5	86	92	thick	9	S	2	,185	
	5.55 A	29,650	57	84	82	thick	7	S by W	2		(i)
14	1.20 P	29,592	55	87	93	thick heavy	9	SSE	2		
	7.10 A	29,655	56,5	83,3	81,9	foggy	10	ESE	2	,010	(k)
15	2.10 P	29,608	52	86	89,5	thunder	8	SE by S	4	,002	
	5.50 A	29,600	56,5	82	80	loose	7	E by N	3	,001	(l)
16	7.15 A	29,648	56,5	82	81	thin	4	E by S $\frac{1}{2}$ S	3	,128	(m)
	2. P	29,616	54	84	86	thunder	5	E $\frac{1}{2}$ S	2	,590	
17	8.40 P	29,659	83	82	82	thin	5	SE by E	3	,110	
	6. A	29,630	59	82	80	thin	9	SE by E	2	,003	(n)
	2.25 P	29,628	54	85	82,5	thick	10	E by N $\frac{1}{2}$ N	1	,001	
Carried forward,										1,820	

- (a) A shower about 1 in the morning, with violent wind. 2.30 P. A shower about 10.
 (b) Distant thunder.
 (c) 2.30 P. We had a sprinkling of rain at 11, and some thunder since.
 (d) Yesterday it rained hard at *Dumdum*, and to-day there was a very smart shower in *Calcutta*; only a sprinkling here.
 (e) 2.10 P. Distant thunder, but approaching from the SW to SSE.
 (f) About and until sun-set we had a double rainbow, but the rain was only in scattered drops.
 (g) 2. P. Loud thunder in the NE.
 (h) At $\frac{1}{2}$ past 4 we had heavy rain from the SW. with lightning. 2.10 P. Rain about 9 o'clock.
 (i) A sprinkling just over.
 (k) We had a great deal of thunder last night, sprinkling rain and dead calm till day-break.
 2.10 P. We had two or three sprinklings, and some thunder.
 (l) A sprinkling in the afternoon about 3. P.
 (m) This water fell yesterday, and it did not rain in town. 2. P. At $\frac{1}{2}$ past 12 a very heavy shower gave this water in less than 20 from SE $\frac{1}{2}$ S. 8.40 P. This water fell about sun-set, from which time the sky began to clear.
 (n) This fell in the night. 2.25 P. A sprinkling in the forenoon.

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Day.	Time.	Barometer.	Hygrometer.	Thermometer.		Clouds.		Wind.		Rain.	Sept. 1785. Miscellaneous.
				In.	Out.	Kind.	Quant.	Quarter.	Force.		
18	6. A	29,648	58	81	80,5	loose	8	Brought forward,		1,820	
	7. A	29,664	58	81	80	loose	10	E by N $\frac{1}{2}$ N	2		(o)
	2.20 P	29,613	56	84	85	loose	10	ditto	2		
	9.57 P	D Full						S by E	3	,056	
19	6. A	29,590	59	81	80	thick loose	10	E by S	2	,003	(p)
	2.15 P	29,588	61	83	87,2	thick heavy	10	S by W	2	,002	
20	6. A	29,580	62	81	80	thick loose	10	SE	2	,281	(q)
	2. P	29,576	59	84,5	89	thick	8	S by E	3	,163	
21	7.50 A	29,687	61	81	81,5	thick	9	E by S	4	,387	(r)
	2.25 P	29,666	60,5	84,3	87	thick	10	SE by S	4	,084	
22	6. A	29,754	62	81	79,8	thick	3	E by N	4	,016	(s)
	7. A	29,756	62	80	80,8	thin	4	NE	1	,270	
23	1.30 P	29,728	58	84,7	88,8	thick	6	NW	1		(t)
	8.15 A	29,723	62	83	84,5	thick	9	NW	3		
	2.15 P	29,536	55	86	89,5	thick	8	NNW	3		
25	8.50 A	29,668	58	83	84	thick	5	E by S	4		(v)
	2.15 P	29,83	53	84,3	86	thick	7	ESE	4	,154	
	2.21 P	D L. Q.									
26	8. A	29,666	58	80,8	81,2	thick loose	5	ENE	3	,395	(w)
	2. P	29,608	58	82	84	thick	9	SSE varying to S by W	5	,291	
27	7.45 A	29,641	61	81	81,8	thin	5	SE	3	,018	(x)
	12.25 P	29,573	59	82	81	thick	10	SW	3	,130	
28	7.20 A	29,600	60	81	81	thick	9	SE by S	5	,130	(y)
	2.15 P	29,556	62	83	85,5	thick	10	SSE	5	,009	
29	6.30 A	29,638	63	81	79,5	thick	10	S by E	2	,640	(z)
	6.30 A	29,680	61	78,2	79,9	thick hard	4	SW $\frac{1}{2}$ W	3	,182	(aa)
	12. P									,001	
TOTAL IN SEPTEMBER,										7,032	

(o) 7. A. A small rain. 2.20 P. Rain in the forenoon, several small showers.

(p) This fell yesterday before sun-set. 2.15 P. Rain in a short sprinkling this forenoon.

(q) Rain yesterday evening, and in the night: it still rains scattered large drops. 2. P. Rain in the forenoon.

(r) Rain with thunder at 5. P. again in the night twice, and since day also. 2.25. P. Two or three showers since last observation.

(s) Rain in the afternoon yesterday. Rain twice to-day.

(t) 1.30 P. The wind has varied round and round, though hardly perceptible.

(v) The night was dead calm till about an hour before dawn, and then we had a storm from the NE. with lightning. 2.15 P. A shower just over.

(w) Rain at 4. A. and again at sun-rise. 2. P. Flying showers all the forenoon.

(x) Rain yesterday afternoon. 2.25. P. Several smart showers since last observation.

(y) A very stormy night, with frequent showers. 2.15 P. Two or three showers since morning, but all momentary, and small.

(z) Before 11 o'clock P. we had rain 15. Between 12 and 1 there came on a violent rain, attended with thunder, lightning, and wind, which varied round and round; it produced 1,25; before three 1,20, and the rest since. It still lowers, and threatens.

(aa) Several showers yesterday, and one in the night. 12. P. A sprinkling to-day.

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Day.	Time.	Barometer.	Hygrometer.	Thermometer.		Clouds.		Wind.		Rain.	Or. 1785.	Miscellaneous.
				In.	Out.	Kind.	Quant.	Quarter.	Force.			
1	8. A	29.826	58.5	81.2	81.5	thin	4	WNW	2			
	2.10 P	29.770	50	84	87.5	thin	2	W by S	3			
2	7.45 A	29.840	56.5	80.5	80.5			SW 1/2 S	2			
	2.20 P	29.797	37	83	86			WNW	3			
3	6.15 A	29.790	53	80.5	82	thin	7	SW by S	2			
	3.54 P	29.764	46	84	84.5	thunder	5	WNW	3			(a)
4	7.15 A	29.845	54	81	80	thick scat.	4	NW	2			
	2.20 P	29.824	49	84.3	87.3	thick	6	WNW	2			(b)
5	7.30 A	29.875	54	82	81.5	thin	2	SE by S	2			
	2.15 P	29.833	43	86	90.5	thick	6	SSW	2			
6	6.50 A	29.910	52	82	79	thin	1	S	1			
	6. A	29.872	51	82	81.5			SW				
7	7.40 A	29.790	45	86	89.5	thick	6	WNW	2			
	2.30 P	29.858	50	81	78	thunder	8	E 1/2 N	2	.332		(c)
8	7.15 A	29.858	50	81	78	thick thund.	8	NE	2			
	2.30 P	29.773	45	85	88.5	thick	3	NE	2	.335		(d)
9	6. A	29.86	52	80.5	78	thick	3	S by E	3	.268		
	2.25 P	29.799	50	81.7	87.5	thunder	9		3	.455		
10	10.30 P	29.873	55	78.2	75.5	thick	4	ENE	2	.002		(e)
	5.35 A	29.907	56	80.5	78.6	thick scat.	7	E	2			
11	6.15 A	29.863	52	84	88.5	thick	6	NNE	3			
	2.46 P	29.902	55	81.2	81	thin	2	W 1/2 N	1			(f)
12	7.15 A	29.902	47	84.3	87.5	thick	6	NW	1			
	2.25 P	29.868	47	84.3	87.5	thick	6	NW 1/2 W	2			
13	6.30 A	29.900	53	81.5	79	thin	2	W by S	2			
	7. A	29.894	53	81.5	80							
14	2.20 P	29.848	46	84	88.9	thick	8	WNW	2			
	7. A	29.892	53	82	79.9	thunder	3	NW by W	2			(g)
15	2.15 P	29.878	45	86	89	thick thund.	6	NW 1/2 N	3			
	6.45 A	29.848	52	81.5	80	thin	4	N	2			
16	2.25 P	29.897	46	86	88.5	thick	6	N	3			
	Carried forward.										1.391	

- (a) 5.30 P. Rain in the North.
 (b) 2.20 P. Very sultry.
 (c) There was much lightning in the North, with distant thunder, and at 4 we had a thunder shower.
 (d) A thunder shower about sun-set. 2.25 P. Rain began at 3, and continued till near 9; it came from the NE. with a very sudden change.
 (e) Whether this was rain or dew I do not know.
 (f) At 6.30 A. The thermometer out of doors 78.7.
 (g) Thunder at a distance twice this morning.

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Day.	Time.	Barometer.	Hygrometer.	Thermometer.		Clouds.		Wind.		Rain.	Ozn. 1785.	Miscellaneous.
				In.	Out.	Kind.	Quant.	Quarter.	Force.			
17	6.20 A	29.928	50	80.7	78.2			Brought forward,		1.391		
	2.5 P	29.885	42.5	85	86.5			N by E $\frac{1}{2}$ E				
18	6.46 A) Full						N				(b)
	6.50 A	29.914		79				N				(i)
	2.30 P	29.878		86				N				
19	6.30 A	29.872		79				NNE				
	2.30 P	29.856		86				N				
20	7.30 A	29.900		80		thick	10	N				(k)
	2. P	29.832		86		thin	5	N				
21	8. A	29.92		81.7		thin	3	N Eastly				
	2.30 P	29.864		87.5		thick & scat.	5	N				
22	6.20 A	29.884		78				N				
	2.40 P	29.828		87				NNE				
23	6.20 A	29.892		77.5		thin	4	N				
	2. P	29.864		87		thin	3	NE				
24	7.10 A	29.936		79.5		thin	6	NNE				
	2. P	29.903		85.5		thin	4	NNE				
25	4.45 A) L. Q.										
	6.30	29.913		78.5		thin	4	NE				
	2.10 P	29.900		88		thick scat.	3	N				
26	6.40 A	29.874		80.5		thick & thin	4	NE				(l)
	1. P	29.860		88		thunder	8	SE				
	2.25 P	29.866		86		thunder	9	SE				
	1.40 P					thunder	10	SE				
27	7. A	29.840		78.5		thick loofe	10	NNE			.920	(m)
	2. P	29.780		83		thick	10	NE			.456	
28	7. A	29.724		77		loofe foggy	9	NNE				
30											.084	(n)
31											.012	(o)
TOTAL IN OCTOBER,										2.863		

- (b) 2.5 P. Quitted the gardens this evening.
 (i) First observation in *Calcutta*.
 (k) The clouds began to collect yesterday about 9 A.
 (l) Foggy. 1 P. Distant thunder. 1.25 P. Do. and rain coming on. 1.40 P. Rain began in large drops.
 (m) The rain fell heavily, and continued till about three, and produced the water above at the gardens. It has rained in the night, and I heard it at day-break, and it drizzles now 2 P. Smart rain. This water was measured in the morning.
 (n) Rain at day-break.
 (o) Rain at noon.

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Day.	Time.	Barometer.	Hygrometer.	Thermometer.		Clouds.		Wind.		Rain.	Av. 1785. Miscellaneous.	
				In.	Out.	Kind.	Quant.	Quarter.	Force.			
2	7.15 A	29.947		80		thick	4	N	1			
	9.33 A	D New										
3	2.30 P	29.912		85.5		thick	8	ESE	3			
	8.30 A	29.964		80				N	2	.003	(a)	
4	8.15 A	29.936		79.3		thick	6	NE	3			
	2.30 P	29.840		81.7		thick	8	E	3			
5	9. A	29.924		78.3		thick	10	N	3	.001	(b)	
	2.20 P	29.802		82.3		thick	9	N	2			
6	6.40 A	29.850		78		thick	8	E	1	.019	(c)	
	2.20 P	29.820		81.8		thick	10	NE	1			
7	7.40 A	29.914		78.3		fudged	6	N	2			
	2.15 P	29.900		83		thick	8	NNE	2			
8	7. A	29.932		78.8		thick	10	NE	1		(d)	
	2.10 P	29.881		79.5		thick	10	NE	3			
9	7. A	29.940		74.3		thick	9	N	2	1.000		
	2.10 P	29.896		77		thick	8	NNE	3		(e)	
10	1.43 A	D F. Q.										
	7.40 A	29.936		73		none		N	2			
11	2. P	29.936		77.8		white scat.	3	NW	2			
	7. A	30.022		74				N	2		(f)	
12	2. P	29.988		80		thick white sc.	6	NW	2			
	8. A	30.118		75		thick	3	NNE	2			
13	2.30 P	30.036		79.3		thick	4	NNE	2			
	8. A	30.118		74.3		thick	3	N	3			
14	2. P	30.062		79		scattered	3	N	4			
	7. A	30.082		71				N	3			
15	2.25 P	30.024		78				NNW	3			
	7.35 A	30.005		70.5				NW	3			
Carried forward,										-	1.023	

(a) A small shower at the gardens.

(b) Small rain: the produce at the gardens.

(c) It rained last night, and the water was measured this morning at the gardens. 2.20 P. At noon there was a smart shower of rain.

(d) Very gloomy and about to rain. 2.10 P. It began to rain about 8 o'clock, and it continued till near two. The sky begins to brighten a little.

(e) Yesterday at 3 P. it began to rain, and about 4 P. to blow, and the wind increased to great violence from the N and NE. About 7 P. a blast broke the pipe of the water-gage, at which time there was 0.5 in the cistern; and the quantity that fell afterwards was estimated at 0.5. The rain was heavy at times, and continued till one the next morning.

(f) Thick fog going off.

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Day.	Time.	Barometer.	Hygrometer.	Thermometer.		Clouds.		Wind.		Rain.	Nov. 1785. Miscellaneous.
				In.	Out.	Kind.	Quant.	Quarter.	Force.		
16	6.40 A	29,944		69,7				Brought forward,		1,023	
	4.44 P	D Full						NW	2		
17	7.30 A	29,960		71,3	72,3			NW	2		(g)
	2.20 P	29,96		78,3				N	2		
18	7.45 A	30,036		72,5		thin	3	E	2		(b)
	2.15 P	30,013		78		scattered	4	WNW	2		
19	7.20 A	30,073		72		thick & thin	7	W	2		
	2.10 P	30,023		78,5		thin	4	WNW	3		
20	2.15 P	30,040		77,7		thin	3	NW	3		(i)
21	7.20 A	30,072		71,3		thick	9	N	2		(k)
	2.10 P	30,020		78		thick	6	E	2		
22	6.40 A	30,038		71,5		thick	9	ENE	4		(l)
	1.50 P	30,020		78		scattered	7	ENE	3		
23	7. A	29,986		72	67	thin	3	N	2		
	11.06 P	D Last									
24	8. A	29,976		73		thick	10	NE	3		
	2. P	29,920		79,5		thin	6	N	2		
25	7.30 A	29,942		72		thin	4	N	3		
28	6.20 A				59,7			N	4		(m)
	7.10 A	30,050		66,2	59,3	thin, a stripe in the east		N	4		
	2. P	30,000		73		none		N	3		
29	7.25 A	30,022		66,5	58	none		N	3		(n)
	2.10 P	29,963		75,5				N	3		
30	6.40 A	29,977		66	59			N	3		
	2.30 P	29,940		77,3				NNW	3		
TOTAL IN NOVEMBER,										1,023	

- (g) The thermometer out was in the sun.
 (b) Thin fog.
 (i) This morning was very cold, but I did not observe.
 (k) It rained about three in the morning.
 (l) Very sharp wind abroad.
 (m) One very small cloud. 7.10 A. Foul sky in the West. 2. P. Not a single cloud to be seen; the small stripe went off before 8, and the whole day has been delightfully pleasant.
 (n) Yesterday ended as delightful as it was at noon; and to-day promises to be just as fair and pleasant.

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Day.	Time.	Barometer.	Hygrometer.	Thermometer.		Clouds.		Wind.		Rain. Inches.	Dec. 1785. Miscellaneous.
				In.	Out.	Kinds.	Quant.	Quarter.	Force.		
1	6.45 A	29,988		66,5	61	thin	2	W	2		
	2. P	29,976		78,2		scattered	3	NW	2		
2	2.42 A	D. New									
	7.15 A	29,956		67	62	thin & thick sea.	5	W	2		
3	2. P	29,944		77,5				WNW	4		
	7. A	30,000		69	64	thin	4	WNW	2		
4	2.20 P	29,86		77		thin	4	N	2		
	7. A	30,032		66,4	59			N	2		
5	7. P			65				N	2		(a)
	2. P				74			WNW	2		
6	7.10 A	29,070		68				WSW	2		(b)
7	7. A				67,5			WSW	3		(c)
8	6.40 A				68			WNW	2		
9	6.30 A				52						(d)
	10.46 A	D. F. Q.									
10	2.20 P	30,044		79,5	77,5			WNW	3		
	6.30 A	29,966		57	51						(e)
15	11. P	30,060		58							
16	4.30 A	D. Fall									
	6. A	30,050		53	48,5			NNW	3		
	2. P	30,040		76,3	74,8			W	1		

(a) At Purree Baugh.

(b) Foggy.

(c) Foggy.

(d) At Dundum in tents: thermometer wet with the dew.

(e) Very thick fog.

A METEOROLOGICAL JOURNAL.

Day.	Time.	Barometer.	Hygrometer.	Thermometer.		Clouds.		Wind.		Rain.	Dec. 1785. Miscellaneous.
				In.	Out.	Kind.	Quant.	Quarter.	Force.		
17	6. A	29,977		62	53	thick	8				(f)
	2. P			67	73	thick	5	NW	2		
18	6. A			62		thin	5	NW	2		
19	6. A	29,963		67	52	thin	5	N	2		
	2. P	29,944		78	78	thin	6	N	3		
20	2 20 P	29,976		77	78	thin & thick	6	ENE	3		(g)
21	7. A	30,000		58	53	thick	4	E	3		(b)
	2. P	29,944		78,5	77,5	thick	8	NE	2		
22	6.30 A	30,012		57,8	53			N	2		
	1. P	30,025		79,5	76	thick	9	N	3		
23	7.20 A	30,003	45	64,5	61	none		NNE	2		
	2.35 P	29,965		72	75			NNW	2		(i)
	8.01 P	D L. Q.									
24	7. A	30,024	43	67	60			NW by N	3		
25	6.40 A				59,5			NNE	3		
26	6.30 A				55			NW	2		
27	6.30 A				55			WNW	2		
	2.30 P	29,934			73			WNW	3		
29	8. A	30,088		69	59			NW by W	2		
	2.40 P	30,002		71,2	74,7			WNW	3		
31	6.31 P	D New									

- (f) Last night the wind was South of the West. At the gardens.
 (g) In the morning it was E. 4.
 (b) Excessive fog, but going off.
 (i) At the gardens.

A METEOROLOGICAL JOURNAL.

Day.	Time.	Barometer.	Hygrometer.	Thermometer.		Clouds.		Wind.		Rain.	Jan. 1785.	Miscellaneous.
				In.	Out.	Kind.	Quant.	Quarter.	Force.			
1.	7.	A 30,128		72,5	60			WNW	2			
3	8.	A 30,116		70	63,5			W $\frac{1}{2}$ S	2			()
4	8.	A 30,114		69,7	62,5	thin	5	W by N	2			
	1.10	P 30,064		71,5	74	thin	6	WNW	2			
5	8.48	A 30,144		69,5	66,5	thin	2	NW	3			
6	8.	A 30,212		69	61			N	3			
	2.30	P 30,172		75,5	75			N $\frac{1}{2}$ W	4			
7	8.10	A 30,248		68,5	59			NNW	3			
	6.37	P $\frac{1}{2}$ First										
11	2.	P 30,042		69,5	73,5			N	3			(b)
12	9.	A 30,107		64	61	thin	2	NW	3			
	3.	P 30,004		72	73	thick	3	NW by N	2			
13	8.30	A 30,078		59,5	66,5	none		NW	3			
	2 15	P 29,998		69	73			WNW	2			
14	8.	A 30,124		67,6	57			NW	3			
	2.15	P 30,074		70	72,5			WNW	3			
	6.30	P $\frac{1}{2}$ Full										
15	7.30	A 30,124		66	56,5			NW $\frac{1}{2}$ N	3			
	2.30	P 30,050		70,5	72,3			NW by N	3			
16	6	A			52			NW	3			(c)
	2.20	P			78			NW	3			

- (a) A fog so thick hardly any thing is visible.
 (b) To-day at day-break it was 52 at *Dumdum*.
 (c) Foggy, and piercing by cold.

A METEOROLOGICAL JOURNAL.

Day.	Time.	Barometer.	Hygrometer.	Thermometer.		Clouds.		Wind.		Rain.	Jan. 1786. Miscellaneous.
				In.	Out.	Kind.	Quant.	Quarter.	Force.		
17	6. A				50			NNW	3		
	2. P				79			NW	3		
18	6. A				49			NW	0		(d)
19	7. A	30,040		66,5	56,5			NW	2		(e)
	2.20 P				82			WNW	4		
20	6.30 A				50			W	4		
	2. P				80			W	4		
22	5.42 P	▷ Laft									
23	6. A				47			N	3		(f)
24	6. A				50			ENE	2		
25	6. A				60			S	2		
26	7. A				68			NW	2		
	2. P				84						
27	8. A				64						
	2. P				87			W	1		
29	7 45 A				65			NE	3		(g)
	2.50 P				85			NNE	3		
30	8.00 A	▷ New									
	8.32 A				64	thick feat.	4	WSW	1		(b)
	2.35 P				83			NNE	4		

- (d) Fog, and thermometer wet: the air mild to the feeling.
 (e) Foggy.
 (f) Thermometer wet with dew.
 (g) Thermometer wet with dew.
 (b) Sun eclipsed, going off.

A METEOROLOGICAL JOURNAL.

Day.	Time.	Barometer.	Hygrometer.	Thermometer.		Clouds.		Wind.		Rain.	Feb. 1786. Miscellaneous.
				In.	Out.	Kind.	Quant.	Quarter.	Force.		
1	7.15 A	29.994		72.3	67			SW	2		(a)
2	6.50 A	29.927		69.5	66	thick	3	SSW	3		(b)
3	7.45 A	30.036		67.5	63.5			N by W	3		
	2.30 P	30.009		76	75			NW	4		
4	6.30 A	30.047		67	55			WNW	3		
	2.30 P	30.060		77	75			NW by W	4		
6	2.22 A	∅ First									
	6.40 A	30.100		67	58.5			W	3		
	2.50 P	30.078		78	77			NW	4		
7	7.00 A	30.078		66	57.5			NW $\frac{1}{2}$ N	3		
	3.30 P	30.020		73	77.5			NW $\frac{1}{2}$ N	3		
8	7.15 A	30.068		66	59			NW $\frac{1}{2}$ N	3		
10	6.50 A	30.084		68	58			WNW	3		
	2.40 P	30.087		79	79.3			W by N	3		
11	6.50 A	30.094		69	59			W by N	3		(c)
	2.30 P	30.026		71	80.7			E $\frac{1}{2}$ S	3		
12	7.50 A	30.00		69.3	65.5			N	2		
13	7.30 A	30.00		73.2	68.3			SW by S	2		(d)
	10.35 A	∅ Full									
	2. P	29.956		80.5	81.3			SW	2		
14	5.50 A	29.970		71.5	66			S $\frac{1}{2}$ E	2		(e)

- (a) Excessive fog.
 (b) Thick fog rising into clouds.
 (c) Foggy.
 (d) Excessive fog.
 (e) Excessive fog.

A METEOROLOGICAL JOURNAL.

Day.	Time.	Barometer.	Hygrometer.	Thermometer.		Clouds.		Wind.		Rain.	Feb. 1786. Miscellaneous.
				In.	Out.	Kind.	Quant.	Quarter.	Force.		
15	1.40 P				86	thick	6	S	4		(f)
16	7. A				64	thick	3	ESE	2		(g)
	2.10 P	29,914		76	79,5	thunder	10	SSW	2		
	6. P									,1600	
17	7.50 A	29,952		70,3	64,3	thick	10	SE	5	,4200	(b)
18	7.40 A	29,992		65,5	61,3	thick fcat.	5	NNE	3	,1750	(i)
19	8.10 A	30,02		65	65			WNW	4		
21	7.40 A	29,892		69	65,4			SW $\frac{1}{2}$ S	3		
	2.11 P	Q Laft									
22	6. P	29,882		77	77	thick thund.	7	S	3		(k)
23	8. A	29,970		74	75	thick	10	SSW	3		(l)
24	2.30 P	29,982		76	80,8	thick	6	NW	3	,1800	(m)
25	8. A	30,062		74	73,5			S by E	2		
	2.30 P	30,000		78	82	thick	4	ENE $\frac{1}{2}$ N	2		
26	7.15 A	30,076		73	69,3	thick	10	NNW	2		(n)
	2.30 P	30,066		78,5	80,5	ditto	10	N by E	3		
27	7.10 A	30,095		72,5	70,3	ditto	10	NW	2		
28	2.20 P	30,058		77	85	thunder	6	W	2		(o)
	8.20 P	D New									
TOTAL IN FEBRUARY, 0,936											

- (f) The clouds have been thick 9, and it looked as if it was about to rain.
- (g) Foggy (at Dumdum). 2.10 P. (At the Gardens) thunder coming on and drawing near. 6. P. Rain had began in drops when laft obfervation was made, there was thunder but not any thunder guft.
- (b) It has been a very tempeftuous night with exceffively heavy thunder, and of very long continuance, the thunder fhook the whole houfe feveral times.
- (i) This fell in the laft night.
- (k) The wind has been S.6 the greateft part of the day
- (l) It lightened a good deal till 8 P, and then cleared fuddenly.
- (m) This water fell in a thunder fhower laft night, from the W and NW with much lightning, though but little wind.
- (n) Much lightning in the former part of the night, and a guft of wind from N about 11.
- (o) Very heavy fog this morning, and a mafs forming.

ASIATICK RESEARCHES :
OR,
TRANSACTIONS
OF THE
SOCIETY INSTITUTED IN BENGAL,
FOR INQUIRING INTO THE
HISTORY AND ANTIQUITIES, THE ARTS, SCIENCES, AND LITERATURE,
OF
ASIA.

VOLUME THE SECOND.

ADVERTISEMENT.

IT may greatly conduce to the advancement of useful knowledge, if the learned societies, established in *Europe*, will transmit to the Secretary of the Society in *Bengal* a collection of short and precise queries on every branch of *Asiatick* History, natural and civil, on the Philosophy, Mathematicks, Antiquities, and Polite Literature, of *Asia*, and on eastern Arts, both liberal and mechanick; since it is hoped, that accurate answers may in due time be procured to any questions, that can be proposed on those subjects, which must in all events be curious and interesting, and may prove in the highest degree beneficial to mankind.

I.

THE FOURTH ANNIVERSARY DISCOURSE, DELIVERED 15 FEBRUARY,
1787. See the Works of Sir William Jones, Vol. I. p. 35.

II.

THE FIFTH ANNIVERSARY DISCOURSE, DELIVERED 21 FEBRUARY,
1788. See the Works of Sir William Jones, Vol. I. p. 51.

III.

THE SIXTH ANNIVERSARY DISCOURSE, DELIVERED 19 FEBRUARY,
1789. See the Works of Sir William Jones, Vol. I. p. 73.

IV.

A LETTER FROM THE LATE HENRY VANSITTART, ESQ.
TO THE PRESIDENT.

SIR,

HAVING some time ago met with a *Persian* abridgement, composed by *Maulavi* KHAIRU'DDIN, of the *Afraru'l afaghinab*, or the secrets of the *Afghans*, a book written in the *Pushto* language by HUSAIN, the son of SA'BIR, the son of KHIZR, the disciple of *Hazrat SHA'H KA'SIM Sulaimani*, whose tomb is in *Cbunargur*, I was induced to translate it. Although it opens with a very wild description of the origin of that tribe, and contains a narrative, which can by no means be offered upon the whole as a serious and probable history, yet I conceive, that the knowledge of what a nation suppose themselves to be, may be interesting to a society like this, as well as of what they really are: indeed the commencement of almost every

every history is fabulous ; and the most enlightened nations, after they have arrived at that degree of civilization and importance, which has enabled and induced them to commemorate their actions, have always found a vacancy at their outset, which invention, or at best presumption, must supply. Such fictions appear at first in the form of traditions ; and, having in this shape amused successive generations by a gratification of their national vanity, they are committed to writing, and acquire the authority of history.

As a kingdom is an assemblage of component parts, condensed by degrees, from smaller associations of individuals, to their general union, so history is a combination of the transactions not only of the different tribes, but even of the individuals of the nation, of which it treats : each particular narrative in such a general collection must be summary and incomplete. Biography therefore, as well as descriptions of the manners, actions, and even opinions of such tribes, as are connected with a great kingdom, are not only entertaining in themselves, but useful ; as they explain and throw a light upon the history of the nation.

Under these impressions, I venture to lay before the Society the translation of an abridged history of the *Afghans*, a tribe at different times subject to, and always connected with, the kingdoms of *Persia* and *Hindustàn*. I also submit a specimen of their language, which is called by them *Pukhto* ; but this word is softened in *Persian* into *Pushto*.

I am, Sir,

With the greatest respect,

Your most obedient humble servant,

HENRY VANSITTART.

Calcutta, March 3, 1784.

ON THE DESCENT OF THE AFGHANS FROM THE JEWS.

THE *Afgbàns*, according to their own traditions, are the posterity of MELIC TA'LU'T (king SAUL), who, in the opinion of some, was a descendant of JUDAH, the son of JACOB, and according to others, of BENJAMIN, the brother of JOSEPH.

In a war, which raged between the children of *Israel* and the *Amalekites*, the latter, being victorious, plundered the *Jews*, and obtained possession of the ark of the covenant. Considering this the God of the *Jews*, they threw it into fire, which did not affect it. They afterwards attempted to cleave it with axes, but without success: every individual, who treated it with indignity, was punished for his temerity. They then placed it in their temple, but all their idols bowed to it. At length they fastened it upon a cow, which they turned loose in the wilderness.

When the Prophet SAMUEL arose, the children of *Israel* said to him: "We have been totally subdued by the *Amalekites*, and have no king. Raise to us a king, that we may be enabled to contend for the glory of God." SAMUEL said: "In case you are led out to battle, are you determined to fight?" They answered: "What has befallen us, that we should not fight against infidels? That nation has banished us from our country and children." At this time the Angel GABRIEL descended, and, delivering a wand, said: "It is the command of GOD, that the person whose stature shall correspond with this wand shall be king of *Israel*."

MELIC TA'LU'T was at that time a man of inferior condition, and performed the humble employment of feeding the goats and cows of others. One day a cow under his charge was accidentally lost. Being disappointed in his searches, he was greatly distressed, and applied to SAMUEL, saying, "I have lost a cow, and do not possess the means of satisfying the owner. Pray for me, that I may be extricated from this difficulty." SAMUEL, perceiving that he was a man of lofty stature, asked his name. He answered TA'LU'T. SAMUEL then said: "Measure TA'LU'T with the wand, which the Angel GABRIEL brought." His stature was equal to it. SAMUEL then said: "GOD has raised TA'LU'T to be your king." The children of *Israel* answered; "We are greater than our king. We are men of dignity, and He is of inferior condition. How, shall He be our king?" SAMUEL informed them, they should know, that God had constituted

tuted TA'LU'T their king, by his restoring the ark of the covenant. He accordingly restored it, and they acknowledged him their sovereign.

After TA'LU'T obtained the kingdom, he seized part of the territories of JALU'T, or GOLIAH, who assembled a large army, but was killed by DAVID. TA'LU'T afterwards died a martyr in a war against the infidels; and God constituted DAVID king of the *Jews*.

MELIC TA'LU'T had two sons, one called BERKIA, and the other IRMIA, who served DAVID, and were beloved by him. He sent them to fight against the infidels; and, by GOD'S assistance, they were victorious.

The son of BERKIA was called AFGH'AN, and the son of IRMIA was named USBEC. Those youths distinguished themselves in the reign of DAVID, and were employed by SOLOMON. AFGH'AN was distinguished by his corporal strength, which struck terror into Demons and Genii. USBEC was eminent for his learning.

AFGH'AN used frequently to make excursions to the mountains; where his progeny, after his death, established themselves, lived in a state of independence, built forts, and exterminated the infidels.

When the select of creatures, MUHAMMED, appeared upon earth, his fame reached the AFGH'ANS, who sought him in multitudes under their leaders KHALID and ABDUL RASHID, sons of WALID. The prophet honoured them with the most gracious reception, saying: "Come, O *Muluc*, or Kings;" whence they assumed the title of *Melic*, which they enjoy to this day. The prophet gave them his ensign, and said that the faith would be strengthened by them.

Many sons were born of KHA'LID, the son of WALID, who signalized themselves in the presence of the prophet, by fighting against the infidels. MUHAMMED honoured and prayed for them.

In the reign of Sultan MAHMU'D of *Gbaznab*, eight men arrived, of the posterity of KHA'LID, the son of WALID, whose names were KALUN, ALUN, DAUD, YALUA, AHMED, AWIN, and GHAZI'. The sultan was much pleased with them, and appointed each a commander in his army. He also conferred on them the offices of *Vazir*, and *Vakili Mutlak*, or Regent of the Empire.

Wherever they were stationed, they obtained possession of the country, built mosques, and overthrew the temples of idols. They increased so much, that the army of MAHMU'D was chiefly composed of *Afghans*. When HERHIND, a powerful prince of *Hindustan*, meditated an invasion of *Gbaznab*, Sultan MAHMU'D dispatched

dispatched against him the descendants of KHA'LID with twenty thousand horse: a battle ensued; the *Afghans* made the attack; and, after a severe engagement, which lasted from daybreak till noon, defeated HERHIND, killed many of the infidels, and converted some to the *Muhammedan* faith.

The *Afghans* now began to establish themselves in the mountains; and some settled in cities with the permission of Sultan MAHMUD. They framed regulations, dividing themselves into four classes, agreeably to the following description. The first is the *pure class*, consisting of those, whose fathers and mothers were *Afghans*. The second class consists of those, whose fathers were *Afghans*, and mothers of another nation. The third class contains those, whose mothers were *Afghans*, and fathers of another nation. The fourth class is composed of the children of women, whose mothers were *Afghans*, and fathers and husbands of a different nation. Persons, who do not belong to one of the classes, are not called *Afghans*.

After the death of Sultan MAHMUD they made another settlement in the mountains. SHIHA'BUDDIN Gauri, a subsequent Sultan of *Ghaznah*, was twice repulsed from *Hindustan*. His *Vazir* assembled the people, and asked, if any of the posterity of KHA'LID were living. They answered: "Many now live in a state of independence in the mountains, where they have a considerable army." The *Vazir* requested them to go to the mountains, and by entreaties prevail on the *Afghans* to come; for they were the descendants of companions of the prophet.

The inhabitants of *Ghaznah* undertook this embassy, and, by entreaties and presents, conciliated the minds of the *Afghans*, who promised to engage in the service of the Sultan, provided he would himself come and enter into an agreement with them. The Sultan visited them in their mountains, honoured them, and gave them dresses and other presents. They supplied him with twelve thousand horse, and a considerable army of infantry. Being dispatched by the Sultan before his own army, they took *Debli*, killed *Roy Pabtoura* the king, his ministers and nobles; laid waste the city, and made the infidels prisoners. They afterwards exhibited nearly the same scene in *Canauj*.

The Sultan, pleased by the reduction of those cities, conferred honours upon the *Afghans*. It is said that he then gave them the titles of *Patan* and *Khān*. The word *Patan* is derived from the *Hindi* verb *Paitna*, *to rush*, in allusion to their alacrity in attacking the enemy. The *Patans* have greatly distinguished themselves in the history of *Hindustan*, and are divided into a variety of sects.

The race of *Afghàns* possessed themselves of the mountain of SOLOMON, which is near *Kandabàr*, and the circumjacent country, where they have built forts: this tribe has furnished many kings. The following monarchs of this race have sat upon the throne of *Deblì*: Sultan *Beblòle*, *Afghàn LODÌ*, Sultan SECANDER, Sultan IBRA'HÌM, SHÌR SHA'H, ISLAM SHA'H, ADIL SHA'H SÜR. They also number the following kings of *Gaur*; SOLAIM'AN *Shàh Gurzani*, BAYAZID *Shàh*, and KUTB *Shàh*; besides whom their nation has produced many conquerors of provinces. The *Afghàns* are called *Solaimànì*, either because they were formerly the subjects of SOLOMON, king of the *Jews*, or because they inhabit the mountain of SOLOMON.

The translation being finished, I shall only add, that the country of the *Afghàns*, which is a province of *Cábul*, was originally called *Rob*, and from hence is derived the name of the *Robillabs*. The city, which was established in it by the *Afghàns*, was called by them *Paisbwer*, or *Paisbòr*, and is now the name of the whole district. The sects of the *Afghàns*, or *Patàns*, are very numerous. The principal are these: *Lodì*, *Lobauni*, *Sür*, *Serwànì*, *Yúsufzibi*, *Bangish*, *Dilazai*, *Khattà*, *Fasìn*, *Kbail*, and *Baloje*. The meaning of *Zibì* is offspring, and of *Kbail*, sect. A very particular account of the *Afghàns* has been written by the late HAFIZ RAHMAT KHAN, a chief of the *Robillabs*, from which the curious reader may derive much information. They are *Muselmans*, partly of the *Sunni*, and partly of the *Shiab* persuasion. They are great boasters of the antiquity of their origin, and reputation of their tribe, but other *Muselmans* entirely reject their claim, and consider them of modern, and even base, extraction. However, their character may be collected from history. They have distinguished themselves by their courage, both singly and unitedly, as principals and auxiliaries. They have conquered for their own princes and for foreigners, and have always been considered the main strength of the army, in which they have served. As they have been applauded for virtues, they have also been reproached for vices, having sometimes been guilty of treachery, and even acted the base part of assassins.

A SPECIMEN OF THE PUSHTO LANGUAGE.

لَسْتُمْ ظَالِمَانِ حَاكِمَانِ
أَوْ كَوْرَ پَشَوْرَ دِرِي وَأَرْهَ يُوْدِي

By the oppression of tyrannical rulers,
Fire, the grave, and *Paisbor*, all three have been rendered equal.

دَسَبَنْتَ وَ پَزْ خَصَتْ دِي رَا غَلِي رَوَا پَت

With respect to prayers enjoined by the *Sunnab*, they are remitted.
It is thus expressed in the reports :

كَأَيُّ أَوْكَادِ يَرْهَ شَهْوِي كَأَيُّ نَكَّةِ هَيْسِ پَرِي نَوِي

If a *man* perform them, it is very laudable. If he do not perform them, it is no crime in him.

مِيرْزَا خَان
اِي مِيرْزَا كَه دَخْوِي بَهْتَرِي نَوِي
دَسَيِّدِ تَغَا وَتْ سَه دِي لَه بَامَنَه

If the disposition be not good, O *Mirza*,
What difference is there between a *Sayyed* and a *Brabman*!

NOTE TO MR. VANSITTART'S PAPER ON THE AFGHANS BEING
DESCENDED FROM THE JEWS. See the *Works of Sir William Jones*,
Vol. I. p. 331.

V.

REMARKS ON THE ISLAND OF HINZUAN, OR JOHANNA. *See the Works of Sir William Jones, Vol. I. p. 485.*

VI.

ON THE BAYA, OR INDIAN GROSS-BEAK. *See the Works of Sir William Jones, Vol. I. p. 543.*

VII.

ON THE CHRONOLOGY OF THE HINDUS. *See the Works of Sir William Jones, Vol. I. p. 281.*

VIII.

ON THE CURE OF THE ELEPHANTIASIS. *See the Works of Sir William Jones, Vol. I. p. 549.*

ON THE CURE OF THE ELEPHANTIASIS, AND OTHER DISORDERS OF THE BLOOD. *See the Works of Sir William Jones, Vol. I. p. 553.*

IX.

ON THE INDIAN GAME OF CHESS. *See the Works of Sir William Jones, Vol. I. p. 521.*

TWO INSCRIPTIONS FROM THE VINDHYA MOUNTAINS, TRANSLATED FROM THE SANSKRIT BY CHARLES WILKINS, ESQ.

FIRST INSCRIPTION,

In a Cavern, called the Grot of the Seven Rishi's, near Gaya.

1. ANANTA VARMA, master of the hearts of the people, who was the good son of Sree SARDOOLA, by his own birth and great virtues classed amongst the principal rulers of the earth, gladly caused this statue of KREESHNA of unfulfilled renown, confirmed in the world like his own reputation, and the image of KANTEEMATEE, to be deposited in this great mountain-cave.

2. Sree SARDOOLA, of established fame, jewel of the diadems of kings, emblem of time to the martial possessors of the earth, to the submissive the tree of the fruit of desire, a light to the Military Order, whose glory was, not founded upon the feats of a single battle, the ravisher of female hearts, and the image of SMARA †, became the ruler of the land.

3. Wherever Srēe SARDOOLA is wont to cast his own discordant sight towards a foe, and the fortunate star, his broad eye is enflamed with anger between its expanded lids, there falleth a shower of arrows from the ear-drawn string of the bow of his son, the renowned ANANTA VARMA, the bestower of infinite happiness.

SECOND INSCRIPTION,

In a Cave behind Nagarjeni.

1. THE auspicious Srēe YAJNA VARMA, whose movement was as the sportive elephant's in the season of lust, was, like MANOO †, the appointer of the military

* RADHA, the favourite Mistress of KREESHA.

† KAMA DEVA the Cupid of the Hindus.

‡ The first legislator of the Hindus.

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station of all the chiefs of the earth.—By whose divine offerings, the God with a thousand eyes * being constantly invited, the emaciated *Powlomēē* †, for a long time, sullied the beauty of her cheeks with falling tears.

2. ANANTA VARMA by name, the friend of strangers; renowned in the world in the character of valour; by nature immaculate as the lunar beams, and who is the offspring of *Srēē* SARDOOLA:—By him this wonderful statue of BHOOTAPATEE and of DEVEE ‡, the maker of all things visible and invisible and the granter of boons, which hath taken sanctuary in this cave, was caused to be made. May it protect the universe!

3. The string of his expanded bow, charged with arrows and drawn to the extremity of the shoulder, bursteth the circle's centre. Of spacious brow, propitious distinction, and surpassing beauty, he is the image of the moon with an undiminished countenance. ANANTA VARMA to the end! Of form like SMARA § in existence, he is seen with the constant and affectionate standing with their tender and fascinated eyes constantly fixed upon him.

4. From the machine his bow, reproacher of the crying *Kōōrārā* ||, bent to the extreme, he is endued with force; from his expanded virtue he is a provoker; by his good conduct his renown reacheth to afar; he is a hero by whose courting steeds the elephant is disturbed, and a youth who is the seat of sorrow to the women of his foes. He is the director, and his name is ANANTA **.

* *Eēndrā*, a deification of the Heavens.

† The wife of *Eēndrā*.

‡ *Sīrvā*, or *Māhādēvā* and his consort in one image, as a type of the deities, *Genitor* and *Genitrix*.

§ The Hindoo *Cupid*.

|| A bird that is constantly making a noise before rain.

** This word signifies eternal or infinite.

XI.

A DESCRIPTION OF AS'AM BY MOHAMMED CAZIM, TRANSLATED
FROM THE PERSIAN BY HENRY VANSITTART, ESQ.*

AS'AM, which lies to the north-east of *Bengal*, is divided into two parts by the river *Brahmaputra*, that flows from *Kbatà*. The northern portion is called *Uttarcul*, and the southern *Dacsbincul*. *Uttarcul* begins at *Gowabutty*, which is the boundary of his Majesty's territorial possessions, and terminates in mountains inhabited by a tribe called *Meeri Mechmi*. *Dacsbincul* extends from the village *Sidea* to the hills of *Srinagar*. The most famous mountains to the northward of *Uttarcul* are those of *Duleh* and *Landab*; and to the southward of *Dacsbincul* are those of *Namrup* (*Cámrùp?*), situated four days' journey above *Gbergong*, to which the *Rájá* retreated. There is another chain of hills, which is inhabited by a tribe called *Nanac*, who pay no revenue to the *Rájá*, but profess allegiance to him, and obey a few of his orders. But the † *Zemleb* tribe are entirely independent of him, and, whenever they find an opportunity, plunder the country contiguous to their mountains. *Asàm* is of an oblong figure: its length is about 200 standard cofs, and its breadth, from the northern to the southern mountains, about eight days' journey. From *Gowabutty* to *Gbergong* are seventy-five standard cofs; and from thence it is fifteen days' journey to *Kboten*, which was the residence of *Peeran Wifeb* †, but is now called *Ava* §, and is the capital of the *Rájá* of *Pegu*, who considers himself of the posterity of that famous general. The first five days' journey from the mountains of *Cámrùp* is performed through forests, and over hills, which are arduous and difficult to pass. You then travel eastward to *Ava* through a level and smooth country. To the northward is the plain of *Kbatà*, that has been before mentioned as the place from whence the *Brahmaputra* issues, which is afterwards fed by several rivers that flow from the southern mountains of *Asàm*. The principal of

* This account of *Asàm* was translated for the society, but afterwards printed by the learned translator as an appendix to his *Aá'emçiránáb*. It is reprinted here, because our government has an interest in being as well acquainted as possible with all the nations bordering on the *British* territories.

† In another copy this tribe are called *Dyfeb*.

‡ According to *Kbonaemir*, *Peeran Wifeb* was one of the nobles of *Afrasiab*, king of *Turán*, contemporary with *Kaicau*, second prince of the *Kianian* Dynasty. In the *Ferbung* *Jebangeery* and *Borbann Kated* (two Persian dictionaries), *Peeran* is described as one of the *Peblovan* or heroes of *Turán*, and general under *Afrasiab*, the name of whose father was *Wifeb*.

§ This is a palpable mistake. *Kboten* lies to the north of *Himálaya*; and *Pirán Vjab* could never have seen *Ava*.
these

these is the *Dbonec*, which has before occurred in this history. It joins that broad river at the village *Luckeigereb*.

Between these rivers is an island well inhabited, and in an excellent state of tillage. It contains a spacious, clear, and pleasant country, extending to the distance of about fifty cofs. The cultivated tract is bounded by a thick forest, which harbours elephants, and where those animals may be caught, as well as in four or five other forests of *Asàm*. If there be occasion for them, five or six hundred elephants may be procured in a year. Across the *Dbonec*, which is the side of *Gbergong*, is a wide, agreeable, and level country, which delights the heart of the beholder. The whole face of it is marked with population and tillage; and it presents on every side charming prospects of ploughed fields, harvests, gardens, and groves. All the island before described lies in *Dacshincul*. From the village *Selagereb* to the city of *Gbergong* is a space of about fifty cofs, filled with such an uninterrupted range of gardens, plentifully stocked with fruit-trees, that it appears as one garden. Within them are the houses of the peasants, and a beautiful assemblage of coloured and fragrant herbs, and of garden and wild flowers blowing together. As the country is overflowed in the rainy season, a high and broad causeway has been raised for the convenience of travellers from *Salagereb* to *Gbergong*, which is the only uncultivated ground that is to be seen. Each side of this road is planted with shady bamboos, the tops of which meet, and are intertwined. Amongst the fruits which this country produces, are mangoes, plantains, jacks, oranges, citrons, limes, pine-apples, and *punialeb*, a species of *amleb*, which has such an excellent flavour, that every person who tastes it prefers it to the plum. There are also cocoa-nut trees, pepper vines, *areca* trees, and the *sádij**, in great plenty. The sugar-cane excels in softness and sweetness, and is of three colours, red, black, and white. There is ginger free from fibres, and betel vines. The strength of vegetation and fertility of the soil are such, that whatever seed is sown, or slips planted, they always thrive. The environs of *Gbergong* furnish small apricots, yams, and pomegranates; but as these articles are wild, and not assisted by cultivation and engraftment, they are very indifferent. The principal crop of this country consists in rice and *masb* †. *Ades* is very scarce, and wheat and barley are never sown. The silks are excellent, and resemble those of *China*; but they manufacture very few more than are re-

* The *Sádij* is a long aromattick leaf, which has a pungent taste, and is called in *Sanscrit* *Téjapatra*. In our botanical books it bears the name of *Malabathrum*, or the *Indian* leaf.

† *Masb* is a species of grain, and *Ades* a kind of pea.

quired

quired for use. They are successful in embroidering with flowers, and in weaving velvet, and *tautbund*, which is a species of silk of which they make tents and *kenauts* *. Salt is a very precious and scarce commodity. It is found at the bottom of some of the hills, but of a bitter and pungent quality. A better sort is in common use, which is extracted from the plantain tree. The mountains, inhabited by the tribe called *Nanac*, produce plenty of excellent *Lignum Aloes*, which a society of the natives imports every year into *Asàm*, and barter for salt and grain. This evil-disposed race of mountaineers are many degrees removed from the line of humanity, and are destitute of the characteristical properties of a man. They go naked from head to foot, and eat dogs, cats, snakes, mice, rats, ants, locusts, and every thing of this sort which they can find. The hills of *Cámruòp*, *Sidea*, and *Luckigereb*, supply a fine species of *Lignum Aloes*, which sinks in water. Several of the mountains contain musk-deer.

The country of *Uttarcul*, which is on the northern side of the *Brabmaputra*, is in the highest state of cultivation, and produces plenty of pepper and *Areca*-nuts. It even surpasses *Dacshincul* in population and tillage; but, as the latter contains a greater tract of wild forests, and places difficult of access, the rulers of *Asàm* have chosen to reside in it for the convenience of controul, and have erected in it the capital of the kingdom. The breadth of *Uttarcul*, from the bank of the river to the foot of the mountains, which is a cold climate, and contains snow, is various, but is no where less than fifteen cofs, nor more than forty-five cofs. The inhabitants of those mountains are strong, have a robust and respectable appearance, and are of a middling size. Their complexions, like those of the natives of all cold climates, are red and white; and they have also trees and fruits peculiar to frigid regions. Near the fort of *Jum Dereb*, which is on the side of *Gowabutty*, is a chain of mountains, called the country of *Dereng*, all the inhabitants of which resemble each other in appearance, manners, and speech, but are distinguished by the names of their tribes, and places of residence. Several of these hills produce musk, *kataus* †, *bboat* ‡, *peree*, and two species of horses, called *goont* and *tanyans*. Gold and silver are procured here, as in the whole country of *Asàm*, by washing the sand of the rivers. This, indeed, is one of the sources of revenue. It is supposed that

* *Kenauts* are walls made to surround tents.

† *Kataus* is thus described in the *Borbaun Katea*: "This word, in the language of *Rùm*, is a seacow; the tail of which is hung upon the necks of horses, and on the summit of standards. Some say that it is a cow which lives in the mountains of *Kba:à*." It here means the mountain-cow, which supplies the tail that is made into *cowries*, and in *Sanscrit* is called *chámara*.

‡ *Bboat* and *peree* are two kinds of blanket.

12,000 inhabitants, and some say, 20,000, are employed in this occupation; and it is a regulation, that each of these persons shall pay a fixed revenue of a *tollà* * of gold to the *Rájá*. The people of *Asàm* are a base and unprincipled nation, and have no fixed religion. They follow no rule but that of their own inclinations, and make the approbation of their own vicious minds the test of the propriety of their actions. They do not adopt any mode of worship practised either by *Heathens* or *Mohammedans*; nor do they concur with any of the known sects which prevail amongst mankind. Unlike the Pagans of *Hindustàn*, they do not reject victuals which have been dressed by *Muselmans*; and they abstain from no flesh except human. They even eat animals that have died a natural death; but, in consequence of not being used to the taste of ghee, they have such an antipathy to this article, that if they discover the least smell of it in their victuals, they have no relish for them. It is not their custom to veil their women; for even the wives of the *Rájá* do not conceal their faces from any person. The females perform work in the open air, with their countenances exposed, and heads uncovered. The men have often four or five wives each, and publicly buy, sell, and change them. They shave their heads, beards, and whiskers, and reproach and admonish every person who neglects this ceremony. Their language has not the least affinity with that of *Bengal* †. Their strength and courage are apparent in their looks; but their ferocious manners, and brutal tempers, are also betrayed by their physiognomy. They are superior to most nations in corporal force and hardy exertions. They are enterprising, savage, fond of war, vindictive, treacherous, and deceitful. The virtues of compassion, kindness, friendship, sincerity, truth, honour, good faith, shame, and purity of morals, have been left out of their composition. The seeds of tenderness and humanity have not been sown in the field of their frames. As they are destitute of the mental garb of manly qualities, they are also deficient in the dress of their bodies. They tie a cloth round their heads, and another round their loins, and throw a sheet upon their shoulder; but it is not customary in that country to wear turbans, robes, drawers, or shoes. There are no buildings of brick or stone, or with walls of earth, except the gates of the city of *Gbergong*, and some of their idolatrous temples. The rich and poor construct their habitations of wood, bamboos, and straw. The *Rájá* and his courtiers travel in stately

* Eighty *reti*-weights.

† This is an error: young *Bráhmens* often come from *Asàm* to *Nadijá* for instruction, and their vulgar dialect is understood by the *Bengal* teachers.

litters; but the opulent and respectable persons amongst his subjects are carried in lower vehicles, called doolies. *Asàm* produces neither horses*, camels, nor asses; but those cattle are sometimes brought thither from other countries. The brutal inhabitants, from a congenial impulse, are fond of seeing and keeping asses; and buy and sell them at a high price; but they discover the greatest surprize at seeing a camel; and are so afraid of a horse, that if one trooper should attack a hundred armed *Asamians*, they would all throw down their arms and flee; or should they not be able to escape, they would surrender themselves prisoners. Yet, should one of that detestable race encounter two men of another nation on foot, he would defeat them.

The ancient inhabitants of this country are divided into two tribes, the *Asamians* and the *Cultanians*. The latter excel the former in all occupations except war, and the conduct of hardy enterprizes, in which the former are superior. A body-guard of six or seven thousand *Asamians*, fierce as demons, of unshaken courage, and well provided with warlike arms and accoutrements, always keep watch near the *Rájà's* sitting and sleeping apartments; these are his loyal and confidential troops and patrol. The martial weapons of this country are the musquet, sword, spear, and arrow and bow of bamboo. In their forts and boats they have also plenty of cannon, *zerbzen* †, and *ramcbangee*, in the management of which they are very expert.

Whenever any of the *Rájà's*, magistrates, or principal men die, they dig a large cave for the deceased, in which they inter his women, attendants, and servants; and some of the magnificent equipage and useful furniture, which he possessed in his lifetime, such as elephants, gold and silver, *bádcush* (large fans), carpets, clothes, victuals, lamps, with a great deal of oil, and a torch-bearer; for they consider those articles as stores for a future state. They afterwards construct a strong roof over the cave upon thick timbers. The people of the army entered some of the old caves, and took out of them the value of 90,000 rupees, in gold and silver. But an extraordinary circumstance is said to have happened, to which the mind of man can scarcely give credit, and the probability of which is contradicted by daily experience. It is this: All the nobles came to the Imperial General, and declared, with universal agreement, that a golden betel stand was found in one of the caves, that was dug eighty years before, which contained betel-leaf quite green and fresh; but the authenticity of this story rests upon report.

* As the author has asserted that two species of horses, called *goons* and *tanyans*, are produced in *Dering*, we must suppose that this is a different country from *Asàm*.

† Swivels.

Gbergong has four gates, constructed of stone and earth; from each of which the *Rájá's* palace is distant three cofs. The city is encompassed with a fence of bamboo, and within it high and broad causeys have been raised for the convenience of passengers during the rainy season. In the front of every man's house is a garden, or some cultivated ground. This is a fortified city, which encloses villages and tilled fields. The *Rájá's* palace stands upon the bank of the *Degoo*, which flows throughout the city. This river is lined on each side with houses, and there is a small market, which contains no shopkeepers except sellers of betel. The reason is, that it is not customary for the inhabitants to buy provisions for daily use, because they lay up a stock for themselves, which lasts them a year. The *Rájá's* palace is surrounded by a causey, planted on each side with a close hedge of bamboos, which serves instead of a wall. On the outside there is a ditch, which is always full of water. The circumference of the enclosure is one cofs and fourteen jereeb. Within it have been built lofty halls, and spacious apartments for the *Rájá*, most of them of wood, and a few of straw, which are called *chuppers*. Amongst these is a *diwán kábnab*, or publick saloon, one hundred and fifty cubits long, and forty broad, which is supported by sixty-six wooden pillars, placed at an interval of about four cubits from each other. The *Rájá's* seat is adorned with lattice-work and carving. Within and without have been placed plates of brass, so well polished, that when the rays of the sun strike upon them, they shine like mirrors. It is an ascertained fact, that 3000 carpenters and 12,000 labourers were constantly employed in this work, during two years, before it was finished. When the *Rájá* sits in this chamber, or travels, instead of drums and trumpets they beat the * *dból* and *dand*. The latter is a round and thick instrument made of copper, and is certainly the same as the drum †, which it was customary, in the time of the ancient kings, to beat in battles and marches. *

The *Rájá's* of this country have always raised the crest of pride and vain-glory, and displayed an ostentatious appearance of grandeur, and a numerous train of attendants and servants. They have not bowed the head of submission and obedience, nor have they paid tribute or revenue to the most powerful monarch; but they have curbed the ambition, and checked the conquests, of the most victorious princes of *Hindustán*. The solution of the difficulties attending a war against them, has baffled the penetration of heroes, who have been styled conquerors of the world. Whenever an invading army has entered their territories, the *Asamians* have covered

* The *dból* is a kind of drum, which is beaten at each end.

† This is a kind of kettle-drum, and is made of a composition of several metals,

themselves

themselves in strong posts, and have distressed the enemy by stratagems, surprises, and alarms, and by cutting off their provisions. If these means have failed, they have declined a battle in the field, but have carried the peasants into the mountains, burnt the grain, and left the country empty. But when the rainy season has set in upon the advancing enemy, they have watched their opportunity to make excursions, and vent their rage; the famished invaders have either become their prisoners, or been put to death. In this manner powerful and numerous armies have been sunk in that whirlpool of destruction, and not a soul has escaped.

Formerly HUSAIN SH'AH, a King of *Bengal*, undertook an expedition against *Asàm*, and carried with him a formidable force in cavalry, infantry, and boats. The beginning of this invasion was crowned with victory. He entered the country, and erected the standard of superiority and conquest. The *Rájá* being unable to encounter him in the field, evacuated the plains, and retreated to the mountains. HUSAIN left his son, with a large army, to keep possession of the country, and returned to *Bengal*. The rainy season commenced, and the roads were shut up by the inundation. The *Rájá* descended from the mountains, surrounded the *Bengal* army, skirmished with them, and cut off their provisions, till they were reduced to such straits, that they were all, in a short time, either killed or made prisoners.

In the same manner MOHAMMED *Shàb*, the son of TOGLUC *Shàb*, who was king of several of the provinces of *Hindustàn*, sent a well-appointed army of a hundred thousand cavalry to conquer *Asàm*; but they were all devoted to oblivion in that country of enchantment; and no intelligence or vestige of them remained. Another army was dispatched to revenge this disaster; but when they arrived in *Bengal*, they were panick-struck, and shrunk from the enterprize; because if any person passes the frontier into that district, he has not leave to return. In the same manner, none of the inhabitants of that country are able to come out of it, which is the reason that no accurate information has hitherto been obtained relative to that nation. The natives of *Hindustàn* consider them as wizzards and magicians, and pronounce the name of that country in all their incantations and counter-charms. They say, that every person who sets his foot there, is under the influence of witchcraft, and cannot find the road to return.

JEIDEJ SING *, the *Rájá* of *Asàm*, bears the title of *Swerg*, or *Celestial*. *Swerg*,

* Properly *Jayadr-waja Sinha*, or the *Lion with Banners of Conquest*.

in the *Hindustani* language, means heaven. That frantick and vain-glorious prince is so excessively foolish and mistaken, as to believe that his vicious ancestors were sovereigns of the heavenly host; and that one of them, being inclined to visit the earth, descended by a golden ladder. After he had been employed some time in regulating and governing his new kingdom, he became so attached to it, that he fixed his abode in it, and never returned.

In short, when we consider the peculiar circumstances of *Asam*; that the country is spacious, populous, and hard to be penetrated; that it abounds in perils and dangers; that the paths and roads are beset with difficulties; that the obstacles to the conquest of it are more than can be described; that the inhabitants are a savage race, ferocious in their manners, and brutal in their behaviour; that they are of a gigantick appearance, enterprising, intrepid, treacherous, well armed, and more numerous than can be conceived; that they resist and attack the enemy from secure posts, and are always prepared for battle; that they possess forts as high as heaven, garrisoned by brave soldiers, and plentifully supplied with warlike stores, the reduction of each of which would require a long space of time; that the way was obstructed by thick and dangerous bushes, and broad and boisterous rivers: when we consider these circumstances, we shall wonder that this country, by the aid of GOD, and the auspices of his Majesty, was conquered by the Imperial army, and became a place for erecting the standard of the faith. The haughty and insolent heads of several of the detestable *Asamians*, who stretch the neck of pride, and who are devoid of religion, and remote from GOD, were bruised by the hoofs of the horses of the victorious warriors. The *Muselman* heroes experienced the comfort of fighting for their religion; and the blessings of it reverted to the sovereignty of his just and pious Majesty.

The *Raja*, whose soul had been enslaved by pride, and who had been bred up in the habit of presuming on the stability of his own government, never dreamt of this reverse of fortune; but being now overtaken by the punishment due to his crimes, fled, as has been before mentioned, with some of his nobles, attendants, and family, and a few of his effects, to the mountains of *Camrup*. That spot, by its bad air and water, and confined space, is rendered the worst place in the world, or rather it is one of the pits of hell. The *Raja's* officers and soldiers, by his orders, crossed the *Dhonce*, and settled in the spacious island between that and the *Brahmaputra*, which contains numerous forests and thickets. A few took refuge in other mountains; and watched an opportunity of committing hostilities.

CAMRUP

CA'MR'UP, is a country on the side of *Dacshincul*, situated between three high mountains, at the distance of four days' journey from *Gbergong*. It is remarkable for bad water, noxious air, and confined prospects. Whenever the *Rájá* used to be angry with any of his subjects, he sent them thither. The roads are difficult to pass, infomuch that a foot-traveller proceeds with the greatest inconvenience. There is one road wide enough for a horse; but the beginning of it contains thick forests for about half a cos. Afterwards there is a defile, which is stony and full of water. On each side is a mountain towering to the sky.

The Imperial General remained some days in *Gbergong*, where he was employed in regulating the affairs of the country, encouraging the peasantry, and collecting the effects of the *Rájá*. He repeatedly read the *Khotbeb*, or prayer, containing the name and titles of the Prince of the age, King of Kings, ALEMGEER, Conqueror of the World, and adorned the faces of the coins with the Imperial impression. At this time there were heavy showers, accompanied with violent wind, for two or three days; and all the signs appeared of the rainy season, which in that country sets in before it does in *Hindustán*. The General exerted himself in establishing posts, and fixing guards, for keeping open the roads and supplying the army with provisions. He thought now of securing himself during the rains, and determined, after the sky should be cleared from the clouds, the lightning cease to illuminate the air, and the swelling of the water should subside, that the army should again be set in motion against the *Rájá* and his attendants, and be employed in delivering the country from the evils of their existence.

The Author then mentions several skirmishes, which happened between the *Rájá's* forces and the Imperial troops, in which the latter were always victorious. He concludes thus:

At length all the villages of *Dacshincul* fell into the possession of the Imperial army. Several of the inhabitants and peasants, from the diffusion of the fame of his Majesty's kindness, tenderness, and justice, submitted to his government, and were protected in their habitations and property. The inhabitants of *Uttarcul* also became obedient to his commands. His Majesty rejoiced, when he heard the news of this conquest, and rewarded the General with a costly dress, and other distinguishing marks of his favour.

The Narrative to which this is a supplement, gives a concise history of the military expedition into *Asám*. In this description the Author has stopt at a period, when the Imperial troops had possessed themselves of the capital, and were masters
of

of any part of the plain country, which they chose to occupy or over-run. The sequel diminishes the credit of the conquest, by showing that it was temporary, and that the *Rájá* did not forget his usual policy of harassing the invading army during the rainy season: but this conduct produced only the effect of distressing and disgusting it with the service, instead of absolutely destroying it, as his predecessors had destroyed former adventurers. Yet the conclusion of this war is far from weakening the panegyrick which the Author has passed upon the Imperial General, to whom a difference of situation afforded an opportunity of displaying additional virtues, and of closing that life with heroick fortitude, which he had always hazarded in the field with martial spirit. His name and titles were, *Mir JUMLEH, MOAZZIM Kbán, Kbání Kbánán, Sipáhi SA'LA'R.*

REMARK.

The preceding account of the *Ajamians*, who are probably superior in all respects to the *Moguls*, exhibits a specimen of the black malignity and frantick intolerance, with which it was usual, in the reign of AURANGZ'IB, to treat all those whom the crafty, cruel, and avaricious Emperor was pleased to condemn as infidels and barbarians.

XII.

ON THE MANNERS, RELIGION, AND LAWS OF THE CUC'S, OR
MOUNTAINEERS OF TIPRA.

Communicated in Persian by JOHN RAWLINS, Esq.

THE inhabitants of the mountainous districts to the east of *Bengal* give the name of PA'TYA'N to the Being, who created the Universe; but they believe that a Deity exists in every Tree, that the Sun and Moon are Gods, and that, whenever they worship those subordinate divinities, PA'TIYA'N is pleased.

If any one among them put another to death, the Chief of the Tribe, or other persons

persons, who bear no relation to the deceased, have no concern in punishing the murderer; but, if the murdered person have a brother, or other heir, he may take blood for blood; nor has any man whatever a right to prevent or oppose such retaliation.

When a man is detected in the commission of theft or other atrocious offence, the chieftain causes a recompense to be given to the complainant, and reconciles both parties; but the Chief himself receives a customary fine; and each party gives a feast of pork, or other meat, to the people of his respective tribe.

In ancient times it was not a custom among them to cut off the heads of the women, whom they found in the habitations of their enemies; but it happened once, that a woman asked another, why she came so late to her business of sowing grain: she answered, that her husband was gone to battle, and that the necessity of preparing food and other things for him had occasioned her delay. This answer was overheard by a man at enmity with her husband; and he was filled with resentment against her, considering, that, as she had prepared food for her husband for the purpose of sending him to battle against his tribe, so in general, if women were not to remain at home, their husbands could not be supplied with provision, and consequently could not make war with advantage. From that time it became a constant practice, to cut off the heads of the enemy's women; especially, if they happen to be pregnant, and therefore confined to their houses; and this barbarity is carried so far, that if a *Cúcì* assail the house of an enemy, and kill a woman with child, so that he may bring two heads, he acquires honour and celebrity in his tribe; as the destroyer of two foes at once.

As to the marriages of this wild nation; when a rich man has made a contract of marriage, he gives four or five head of *gayáls* (the cattle of the mountains) to the father and mother of the bride, whom he carries to his own house: her parents then kill the *gayáls*, and, having prepared fermented liquors and boiled rice with other eatables, invite the father, mother, brethren, and kindred of the bridegroom to a nuptial entertainment. When a man of small property is inclined to marry, and a mutual agreement is made, a similar method is followed in a lower degree; and a man may marry any woman, except his own mother. If a married couple live cordially together, and have a son, the wife is fixed and irremovable; but, if they have no son, and especially if they live together on bad terms, the husband may divorce his wife, and marry another woman.

They have no idea of heaven or hell, the reward of good, or the punishment of bad actions; but they profess a belief, that, when a person dies, a certain spirit comes and seizes his soul, which he carries away; and that, whatever the spirit promises to give at the instant when the body dies, will be found and enjoyed by the dead; but that, if any one should take up the corse and carry it off, he would not find the treasure.

The food of this people consists of elephants, hogs, deer, and other animals; of which if they find the carcases or limbs in the forests, they dry them and eat them occasionally.

When they have resolved on war, they send spies, before hostilities are begun, to learn the stations and strength of the enemy, and the condition of the roads; after which they march in the night; and two or three hours before daylight, make a sudden assault with swords, lances, and arrows: if their enemies are compelled to abandon their station, the assailants instantly put to death all the males and females, who are left behind, and strip the houses of all their furniture; but, should their adversaries, having gained intelligence of the intended assault, be resolute enough to meet them in battle, and should they find themselves overmatched, they speedily retreat and quietly return to their own habitations. If at any time they see a star very near the moon, they say, 'to-night we shall undoubtedly be attacked by some enemy;' and they pass that night under arms with extreme vigilance. They often lie in ambush in a forest near the path, where their foes are used to pass and repass, waiting for the enemy with different sorts of weapons, and killing every man or woman, who happens to pass by: in this situation, if a leech, or a worm, or a snake should bite one of them, he bears the pain in perfect silence; and whoever can bring home the head of an enemy, which he has cut off, is sure to be distinguished and exalted in his nation. When two hostile tribes appear to have equal force in battle, and neither has hopes of putting the other to flight, they make a signal of pacifick intentions, and, sending agents reciprocally, soon conclude a treaty; after which they kill several head of *gayals*, and feast on their flesh, calling on the Sun and Moon to bear witness of the pacification: but if one side, unable to resist the enemy, be thrown into disorder, the vanquished tribe is considered as tributary to the victors; who every year receive from them a certain number of *gayals*, wooden dishes, weapons, and other acknowledgements of vassalage. Before they go to battle they put a quantity of roasted *álu's* (esculent roots like potatoes)

potatoes) and paste of rice-flour into the hollow of bambu's, and add to them a provision of dry rice with some leathern bags' full of liquor: then they assemble, and march with such celerity, that in one day they perform a journey ordinarily made by letter-carriers in three or four days, since they have not the trouble and delay of dressing victuals. When they reach the place to be attacked, they surround it in the night, and, at early dawn, enter it, putting to death both young and old, women and children; except such as they chuse to bring away captive: they put the heads, which they cut off, into leathern bags; and, if the blood of their enemies be on their hands, they take care not to wash it off. When, after this slaughter, they take their own food, they thrust a part of what they eat into the mouths of the heads, which they have brought away, saying to each of them: 'Eat; quench thy thirst; and satisfy thy appetite: as thou hast been slain by my hand, so may thy kinsmen be slain by my kinsmen!' During their journey, they have usually two such meals; and every watch, or two watches, they send intelligence of their proceedings to their families: when any one of them sends word, that he has cut off the head of an enemy, the people of his family, whatever be their age or sex, express great delight, making caps and ornaments of red and black ropes; then filling some large vessels with fermented liquors, and decking themselves with all the trinkets they possess, they go forth to meet the conqueror blowing large shells, and striking plates of metal, with other rude instruments of musick. When both parties are met they show extravagant joy, men and women dancing and singing together; and, if a married man has brought an enemy's head, his wife wears a head-dress with gay ornaments, the husband and wife alternately pour fermented liquor into each other's mouths, and she washes his bloody hands with the same liquor, which they are drinking: thus they go revelling, with excessive merriment, to their place of abode; and, having piled up the heads of their enemies in the court-yard of their chieftain's house, they sing and dance round the pile; after which they kill some *gayáls* and hogs with their spears, and, having boiled the flesh, make a feast on it, and drink the fermented liquor. The richer men of this race fasten the heads of their foes on a bambu, and fix it on the graves of their parents; by which act they acquire great reputation. He, who brings back the head of a slaughtered enemy, receives presents from the wealthy of cattle and spirituous liquor; and, if any captives are brought alive, it is the prerogative of those chieftains, who were not in the campaign, to strike off the heads of the captives. Their weapons are made
by

by particular tribes; for some of them are unable to fabricate instruments of war.

In regard to their civil institutions; the whole management of their household affairs belongs to their women; while the men are employed in clearing forests, building huts, cultivating land, making war, or hunting game and wild beasts. Five days (they never reckon by months or years) after the birth of a male child, and three days after that of a female, they entertain their family and kinsmen with boiled rice and fermented liquor; and the parents of the child partake of the feast. They begin the ceremony with fixing a pole in the court yard; and, then, killing a *gayál* or a hog with a lance, they consecrate it to their deity; after which all the party eat the flesh and drink liquor, closing the day with a dance and with songs. If any one among them be so deformed, by nature or by accident, as to be unfit for the propagation of his species, he gives up all thought of keeping house, and begs for his subsistence, like a religious mendicant, from door to door, continually dancing and singing. When such a person goes to the house of a rich and liberal man, the owner of the house usually strings together a number of red and white stones, and fixes one end of the string on a long cane, so that the other end may hang down to the ground; then, paying a kind of superstitious homage to the pebbles, he gives alms to the beggar; after which he kills a *gayál* and a hog, and some other quadrupeds, and invites his tribe to a feast: the giver of such an entertainment acquires extraordinary fame in the nation; and all unite in applauding him with every token of honour and reverence.

When a *Cúci* dies, all his kinsmen join in killing a hog and a *gayál*; and, having boiled the meat, pour some liquor into the mouth of the deceased, round whose body they twist a piece of cloth by way of shroud: all of them taste the same liquor as an offering to his soul; and this ceremony they repeat at intervals for several days. Then they lay the body on a stage, and, kindling a fire under it, pierce it with a spit and dry it: when it is perfectly dried, they cover it with two or three folds of cloth; and, enclosing it in a little case within a chest, bury it underground. All the fruits and flowers, that they gather within a year after the burial, they scatter on the grave of the deceased: but some bury their dead in a different manner; covering them first with a shroud, then with a mat of woven reeds, and hanging them on a high tree. Some when the flesh is decayed, wash the bones, and keep them dry in a bowl, which they open on every sudden emergence; and,
fancying

fancying themselves at a consultation with the bones, pursue whatever measures they think proper; alleging, that they act by the command of their departed parents and kinsmen. A widow is obliged to remain a whole year near the grave of her husband; where her family bring her food: if she die within the year, they mourn for her; if she live, they carry her back to her house, where all her relations are entertained with the usual feast of the *Cúci's*.

If the deceased leave three sons, the eldest and the youngest share all his property; but the middle son takes nothing: if he have no sons, his estate goes to his brothers, and, if he have no brothers, it escheats to the chief of the tribe.

NOTE.

A party of *Cúci's* visited the late CHARLES CROFTES, Esq. at *Jáfarabád* in the spring of 1776, and entertained him with a dance: they promised to return after their harvest, and seemed much pleased with their reception.

XIII.

OF THE SECOND CLASSICAL BOOK OF THE CHINESE. See the works of Sir William Jones, Vol. I. p. 365.

A LETTER TO THE PRESIDENT FROM A YOUNG CHINESE.

SIR,

I RECEIVED the favour of your letter dated the 28th March, 1784, by Mr. Cox. I remember the pleasure of dining with you in company with Captain *Blake* and Sir *Josiah Reynolds*; and I shall always remember the kindness of my friends in England.

The

246 A LETTER TO THE PRESIDENT FROM A YOUNG CHINESE.

The *Chinese* book, *Sbi King*, that contains three hundred poems, with remarks thereon, and the work of *Con-fu-tsu*, and his grandson, the *Tai Ho*, I beg you will accept: but to translate the work into *English* will require a great deal of time, perhaps three or four years; and I am so much engaged in business, that I hope you will excuse my not undertaking it.

If you wish for any books or other things from *Canton*, be so good as to let me know, and I will take particular care to obey your orders.

Wishing you health,

I am, Sir,

Your most obedient humble Servant,

WHANG ATONG

A TABLE CONTAINING EXAMPLES, &c.

5th. From	6th. From	7th. From	8th. From	10th. From
تَكْبَرُ arrogance,	كِبْرُ negligence,	غَفْلُ contrition,	كَسْرُ regulation,	نَظْمُ a meeting,
مُتَصَرِّفٌ possessing,	مُتَعَاتِبٌ succeeding another,	مُتَدَرِّجٌ comprehending & comprehended,	مُنْتَظَرٌ expecting,	مُنْتَهَى protecting,
مُتَعَلِّقٌ annexed,	مُتَبَاعِدٌ removed,	مُتَجَلِّدٌ solution,	مُنْتَظَمٌ regulated,	مُنْتَحَكَمٌ confirmed,
تَجَسُّسٌ investigation,	تَدَاوَعٌ mutual search,	مُتَهَلِّجٌ flowing profusely,	مُنْتَهَمٌ solicitude,	مُنْتَهَلٌ independency,
مُتَرَدِّدٌ opposing,	تَحَاجٌّ disputation,		مُتَشَدِّدٌ wearing out,	مُنْتَهَلٌ absolute,
مُتَضَرَّرٌ injured,	مُتَرَاكِبٌ opposing each other,		مُتَخَلِّلٌ depraved,	مُنْتَهَبٌ past,
تَأَمُّلٌ deliberation,	مُتَبَّاسٌ touched,		مُنْتَهَبٌ confidence,	مُنْتَهَبٌ extirpation,
مُتَأَخِّرٌ retarding,			مُنْتَهَبٌ confiding,	مُنْتَهَبٌ studying civility,
			مُنْتَهَبٌ confided,	مُنْتَهَبٌ eradicated,
			مُنْتَهَبٌ auguration,	
تَسْبِيلٌ the act of begging,	تَسَاءَلٌ expostulation,			
مُنْسَائِلٌ or مُنْسَوِّلٌ begging,	مُنْسَائِلٌ begging,			
	مُنْتَهَلٌ portended,			
تَهْنِئَةٌ refreshing with good food,			مُنْتَهَبٌ commencement,	مُنْتَهَبٌ purification,
مُنْتَهَبٌ freeing,	مُنْتَهَبٌ boasting mutually,		مُنْتَهَبٌ beginning,	مُنْتَهَبٌ desiring to be free,
مُنْتَهَبٌ congratulated,			مُنْتَهَبٌ begun,	
تَوَقُّفٌ delay,	تَوَاضَعٌ submission,		مُنْتَهَبٌ union,	مُنْتَهَبٌ residence,
مُنْتَهَبٌ giving countenance,	مُنْتَهَبٌ succeeding another,		مُنْتَهَبٌ approaching,	مُنْتَهَبٌ residing,
مُنْتَهَبٌ expected,	مُنْتَهَبٌ united,		مُنْتَهَبٌ united,	مُنْتَهَبٌ deposited,
تَصَوُّرٌ the act of imagining,	تَجَاوَزٌ excess,	تَوَقُّفٌ submission,	مُنْتَهَبٌ affection,	مُنْتَهَبٌ approbation,
مُنْتَهَبٌ imagining,	مُنْتَهَبٌ exceeding,	تَوَقُّفٌ obeying,	مُنْتَهَبٌ desiring,	مُنْتَهَبٌ exalting himself,
مُنْتَهَبٌ imagined,	مُنْتَهَبٌ received in loan,		مُنْتَهَبٌ desired,	مُنْتَهَبٌ received in loan,
تَعَدِيٌّ violence,	تَلَافِيٌّ prosecution,	تَلَوٌ brightness,	تَلَوٌ conference,	تَلَوٌ the act of petitioning,
مُنْتَهَبٌ transgressing,	تَعَالَى raising on high,	تَعَدِيٌّ contagious,	تَلَوٌ coming to meet,	تَلَوٌ desiring aid to oppose,
مُنْتَهَبٌ met,			تَلَوٌ afflicted,	تَلَوٌ solicited,
تَعْيُنٌ the act of making happy,	تَيَاجَرٌ the act of revolting,	تَيَاجَرٌ submission,	تَيَقُنٌ the act of ascertaining,	تَيَقُنٌ the act of facilitating,
مُنْتَهَبٌ ascertaining,	مُنْتَهَبٌ revolting,	تَيَاجَرٌ obeying,		مُنْتَهَبٌ exploring,
مُنْتَهَبٌ roused,	مُنْتَهَبٌ revolted,			
تَعْيِدٌ application,	تَيَاطَلٌ inflexion,	تَيَاطَلٌ submission,		
مُنْتَهَبٌ wondering,	مُنْتَهَبٌ altering,	تَيَاطَلٌ obeying,		
مُنْتَهَبٌ appointed,				
تَعَصِيٌّ rebellion,	تَعَالَى exaltation,	تَعَالَى expiration of time,	تَقْضِيٌّ sufficiency,	تَقْضِيٌّ appeal for judgment,
مُنْتَهَبٌ wishing,	مُنْتَهَبٌ completing,	مُنْتَهَبٌ coming to a conclusion,	مُنْتَهَبٌ requiring,	مُنْتَهَبٌ enjoying plenty,
مُنْتَهَبٌ wished,			مُنْتَهَبٌ required,	مُنْتَهَبٌ excepted,
تَأْوِيلٌ exposition,				
مُنْتَهَبٌ interpreting,			مُنْتَهَبٌ returning,	مُنْتَهَبٌ taking fright,
مُنْتَهَبٌ translated,			مُنْتَهَبٌ returned,	مُنْتَهَبٌ affrighted,

A TABLE,

Containing Examples of all the different species of Infinitives and Participles that are derived from Trilateral Verbs, in the form in which they are used in the Persian, and in the Language of Hindoostan.

	CONJUGATION 1st.		2d.		3d.		4th.					
	From		From		From		From					
I. With three different radicals, none of them, as فعل	اوي	Infin. فَعَلَ action, Part. act. حَاكِمٌ judging, Part. pas. مَقْتُولٌ slain,	فعل	تَعَصِيرٌ fault, مُصَدِّعٌ importuning, مُكْسَرٌ broken,	فصر	مُخَالَفَةٌ opposition, مُطَابِقٌ conforming, مُنَاسِبٌ connected,	خلف	أُظْهَرٌ demonstration, مُؤَلِّكٌ deftroying, مُطْلَقٌ absolved,	ظهر	هلك	طلق	
II. With the 2d and 3d radicals the same, but none of them, as عَزَّ	اوي	Infin. عَزَّ honor, Part. act. حَاجٌ performing the pilgrimage, Part. pas. مَذْمُومٌ blamed,	عز	تَكَرَّرٌ repetition, مُحَقِّقٌ certifying, مُكْرَرٌ repeated,	كر	مُتَدَبِّعٌ extension, مُتَدَبِّعٌ extending, مُتَدَبِّعٌ opposed,	مد	أُتْرِرَ confirmation, مُعَزَّزٌ honoring, مُعَدَّدٌ prepared,	تر	عز	عد	
III. With for the 1st radical, as اَكَلَ	ادب	Infin. أَكَلَ civility, Part. act. أَكَلَ eating, Part. pas. مَأْكُودٌ taken,	اكل	تَأْدِيبٌ instruction, مُؤَسِّدٌ establishing, مُؤَدَّبٌ well educated,	ادب	مُؤَخَّرٌ procrastination, مُؤَارَفٌ lying contiguous, مُؤَانَسٌ familiarized,	اخر	أُيُنَّارٌ presentment, مُؤَكَّلٌ giving to eat, مُؤَلِّمٌ pained,	اثر	اكل	الهم	
IV. With for the 2d radical, as سَأَلَ	شان	Infin. سَأَلَ condition, Part. act. سَأَلَ interrogating, Part. pas. مَسْئُولٌ fought,	شان	تَأْيِيسٌ mitigation, مُكَلِّمٌ clothed in mail,	لام			مُعَامٌ filled, أُبرَأٌ relief,	فام			
With for the 3d radical, as بَرَأَ	برا	Infin. بَرَأَ relief, cure, Part. act. بَرَأَ creating, Part. pas. مُبرَأٍ freed,	برا	تَهْنِيتٌ congratulation, مُبرَأٍ free, مُهَنَّا congratulated,	هنا			مُؤَبِّئٌ causing to build, مُنْشَأٌ erected,	بنا		نشا	
VI. With و for the 1st radical, as وَضَعَ	وضع	Infin. وَضَعَ situation, Part. act. وَضَعَ arriving, Part. pas. مَوْضِعٌ placed,	وضع	تَوْضِيعٌ concurrence, مُؤَكِّدٌ confirming, مُؤَقِّفٌ affixed,	وقن	مُؤَاطَبَةٌ perseverance, مُؤَافِقٌ agreeing,	وظب	أُجَابٌ necessity, مُؤَجِّبٌ causing, مُؤَجَّدٌ confirmed,	وجب	وجد		
VII. With و for the 2d radical, as قَوْلٌ	قول	Infin. قَوْلٌ speech, Part. act. قَوْلٌ speaking, Part. pas. مُخَوِّفٌ dreaded,	قول	تَطْوِيلٌ prolixity, مُؤَوِّدٌ illuminating, مُطَوَّلٌ extended,	ظولن	مُتَدَوِّمٌ continuation, مُؤَامَمٌ rising against another,	دوم	أُجَازَةٌ permission, مُعْتَمِدٌ continuing, مُجَازٌ permitted,	جوز	قوم	جوز	
VIII. With و for the 3d radical, as سَهَوَ	سهو	Infin. سَهَوَ omission, Part. act. سَهَوَ transgressing, Part. pas. مُدْعَى & مُدْعُوٌ solicited,	سهو	تَرْبِيتٌ education, مُؤَرِّبٌ instructing, مُؤَرَّبٌ instructed,	ربو	مُؤَادَاتٌ interview, مُؤَادَتِي meeting,	لقو	أُنْشَأٌ composition, مُنْشِئٌ a Moonshy, a composer, comp. sing,	نشو	لقو		
IX. With ي for the 1st radical, as يَبِنُ	يقن	Infin. يَبِنُ certainly, Part. act. يَبِنُ prospering, Part. pas. مُيَسَّرٌ favoured by fortune,	يقن	تَيْسِيرٌ the act of facilitating, مُيَسِّرٌ enjoying prosperity,	يسر	مُيَسَّرٌ obtained, تَغْيِيرٌ alteration,	غير	مُغَيِّرٌ the act of changing, مُغَيَّرٌ opposing,	غير	أَضَافٌ relation, مُخَيِّمٌ pitching a tent,	ضيف	خيم
X. With ي for the 2d radical, as سَبَرَ	سبر	Infin. سَبَرَ the act of walking out, Part. act. سَبَرَ inclining, Part. pas. مُتَبَيِّعٌ fold,	سبر	تَغْيِيرٌ alteration, مُخَيَّرٌ choosing, مُغَيَّرٌ changed,	غير			مُضَافٌ annexed,	ضيف			
XI. With ي for the 3d radical, as بَغَى	بغى	Infin. بَغَى injustice, Part. act. بَغَى judging, Part. pas. مُتَبَيِّنٌ determined,	بغى	تَنْدِيبٌ the act of doubling, مُصَلِّيٌ praying, مُتَبَّنٌ doubled,	ثني	مُكَافَأَةٌ compensation, مُتَبَائِفٌ repugnant,	كفي	أُنْهَى the act of announcing, مُنْهِيٌ reporting,	نهى	عَشَى covered over,	عشى	
XII. With for the 1st, and و the 2d radical, as اَوْبٌ	اوب	Infin. اَوْبٌ attract, Part. act. اَوْبٌ troublefome, Part. pas. مَأْوُوفٌ hurt,	اوب	تَأْوِيلٌ explication, مُؤَوِّلٌ explaining, مُؤَوِّلٌ translated,	اول			مُؤَوِّلٌ weighed down,	اود			

A TABLE CONTAINING EXAMPLES, &c.

5th. From		6th. From	7th. From	8th. From	10th. From
<p>تَأْيِدٌ confirmation, مُتَأْيِدٌ confirming, مُتَأْيِسٌ made soft,</p>	<p>ايد ايد ايس</p>				
<p>تَهْيِوُ preparation, مُتَهْيِوٌ preparing, مُتَهْيِاٌ prepared,</p>	<p>هي هي هي</p>				
<p>تَأَخِيُ behaviour of a brother, مُتَأَخِيٌ acting like a brother,</p>	<p>اخو اخو</p>	<p>اِخْوٌ mutual fraternity, مُتَأَخِيٌ behaving mutually like brothers,</p>	<p>اخو اخو</p>	<p>مُتَوَسِّيٌ imitating,</p>	<p>اسو</p>
<p>تَأْيِيٌ caution, مُتَأْيِيٌ cautious,</p>	<p>اني اني</p>				<p>مُسْتَأْيِيٌ waiting with patience,</p>
		<p>مُتَرَايٌ looking at one another,</p>	<p>راي</p>		
<p>تَوَفَّى the act of fulfilling, مُتَوَفِّىٌ giving up life, مُتَوَفِّاٌ deceased,</p>	<p>وفي وفي وفي</p>	<p>تَوَالِيٌ a series of succession, مُتَوَالِيٌ following in succession,</p>	<p>ولي ولي</p>	<p>اِتْقَاٌ abstinence, مُتَقِيٌ abstinent,</p>	<p>وَقِيٌ the act of fulfilling, مُسْتَوْفِيٌ fulfilling,</p>
<p>تَقْوَى superior strength مُتَقَوِيٌ having great strength,</p>	<p>توي توي</p>	<p>تَعَاوَى the act of empowering, مُتَعَاوِيٌ empowering,</p>	<p>توي توي</p>	<p>اِسْتَوَاٌ equality, مُسْتَوِيٌ equal,</p>	<p>سوي سوي</p>
					<p>اِسْتَحْيَاٌ modify, حبي</p>
<p>مُتَوَاوِيٌ collecting together,</p>	<p>اوي</p>			<p>مُتَوَاوِيٌ receiving into his house,</p>	<p>اوي</p>

		CONJUGATION 1st. From		2d. From		3d. From		4th. From		
FROM ARABIC TRILITERAL VERBS.	XIII. With ا for the 1st, and ي the 2d radical, <small>as</small>	ايد	Inf. اَيْدُ strength,	ايد	تَأْيَدُ confirmation,	ايد				
			Part. act. اَيْدٍ potent,	ايد	مُوَيْدٌ confirming,	ايد	مُوَيْدٌ confirming,	ايد		
			Part. paf. مَأْيُوسٌ made desperate,	ايس	مُوَيْدٌ confirmed,	ايد	مُوَيْدٌ confirmed,	ايد		
	XIV. With ا the 3d, and و the 2d radical, <small>as</small>	سوء	Inf. سُوٌّ depravity,	سوء	تَسْوِيَةٌ accusation,	سوء	مَسَايِدٌ evil,	سوء	اِسَاءٌ evil doing,	سوء
			Part. act.						مُسِيٌّ finning,	سوء
			Part. paf.							
	XV. With ا the 3d, and ي the 2d radical, <small>as</small>	جاء	Inf. هَيَّ the act of calling-to eat and drink,	جاء	تَهَيُّةٌ preparation,	جاء				
			Part. act. جَائٍ coming,	جاء	مُهَيِّءٌ preparing,	جاء				
			Part. paf.		مُهَيِّأٌ prepared,	جاء				
	XVI. With ا the 1st, and و the 2d radical,	اخوان	Inf. اَسْوٌ medicine,	اسو	تَأْيِدٌ the act of calling "father,"	اسو	مَوَاحَاةٌ the cultivation of friendship,	اخوان		
Part. act. اَسِيٌّ curing,			اسو	مُوَيْدٌ giving comfort,	اسو			مُوَيْدٌ giving comfort,	اسو	
Part. paf. مَأْسُوٌّ cured,			اسو							
XVII. With ا the 1st, and ي the 3d radical,	ازي	Inf. اَذِيٌّ trouble,	ازي	تَادِيَةٌ performance,	ازي	مَوَازَاةٌ parallelism,	ازي	اِذْيٌ molestation,	ازي	
		Part. act. اَذِيٌّ taking trouble,	ازي	مُوَدِيٌّ performing,	ازي	مَوَازِيٌّ parallel,	ازي	مُوَدِيٌّ molesting,	ازي	
		Part. paf.		مُوَدٌ performed,	ازي					
XVIII. With ا the 2d, and ي the 2d radical, <small>as</small>	راي	Inf. رَايٌ observation,	راي			مَرَايَةٌ diffimulation,	راي	اِرَاةٌ the act of shewing,	راي	
		Part. act. رَائِيٌّ observing,	راي			مَرَايِيٌّ diffembling,	راي			
		Part. paf. مَرِيٌّ observed,	راي							
XIX. With و the 1st, and ي the 2d radical,	وقتي	Inf. وُقِيٌّ protection,	وقتي	تَوْقِيَةٌ the act of protecting,	وقتي	مَوَاقَاةٌ the performance of what is due,	وقتي	اِبْعَاةٌ the performance of what is stipulated,	وقتي	
		Part. act. وَاقِيٌّ protecting,	وقتي	مُوَقِيٌّ powerful,	وقتي	مَوَاقِيٌّ performing,	وقتي	مَوْصِيٌّ making a will,	وقتي	
		Part. paf. مَوْقِيٌّ protected,	وقتي	مَوْصَاٌ directed by a will,	وصي			مَوْقَاٌ performed,	وقتي	
XX. With ي the 1st, and ي the 3d radical,	يدي	Inf. يَدِيٌّ power,	يدي			مِبْيَاةٌ payment out of one's own hand,	يدي			
		Part. act.						مُوَدِيٌّ beneficent,	يدي	
		Part. paf. مَبْدِيٌّ hurt in the hand,	يدي					مُوَدٌ benefited,	يدي	
XXI. With و the 2d, and ي the 3d radical,	قوي	Inf. قُوَّتٌ strength,	قوي	تَقْوِيَةٌ corroboration,	قوي	مَسَاوَاةٌ the act of making equal,	سوي			
		Part. act. قَاوِيٌّ seizing,	قوي	مُعْوِيٌّ strengthening,	قوي	مَسَاوِيٌّ equal,	سوي	مُعْوَدِيٌّ having strong cattle,	قوي	
		Part. paf. مَرْوِيٌّ narrated,	روي	مُعْوَاٌ strengthened,	قوي					
XXII. With ي the 2d and ي the 3d radical, <small>as</small>	حيي	Inf. حَيَاتٌ life,	حيي	تَحْيِيَةٌ salutation,	حيي			اِحْيَاةٌ vivification,	حيي	
		Part. act. حَائٍ living,	حيي	مَحْيِيٌّ saluting,	حيي			مَحْيِيٌّ vivifying,	حيي	
		Part. paf.								
XXIII. With و for the 1st, and ي the 2d radical,	اوي	Inf. اَوِيٌّ vid. gol.								
		Part. act. اَوِيٌّ vid. gol.								
		Part. paf.								
XXIV. With و the 1st, and ي the 3d radical,	واي	Inf. وَايٌ promise,	واي							
		Part. act.								
			Part. paf.							

ADVERTISEMENT.

EXAMPLES of derivatives from Arabick Quadrilaterals rarely occur in the Persian language; and from the 9th, 11th, 12th, and 13th Conjugations of Trilaterals there are none to be met with. I have therefore confined my observations to the nine Conjugations included in the Table. And although particular senses and uses are assigned to each of these by Grammarians (which may be seen in Mr. Richardson's Gram. p. 65), it is at the same time to be observed, that they are nevertheless frequently used in other senses; many of them retaining the simple signification of their primitives: and that every root does not extend through every Conjugation; but that some are used in one form; many in several; none in all.

These observations are applicable to the present subject; and the derivatives of such conjugations as are more frequently used in the Arabick seem also to be more frequently than any other introduced into the Persian.

Where no example of any particular form is to be found in Golius and Meninski I have left a blank in the Table, which may be filled up whenever any can be met with.

With regard to the examples which I have brought to illustrate the following Rules, they are such as came first to hand; and *one* example of an Infinitive or Participle is intended as a representation of the Infinitives and Participles of every species and conjugation. To have attempted a complete system of examples would have carried me far beyond the limits of my present undertaking.

Of ARABICK INFINITIVES.

I. Their Masculine Singulars are used in the Persian as Substantives; and in every respect serve the same purposes, and are subject to the same rules of construction, as Substantives originally Persian.

Ex. 1. governing a sub. fol.

اظہارِ یکگانگی demonstrations of unanimity.

2. agreeing with an ad. fol.

استعجالِ تمام great haste.

3. agreeing with a part. paf. fol.

تحریرِ مستور the said writing.

4. nominatives to verbs,

نظرِ براین بود my view was this.

5. governed

- Ex. 5. governed by verbs, احتظاظوا فریانت he received great delight.
 6. governed by a preposition, بعد از تقدیم مراسم after performing the duties.
 7. united by a conjunction, اقبال و اجلال prosperity and splendor.
 8. rendered definite by اتحادی که در میان بود the union that was,
 affixing ی between.

II. Their Masculine Plurals are used in the Persian as Substantives; and in every respect serve the same purposes, and are subject to the same rules of construction, as Substantives originally Persian.

- Ex. 1. governing a sub. fol. اخلاق مردم the dispositions of men.
 2. agreeing with an ad. fol. افعال نیک good actions.
 3. agreeing with a part. paf. fol. اطوار مسطور the qualifications described.

III. Their Feminine Singulars are used in the Persian as Substantives; and in every respect serve the same purposes, and are subject to the same rules of construction, as Substantives originally Persian.

- Ex. 1. nominatives to verbs, اجازت است there is permission.
 2. governing a sub. fol. معاملات ملک the business of the empire.
 3. agreeing with an ad. fol. مقاتله عظیمه a bloody battle.
 4. agreeing with a part. paf. fol. مکاتبه سر قومه بدوستی a letter written in friendship.

IV. Their Feminine Plurals are used in the Persian as Substantives; and in every respect serve the same purposes, and are subject to the same rules of construction, as Substantives originally Persian.

- Ex. 1. governing a sub. fol. توجهات دوستان the civilities of friends.
 2. agreeing with an ad. fol. معاملات کلی public affairs.
 3. agreeing with a part. paf. fol. تکلیفات مزبور the said burthens.

V. The

Ex. 9. with a preposn. fol. an uncommon construction, *مشتبهل بر مصادقت* containing friendship.

II. Their Masculine perfect Plurals are used in the Persian as Substantives, in the form of the oblique case which terminates in *ین*. But they do not seem to be used in the form of the nominative which terminates in *ون*.

Ex. 1. governed by a sub. going before,

علم اولین و آخرین the knowledge of the moderns and ancients.

قوم مسلمین the sect of the faithful.

III. Their Masculine imperfect Plurals are used in the Persian as Substantives.

Ex. 1. governing a sub. fol. *حکام خال و استقبال* officers of the present and future.

2. agreeing with an ad. fol. *عبار جدید و قدیم* the new and old agents.

IV. Their Feminine Singulars are used in the Persian as Participles, as Substantives, and as Adjectives.

Ex. 1. as a part. act. with a verb fol. *حامله است* she is pregnant.

2. as a sub. governing another fol. *مالکه ملک* queen of the empire.

3. as an ad. qualifying a sub. going before *زن حامله* a pregnant woman.

4. as a sub. qualified by an ad.

following,

مشنقه مهربان kind friend.

5. as a sub. qualified by a part. pas.

following,

صاحبه موصوفه accomplished lady.

V. Their Feminine perfect Plurals are used in the Persian as Substantives expressing things without life.

Ex. 1. governing a sub. fol.

واقعات زمان the incidents of time.

2. agreeing with an ad. fol.

واردات ناگهانی unforeseen events.

OF ARABICK PARTICIPLES PASSIVE.

I. Their Masculine Singulars are used in the Persian as Participles Passive, as Substantives, and as Adjectives.

- Ex. 1. as a part. pas. **جہلکئی ہمت مصروف بران است** the sum of my desire is bestowed on that.
- ظلِ شفقت مہد و دیاد** be the shade of clemency extended.
2. as a sub. governing another fol. it, **مشہودِ ضمیر منیر میگرداند** I make it the perception (i. e. the thing perceived) of your enlightened soul; i. e. I represent it, &c.
- مرغوبِ طبایع** the desire (i. e. the thing desired) of the souls.
3. as an ad. qualifying a sub. going before,
- بندۂ مظلوم** the injured slave.
4. joined with another sub. by a conjunction,
- مقصود و مرام** intention and design.
5. governed by verbs, **خالیقرا محظوظا کردند** make the people glad.
6. nominatives to verbs, **مقصود او شان بر این بود** their intention was this.

II. Their Masculine perfect Plural does not seem to be used in the Persian; either in the form of the nominative or the oblique case.

III. Their Feminine Singulars are used in the Persian as Substantives, and as Adjectives.

- Ex. 1. as a sub. governing another fol. it, **معشوقہ من** my beloved, i. e. the beloved of me.
2. as a sub. agreeing with a part. pas. following,
- معشوقہ مدکبوزہ** the said beloved woman.
3. as an ad. agreeing with a sub. going before,
- والدہ مخدومہ** respected mother.

III. These three forms of Adjectives resembling Participles, form, with a following Substantive having the Article **ال** prefixed to it, compounds corresponding to that of **خوبروي**, which are used in the Persian both as Substantives and Adjectives.

Ex. 1. as a sub. qualified by the
pro. demonstr.

آن حسن الوجه that beauty.

آن قدیم الخدمت that old servant.

2. as a sub. qualified by
an ad. fol.

قدیم الخدمت مذکور the said old servant.

3. as an ad. qualifying a sub.
going before,

مردم قدیم الخدمت a man of long service.

OF PARTICIPLES EXPRESSING THE SENSE OF THEIR PRIMITIVES IN A STRONGER DEGREE.

I. The forms **نصير** **نصار** **نصور** **نصر** **منصار** are Participles which express the sense of their primitives in a stronger degree; and are sometimes used in the Persian as Adjectives.

Ex. 1. agreeing with a sub. going before, **ادویه تناله** a poisonous medicine.

2. agreeing with a verb. fol. **صبور است** he is full of patience.

صريب Is the form of a Participle expressing the sense of the primitive in a less degree; but it does not seem to be used in the Persian.

OF ARABICK SUBSTANTIVES.

I. The Arabick Noun of time and place are frequently employed in the Persian; and the following list exhibits the forms of such as are derived from the first Conjugations of the different species of Trilaterals.

ON THE INTRODUCTION OF
CONJUGATION *ift.*

NOUNS OF TIME AND PLACE FROM TRILITERALS.

	FROM	Roots.
I.	مَكْتَبٌ the time and place of writing,	ك ت ب
II.	مَقَرٌّ a place of rest, residence,	ق ر
III.	مَأْمَنٌ a place of safety,	ا م ن
V.	مَبْدَأٌ the place and time of beginning,	ب د ا
VI.	مَوْضِعٌ place, opportunity,	و ض ع
VII.	مَقَامٌ the place and time of standing,	ق و م
VIII.	مَدْعَاٌ the place or object of desire,	د ع و
X.	مَبِيعٌ the place and time of selling,	ب ي ع
XI.	مَرْمَأٌ the place and time of throwing,	ر م ي
XII.	مَابٌ the place of return, the center,	ا و ب
XV.	مَجِيٌ the time of coming—arrival,	ج ي
XVII.	مَاتَاٌ the place, the way of approaching,	ا ت ي
XVIII.	مَرَاٌ the place of looking, beholding,	ر ا ي
XIX.	مَوْلَاٌ the place of power—and thus Lord, Master, &c.	و ل ي
XXI.	مَهْوَاٌ a place of division—the interval,	ه و ي
XXII.	مَجِيَاٌ the time and place of living,	ح ي
XXIII.	مَأْوَاٌ a place of habitation—refuge,	ا و ي

————— To express the *place* more particularly, *ē* is sometimes added to the common form as مَقْبَرَةٌ a burning place.

I. The

II. The Noun of time and place from the derivative Conjugations is exactly the same with the Participle Passive; and is also used in the Persian.

Ex. 1. a part. Passive from the 10th conjugation,

مستودع deposited—also a place of deposit.

III. The Persian language has terms proper to itself for expressing the Instrument of Action; it does not however reject the use of the Arabick Instrumental Noun which is represented by the forms *مِنْصَرَت* or *مِنْصَرٍ مِّنْصَارٍ*.

Ex. 1. governing another sub. fol.

ببیزان عقل سنجید he weighed in scale of reason.

مفتاح مقصود the key of his intention.

IV. All Arabick proper names, and the names of things, are introduced into the Persian at pleasure.

Ex. *مريم* Mary, *مكة* Mecca, *عين* the eye, *لحم* flesh, *جد* an ancestor, &c. &c.

OF ARABICK ADJECTIVES.

I. Besides the Arabick Participles which we have already observed are used as Adjectives, there is also a plentiful source of real Adjectives formed by affixing *ي* to Substantives of almost every denomination, which are freely introduced into the Persian.

Ex. *انساني* humane, *اراضي* earthly, *مصري* Egyptian, &c. &c.

II. The Masculine Singulars of Arabick Superlatives are used in the Persian both as Substantives and Adjectives:

Ex. 1. as a sub. governing another fol. it, *اسعد زمان* the most fortunate of times.

2. as an ad. qualifying a sub. going before,

در وقت احسن at a most lucky time.

III.

III. The Masculine Plurals of Arabick Superlatives are used in the Persian both as Substantives and Adjectives.

Ex. 1. as a sub. governing another fol. it, اکابر وقت the great men of the age.

2. as an ad. qualifying a sub.

going before,

اشخاص اکابر most illustrious personages.

IV. The Feminine Singulars of Arabick Superlatives are used in the Persian as Adjectives.

Ex. 1. qualifying a sub. going before, دولت عظمیٰ prosperity most great.

V. Arabick Ordinal Numbers are used in the Persian as Adjectives.

Ex. 1. qualifying a sub. going before, باب اول the first chapter.

OF THE FORM OF ARABICK WORDS WHEN USED IN THE PERSIAN.

I. All Arabick Infinitives, Participles, Substantives, and Adjectives, are introduced into the Persian in the form of the nominative, which throws away from the last letter every species of Nunnation (ن) or short vowel (ـِ), which they may possess as Arabick words, and remain without motion: but, when their construction in the Persian requires them to assume the termination of another case, they receive it in the same manner as if they were originally Persian words; with the following exceptions.

1st. When an Arabick word terminating in ی, that must be pronounced as | *, becomes the first Substantive in construction with another Substantive following it, ی is actually changed into ا, to which short ی (ـِ) is afterwards affixed, to shew the construction.

Ex. تهنی in construction becomes تهنای شفاعت as تهنای شفاعت the petition of intercession, and so also مولی دعویٰ مغنی &c.

2d. Feminine Arabick *Substantives* terminating in ة, when introduced into the Persian, change ة, sometimes into ه, and sometimes into ت

* See Richardson's Arabick Gram. p. 109. Canon III.

Ex. محبة friendship, being found written by the same author محبة and محبت

3d. Feminine Arabick *Adjectives* and *Participles* terminating in ة, when introduced into the Persian, always change ة into ه.

Ex. خالصة pure, is always written خالصه as محبت خالصة pure friendship.

4th. Arabick *Participles Plural*, terminating in ين, although introduced into the Persian as *Nominatives*, are originally the oblique case.

Ex. دانایان متقدمین چنین فرمودند the learned ancients thus said.

5th. When an Arabick *Infinitive* is used in the Persian language as an adverb, it is introduced in the form of the Arabick *accusative* without any change.

Ex. اتفاقاً accidentally, &c. &c.

OF ARABICK ADVERBS, PRÉPOSITIONS AND CONJUNCTIONS.

I. Arabick *Adverbs*, *Prepositions*, and *Conjunctions* seem to be introduced into the Persian language at pleasure. Of these Mr. Richardson has made a very useful collection in his Chapter of separate Particles, to which I beg leave to refer; observing at the same time, that a knowledge of such, as are most frequently employed, will easily be acquired from experience without any particular instructions.

OF ARABICK COMPOUNDS.

I. The manner, in which different Arabick parts of speech are employed to form a variety of *Compounded Words* made use of in the Persian, is well explained by Sir William Jones in his Persian Grammar; and with respect to Phrases purely Arabick, and whole sentences, which are often met with in Persian Authors, they require a perfect knowledge of the Arabick language, and do not belong to this place.

OF THE CONSTRUCTION OF ARABICK INFINITIVES, PARTICIPLES, SUBSTANTIVES AND ADJECTIVES.

I. In the Persian language, when Arabick *Adjectives* or *Participles* are made use of to qualify Arabick or Persian *Substantives Singular*, they agree with them in *Gender* and *Number*.

- Ex. 1. an Arabick sub. masc. qualified
by an Arabick part. paf. masc. عاشق مذکور the said lover.
2. an Arabick sub. fem. qualified
by an Arabick part. paf. fem. والدۀ مکرمه respected mother.
3. a Perf. sub. masc. qualified
by an Arabick ad. masc. دوست قدیم an old friend.
4. a Perf. sub. fem. qualified
by an Arabick ad. fem. همشیره عزیزه dear sister.

II. When Arabick Adjectives and Participles are made use of to qualify Arabick and Persian Substantives Masculine and Plural, they remain in the Masculine Singular.

- Ex. 1. an Arab. sub. masc. plur. with
an Arab. part. masc. Sing. حکام مذکور the said officers.
2. a Perf. sub. masc. plur. with an
Arab. part. masc. Sing. برادران مذکور the said brethren.

III. When Arabick Adjectives and Participles are made use of to qualify Arabick or Persian Substantives Feminine and Plural, they are put in the Feminine Singular; and often, though not so properly, in the Masculine Singular.

- Ex. 1. an Arabick sub. fem.
plur. with Arabick part.
Sing. both fem. maf. تکلیفات مذکورہ مذکور the said burthens.
2. a Persian sub. fem.
plur. with Arabick part.
Sing. both fem. and maf. زنان موصوفہ موصوف accomplished women.

IV. An Arabick Substantive, in the Persian, is often rendered definite by a following Arabick Adjective or Participle having the article ال prefixed.

- Ex. a sub. with a part. paf. نبي المختار the prophet elect.

For an account of the Genders of Arabick Words, and of their perfect and imperfect Plurals, I must again refer to Mr. Richardson's Arabick Grammar; and to that of ERPENIUS, where the latter subject is treated at still greater length.

OF THE INTRODUCTION OF THE ARABICK INTO THE LANGUAGE OF HINDOSTAN.

I. All the different species of Infinitives, Participles, Substantives and Adjectives which we have enumerated; and all compounds formed by *Arabick* and *Persian* words, are introduced into the language of *Hindostan*, in the same form, for the same purposes, and with the same freedom as in the *Persian*: submitting themselves to the different rules of regimen and concord, that are peculiar to *that* language; in the same manner as if they were words originally belonging to it. *Arabick* Adverbs, Prepositions, and Conjunctions are also used in the language of *Hindostan*; but I think less frequently than in the *Persian*.

ON THE ASTRONOMICAL COMPUTATIONS OF THE HINDUS.

By SAMUEL DAVIS, Esq.

Bhágapur, 15th Feb. 1789.

IT is, I believe, generally admitted, that inquiries into the astronomy of the *Hindus* may lead to much curious information, besides what relates merely to the science itself; and that attempts to ascertain the chronology of this ancient nation will, as they have hitherto done, prove unsatisfactory, unless assistance be derived from such researches.

The following communication is not expected to contribute towards so desirable a purpose; but, with all its imperfections, it may have the useful effect of awakening the attention of others in this country, who are better qualified for such investigations, and of inciting them to pursue the same object more successfully, by showing that numerous treatises in *Sanscrit* on astronomy are procurable, and that the *Bráhmens* are extremely willing to explain them. As an encouragement to those, who may be inclined to amuse themselves in this way, I can farther venture to declare, from the experience I have had, that *Sanscrit* books in this science are more easily translated than almost any others, when once the technical terms are understood: the subject of them admitting neither of metaphysical reasoning nor of metaphor, but being delivered in plain terms and generally illustrated with examples in practice, the meaning may be well enough made out, by the help of a *Pandit*, through the medium of the *Persian* or the *Hindí* language.

Moreover it does not appear, that skill in the abstruse parts of modern mathematics is indispensably necessary, but that, with as much knowledge of geometry and the circles of the sphere, as it may be supposed most of the members of this society possess, a considerable progress might be made in revealing many interesting particulars, which at present lie hid to *Europeans* in the *Jyótish*, or astronomical, *Sástra*.

The prediction of eclipses and other phenomena, published in the *Hindu Patra*, or almanack, excited my curiosity long ago, to know by what means it was effected; but it was not until lately that I had any means of gratification: I had before this been inclined to think with many others, that the *Bráhmens* possess no more know-
ledge

ledge in astronomy than they have derived from their ancestors in tables ready calculated to their hands, and that few traces of the principles of the science could be found among them; but, by consulting some *Sanscrit* books, I was induced to alter my opinion. To satisfy myself on this subject, I began with calculating, by a modern *Hindu* formula, an eclipse which will happen in next *November*; the particulars of which process, although in some measure interesting, were not sufficient for my purpose, as it yet remained to be learnt, on what grounds some tables used in it were constructed; and for this information I was referred to the *Surya Siddhanta*, an original treatise and reputed a divine revelation. For a copy of the *Surya Siddhanta*, I am indebted to Sir ROBERT CHAMBERS, who procured it among other books at *Benares*; but the obscurity of many technical terms made it some times difficult to be understood even by the *Pandit* I employed, who was by no means deeply versed in the science he professed. By his diligence and through the obliging assistance of Mr. DUNCAN at *Benares*, who procured for me the *Tica* or Commentary, this difficulty was at length surmounted; and a computation of the above-mentioned eclipse, not merely on the principles, but strictly by the rules, of the *Surya Siddhanta*, is what I propose now to present you with, after such preliminary observations as may be necessary to make it intelligible.

I suppose it sufficiently well known, that the *Hindu* division of the ecliptick into signs, degrees, &c. is the same as ours; that their astronomical year is sidereal, or containing that space of time in which the sun, departing from a star, returns to the same; that it commences on the instant of his entering the sign *Aries*, or rather the *Hindu* constellation *Mésba**: that each astronomical month contains as many even days and fractional parts, as he stays in each sign; and that the civil differs from the astronomical account of time only in rejecting those fractions, and beginning the year and month at sunrise, instead of the intermediate instant of the artificial day or night.

Hence arises the unequal portion of time assigned to each month dependant on the situation of the sun's apsis, and the distance of the vernal equinoctial colure from the beginning of *Mésba* in the *Hindu* sphere; and by these means they avoid those errors, which *Europeans*, from a different method of adjusting their calendar by intercalary days, have been subject to. An explanation of these matters would lead me beyond my present intention, which is to give a general account only of the method

* Or, to be more particular, on his entering the *Nacbatra*, or lunar mansion (*Aswini*). There were formerly only twenty-seven *Nachatras*; a 28th (*Abhijit*) has been since added, taken out of the 21st and 22d, named *Utaráshará* and *Sravasá*. These three in their order comprehend 10° , 5° , and $11^{\circ} 40'$ of the Zodiaok: the rest comprehend $13^{\circ} 20'$ each.

by which the *Hindus* compute eclipses, and thereby to show, that a late *French* author was too hafty, in asserting generally that they determine them "by set forms, couched in enigmatical verses, &c. *". So far are they from deserving the reproach of ignorance, which Monf. SONNERAT has implied, that on enquiry, I believe, the *Hindu* science of astronomy will be found as well known now, as it ever was among them, although, perhaps, not so generally, by reason of the little encouragement men of science at present meet with, compared with what they formerly did under their native princes.

It has been common with astronomers to fix on some epoch, from which, as from a radix, to compute the planetary motions; and the ancient *Hindus* chose that point of time counted back, when, according to their motions as they had determined them, they must have been in conjunction in the beginning of *Mésba* or *Aries*, and coeval with which circumstance they supposed the creation. This, as it concerned the planets only, would have produced a moderate term of years compared with the enormous antiquity, that will be hereafter stated; but, having discovered a slow motion of the nodes and apfides also, and taken it into the computation, they found it would require a length of time corresponding with 1955884890 years now expired, when they were so situated, and 2364115110 years more, before they would return to the same situation again, forming together the grand anomalistick period denominated a *Calpa*, and fancifully assigned as the day of BRAHMA'. The *Calpa* they divided into *Manwanteras*, and greater and less *Yugas*. The use of the *Manwantera* is not stated in the *Súrya Siddhánta*, but that of the *Mabà*, or greater *Yug*, is sufficiently evident, as being an anomalistick period of the sun and moon, at the end of which the latter, with her apogee and ascending node, is found, together with the sun, in the first of *Aries*; the planets also deviating from that point, only as much as is their latitude and the difference between their mean and true anomaly.

These Cycles being so constructed, as to contain a certain number of mean solar days, and the *Hindu* system assuming, that at the creation, when the planets began their motions, a right line, drawn from the equinoctial point *Lancà* through the centre of the earth, would, if continued, have passed through the centres of the sun and planets to the first star in *Aries*, their mean longitude for any proposed time afterwards may be computed by proportion. As the revolutions a planet makes in any cycle are to the number of days composing it, so are the days given to its motion in that time; and, the even revolutions being rejected, the fraction, if any, shows its

* See the translation of Monf. SONNERAT'S Voyage.

mean longitude at midnight under their first meridian of *Lancà*: for places east or west of that meridian a proportional allowance is made for the difference of longitude on the earth's surface, called in *Sanscrit* the *Désántara*. The positions of the ap-fides and nodes are computed in the same manner, and the equation of the mean to the true place determined on principles, which will be hereafter mentioned.

The division of the *Mabà Yug* into the *Satya*, *Tréta*, *Dwápar*, and *Calì*, ages, does not appear from the *Súrya Siddhánta* to answer any practical astronomical purpose, but to have been formed on ideas similar to the *golden*, *silver*, *brazen*, and *iron* ages of the *Greeks*. Their origin has however been ascribed to the precession of the equinoxes by those, who will of course refer the *Manwantera* and *Calpa* to the same foundation: either way the latter will be found anomalistick, as has been described, if I rightly understand the following passage in the first section of the *Súrya Siddhánta*, the translation of which is, I believe, here correctly given.

—“Time, of the denomination *Murta* *, is estimated by respirations; six respirations make a *Vicalà*, sixty *Vicalàs* a *Danda*, sixty *Dandas* a *Nacshatra* day, and thirty *Nacshatra* days a *Nacshatra* month. The *Sávan* month is that contained between thirty successive risings of *Súrya*, and varies in its length according to the *Lagna Bhuja*. Thirty *Tit'bi's* compose the *Chándra* month. The *Saura* month is that, in which the sun describes one sign of the zodiack, and his passage through the twelve signs is one year, and one of those years is a *Déva* day, or day of the Gods. When it is day at *Afura* †, it is night with the Gods, and when it is day with the Gods it is night at *Afura*. Sixty of the *Déva* days multiplied by six give the *Déva* year, and twelve hundred of the *Déva* years form the aggregate of the four *Yugas*. To determine the *Saura* years contained in this aggregate, write down the following numbers, 4, 3, 2, which multiply by 10,000; the product 4320000 is the aggregate or *Mabà Yugà*, including the *Sandbi* and *Sandbyansa* ‡. This is divided into four *Yugas*, by reason of the different proportions of *Virtue* prevailing on earth, in the following manner. Divide the aggregate 4320000 by 10,

* This is mean syderal time:—A *Nacshatra*, or syderal day, is the time in which the earth makes a turn upon its axis, or, according to the *Hindus*, in which the stars make one complete revolution. This is shorter than the *Sávan* or solar day, which varies in its length according to the *Lagna Bhuja*, or right ascension, and also from the sun's unequal motion in the ecliptick; for both which circumstances the *Hindus* have their *equation of time*, as will appear in the calculation of the eclipse.

† *Afura*, the South Pole, the habitation of the *Afura Lóca*, or Demons, with whom the *Devas*, who reside at *Suméru*, the North Pole, wage eternal war.

‡ *Sandbi* and *Sandbyansa*, the morning and evening twilight. “The proper words, I believe, are *Sandhyà* and *Sandhyánfa*.”

“ and multiply the quotient by four for the *Satya Yug*, by three for the *Tréta*, by
 “ two for the *Dwápar*, and by one for the *Cali Yug*. Divide either of the *Yugs*
 “ by six for its *Sandbi* and *Sandbyansa*. Seventy-one *Yugs* make a *Manwantera* ;
 “ and at the close of each *Manwantera* there is a *Sandbi* equal to the *Satya Yug*,
 “ during which there is an universal deluge. Fourteen *Manwanteras*, including
 “ the *Sandbi*, compose a *Calpa*, and at the commencement of each *Calpa* there is a
 “ *Sandbi* equal to the *Satya Yug*, or 1728000 *Saura* years. A *Calpa* is therefore
 “ equal to 1000 *Mabá Yugs*. One *Calpa* is a day with BRAHMA', and his night
 “ is of the same length ; and the period of his life is 100 of his years. One half
 “ of the term of BRAHMA''s life, or fifty years, is expired, and of the remainder
 “ the first *Calpa* is begun ; and six *Manwantera*'s, including the *Sandbi*, are ex-
 “ pired. The seventh *Manwantera*, into which we are now advanced, is named
 “ *Vaivaswata* : of this *Manwantera* twenty-seven *Mabá Yugs* are elapsed, and we
 “ are now in the *Satya Yug* of the twenty-eighth, which *Satya Yug* consists of
 “ 1728000 *Saura* years. The whole amount of years, expired from the beginning
 “ of the *Calpa* * to the present time, may hence be computed ; but from the num-
 “ ber of years so found must be made a deduction of one hundred times four
 “ hundred and seventy-four divine years, or of that product multiplied by three

* Construction of the <i>Calpa</i> .		Years.
<i>Cali</i> , - - - -	4320000	432000
	10 =	
<i>Dwápar</i> , - - -	4320000	864000
	10 × 2 =	
<i>Tréta</i> , - - - -	4320000	1296000
	10 × 3 =	
<i>Satya</i> , - - - -	4320000	1728000
	10 × 4 =	
Aggregate or <i>Mabá Yug</i> ,	- - - -	4320000
		71
<i>Manwantera</i> ,	- - - -	306720000
With a <i>Sandbi</i> equal to the <i>Satya Yug</i>	- - - -	1728000
		308448000
		14
<i>Calpa</i> ,	- - - -	4318272000
With a <i>Sandbi</i> equal to the <i>Satya Yug</i> ,	- - - -	1728000
Whole duration of a <i>Calpa</i> ,	- - - -	4320000000

Computation of the period elapsed of the *Calpa* at the end of the last *Satya* age, when the *Súrya Siddhánta* is supposed to have been written.

	Years.
<i>Sandbi</i> at the beginning of the <i>Calpa</i> ,	1728000
6 <i>Manwanteras</i> or 308448000 × 6 =	1850688000
27 <i>Mabá Yugs</i> of the 7th	
<i>Manwantera</i> or 4320000 × 27 =	116640000
<i>Satya</i> Age of the 28th <i>Mabá Yug</i> ,	1728000
	1970784000

hundred

“ hundred and sixty for human years, that being the term of BRAHMA’s employ-
 “ ment in the creation ; after which the planetary motions commenced.

“ Sixty *Vicalas* make one *Calá*, sixty *Calás* one *Bhága*, thirty *Bhágas* one *Ráfi*,
 “ and there are twelve *Ráfis* in the *Bhagana* *.

“ † In one *Yug*, *Súrya*, *Budha*, and *Sucra* perform 4320000 *Madhyama* revolu-
 “ tions through the Zodiack. *Mangala*, *Vrihaspati*, and *Sani* make the same num-
 “ ber of *Sigbra* revolutions through it ; *Chandra* makes 57753336 ‡ *Madhyama*
 “ revolutions ; *Mangala* 2296832 *Madhyama* revolutions ; *Budha’s* *Sigbras* are
 “ 17937060 ; *Vrihaspati’s* *Madhyamas* 364220 ; *Sucra’s* *Sigbras* 7022376 ; *Sani’s*
 “ *Madhyamas* are 146568. The *Chandróbcha* revolutions are 488203 ; the retro-
 “ grade revolutions of the *Chandrapáta* are 232238.

“ The time contained between sunrise and sunrise is the *Bhúmi Sávan* day : the
 “ number of those days contained in a *Yug* is 1577917828 §. The number of
 “ *Nacshatra* days 1582237828 || ; of *Chándra* days 1603000080 ; of *Adbi* months

* The division of the *Bhagana*, or Zodiack, into Signs, Degrees, &c.

† *Súrya* the Sun ; *Budha*, Mercury ; *Sucra*, Venus ; *Mangala*, Mars ; *Vrihaspati*, Jupiter ; *Sani*, Saturn ; *Chandra*
 the Moon ; the *Chandra Ucbcha*, or *Chandróbcha*, the Moon’s Apogee ; *Chandra Páta*, the Moon’s ascending Node.
 The *Madhyama* revolutions of Mars, Jupiter and Saturn, and the *Sigbra* revolutions of Venus and Mercury, answer to
 their revolutions about the sun.

‡ $57753336 - 4320000 = 53433336$ lunar months, or lunations in a *Yug* ; and $\frac{1577917828}{53433336} = 29 \text{ } 31 \text{ } 50, 6 \text{ \&c.}$
 D. H. M. S. ^{'''} ^{''''}
 in each mean lunation, or in English time 29. 12. 44. 2. 47. 36. $53433336 - 51840000 = 15933336$ *Adbi* or inter-
 calary lunar months in 4320000 solar syderal years.

§ $\frac{1577917828}{4320000} = 366. 15. 31. 31. 24.$ diurnal revolutions of the Sun, the length of the *Hindu* year.

|| $\frac{1582237828}{4320000} = 366. 15. 31. 31. 24.$ diurnal revolutions of the stars in one year. $\frac{1577917828}{57753336} = 27. 19. 18. 1. 37.$

&c. The Moon’s periodical month. The 1603000080 *Chándra*, or lunar, days, called also *Tit’bis*, are each one thirtieth part of the moon’s synodical month or relative period, and vary in length according to the inequality of her motion from the sun : the *Chaya Tit’bis* and *Adbi*, or intercalary, lunar months are sufficiently evident.

The sun and planets preside alternately over the days of the week, which are named accordingly. The first day after the creation was *Ravivár* or *Sunday* : it began at midnight under the meridian of *Lancá*, and the *Ravivár* of the *Hindus* corresponds with our Sunday. The sun and planets in the same manner govern the years : hence they may be said to have *weeks* of years. DANIEL’S prophesy is supposed to mean *weeks* of years.

The *Hindu* Cycle of 60, supposed by some to be the Chaldean *Sofos*, is referred to the planet Jupiter : “ one of these years is equal to the time in which by his mean motion, he (*Vrihaspati*) advances one degree in his orbit.” (Commentary on the *Súrya Siddhánta*.) This Cycle is, I believe, wholly applied to astrology. Neither this Cycle of 60 nor the *Pitri’s* day are mentioned in this part of the *Súrya Siddhánta*, where they might be expected to occur : perhaps on inquiry there may be found some reason for supposing them both of a later invention. “ The *Pitris* inhabit behind *Chándra*, and their mid-day happens when *Chándra* is in conjunction with *Súrya*, and their midnight, when *Chándra* is in opposition to *Súrya* ; their morning, or sunrise, is at the end of half the *Cristna Pacsha*, and their sunset at the end of half the *Sucra Pacsha* : this is declared in the *Sácalya Sanhitá*. Their names are *Agni*, *Swáti*, &c. their day and night are therefore together equal to one *Chándra* month.” (Commentary.) Hence it appears, the *Hindus* have observed that the moon revolves once on her axis in a lunar month, and consequently has the same side always opposed to the earth. They have also noticed the difference of her apparent magnitude in the horizon and on the meridian, and endeavour to explain the cause of a phenomenon, which *Europeans* as well as themselves are at a loss to account for.

“ 1593336; of *Cshaya Tit'bis* 25082252; of *Saura* months 51840000. From either of the planets' *Nacshatra* days deduct the number of its revolutions, the remainder will be the number of its *Sávan* days contained in a *Yug*. The difference between the number of the revolutions of *Súrya* and *Chándra* gives the number of *Chándra* months; and the difference between the *Saura* months and *Chándra* months gives the number of *A'dbi* months. Deduct the *Sávan* days from the *Chándra* days, the remainder will be the number of *Tit'bi Cshayas*. The number of *A'dbi* months, *Tit'bi Cshayas*, *Nacshatra*, *Chándra*, and *Sávan* days, multiplied severally by 1000, gives the number of each contained in a *Calpa*.

“ The number of *Mandochcha* revolutions, which revolutions are direct, or according to the order of the signs contained in a *Calpa*, is of *Súrya* 387; of *Mangala* 204; of *Budha* 368; of *Vrihaspati* 900; of *Sucra* 535; of *Sani* 39.

“ The number of revolutions of the *Páta's*, which revolutions are retrograde, or contrary to the order of the signs contained in a *Calpa*, is of *Mangala* 214; of *Budha* 488; of *Vrihaspati* 174; of *Sucra* 903; of *Sani* 662. The *Páta* and *Uchcha* of *Chándra* are already mentioned.”

It must be observed, that although the planetary motions as above determined might have served for computations in the time of MEYA, the author of the *Súrya Siddhánta*, yet for many years past they have not been found to agree with the observed places in the heavens in every instance, and that corrections have accordingly been introduced by increasing or reducing those numbers. Thus the motions of the moon's apogee and node are now increased in computations of their places by the addition of four revolutions each in a *Yug* to their respective numbers above given. The nature of these corrections, denominated, in *Sanscrit*, *Bija*, is explained in a passage of the *Ticà*, or Commentary, on the *Súrya Siddhánta*, wherein is maintained the priority of that *Sástra* in point of time to all others. The translation of that passage together with the text it illustrates is as follows :

(*Súrya Siddhánta*.) “ ARCA (the Sun) addressing MEYA, who attended with reverence, said : Let your attention, abstracted from human concerns, be wholly applied to what I shall relate. *SÚRYA* in every former *Yug* revealed to the *Munis* the invariable science of astronomy. The planetary motions may alter; but the principles of that science are always the same.”

(*The Commentary*.) “ Hence it appears, that the *Súrya Siddhánta* was prior to the *Brahma Siddhánta* and every other *Sástra*; because this *Sástra* must be the same that was revealed in every former *Yug*, although the motions of the planets
“ might

“ might have been different. This variation in the planetary motions is mentioned in
 “ the *Vishnu Dhermóttar*, which directs that the planets be observed with an instru-
 “ ment, whereby their agreement or disagreement may be determined in regard to
 “ their computed places, and in case of the latter an allowance of *Bija* accordingly
 “ made. VASISHT’HA in his *Siddhánta* also recommends this occasional correction
 “ of *Bija*, saying to the Muni MA’NDAVYA: “ I have shown you how to determine
 “ some matters in astronomy; but the mean motion of *Súrya* and the other planets
 “ will be found to differ in each *Yug*.” “ Accordingly A’RYABHATTA, BRAHMA-
 “ GUPTA, and others, having observed the heavens, formed rules on the principles
 “ of former *Sástras*, but which differed from each other in proportion to the dif-
 “ agreements, which they severally observed, of the planets with respect to their
 “ computed places.

“ Why the *Munis*, who certainly knew, did not give the particulars of those de-
 “ viations, may seem unaccountable, when the men A’RYABHATTA, BRAHMA-
 “ GUPTA, and others, have determined them: the reason was, that those deviations
 “ are not in themselves uniform; and to state their variations would have been
 “ endless. It was therefore thought better, that examinations at different times
 “ should be made, and due corrections of the *Bija* introduced. A *Ganita Sástra*,
 “ whose rules are demonstrable, is true; and when conjunctions, oppositions, and
 “ other planetary phenomena, calculated by such *Sástras*, are found not to agree
 “ with observation, a proportionable *Bija* may be introduced without any deroga-
 “ tion from their credit. It was therefore necessary, that this *Sástra* (the *Súrya*
 “ *Siddhánta*) should be revealed in each *Yug*, and that other *Sástras* should be com-
 “ posed by the *Munis*.

“ The original *Sástra* then appears to be the *Súrya Siddhánta*; the second, the
 “ *Brahma Siddhánta*; the third, the *Paulastya Siddhánta*; the fourth, the *Sóma*
 “ *Siddhánta*.”

In the following table are given the periodical revolutions of the planets, their
 nodes and apfides, according to the *Súrya Siddhánta*. The corrections of *Bija* at
 present used are contained in one column*, and the inclination of their orbits to
 the ecliptick in another. The obliquity of the ecliptick is inserted according to the

* This I must however at present omit, not having as yet discovered the corrections of this kind, that will bring even the Sun’s place, computed by the *Súrya Siddhánta*, exactly to an agreement with the astronomical books in present use. Of these books, the principal are, the *Grabalághava* composed about 268 years ago, the tables of *Maca-randa* used at Benares and Tirbút, and the *Siddhánta Kabajya* used at Nádiyá; the last written in 1513 *Sáca* or 198 years ago.

same *Sástra*. Its diminution does not appear to have been noticed in any subsequent treatise: in the tables of *Macaranda* and also in the *Grahálághava*, the latter written only 268 years ago, it is expressly stated at twenty-four degrees.

The Planets in their order.	Sydereal Period.				Period of the Apfides.		Period of the Nodes.		Mean motion per day ^{'''} per danda ^{'''} ^{'''}	Inclination of the Orbit.	Cacsba, or dr- cumference of the Orbit.
	Days. D. P. V.	Days. D.		Days. D.		"	"				
The Moon,	27 19 18 1 &c.	3232 50 —		6794 23		790	35	4	30	Yojan.	
Mercury,	87 58 10 —	4287820184 46 —		3233742458 11		186	24	2	—	324000	
Venus,	281 39 38 —	2949379117 45 &c.		1747417306 45		37	—	2	—	1043208	
The Sun,	265 15 13 31 24	4077307049 5 —		Precession of the equi- noxes 54" per year.		59	8	Obliquity of the Ecliptick 24°		26646637	
Mars,	686 59 50 38	7735087392 9 &c.		7373447794 23 &c.		31	26	1	30	4331500	
Jupiter,	4332 19 14 20 &c.	1753242031 6 &c.		9068493264 22 &c.		5	—	1	—	8146909	
Saturn,	10765 46 2 18 &c.	42767123794 52 &c.		2383561673 42 &c.		2	—	2	—	51375764	
										127668255	

The longitude of the sun's apogee in the *Hindu* sphere is $2^{\circ}, 17', 15''$, to which add the *Ayanansa* $19^{\circ}, 21', 27''$, the sum $3^{\circ}, 6', 38', 42''$, is its place according to *European* expression. In this the *Hindu* account differs about $1^{\circ} 22'$ from the observations of *European* astronomers, who determine the place of the earth's aphelion in the present age to be in $9^{\circ}, 8', 1'$. There is much greater disagreement with respect to the aphelia and nodes of the other planets.

On supposition that the obliquity of the ecliptick was accurately observed by the ancient *Hindus*, as 24° , and that its decrease has been from that time half a second a year, the date of the *Súrya Siddhanta* will be about 3840 years. It is remarkable that the *Hindus* do not appear to have noticed its decrease.

The *Cacsbas* are explained farther on.

The motion of the equinoxes, termed in *Sanscrit* the *cránti*, and spoken of in the *Ticà*, or commentary, on the *Súrya Siddhanta* as the sun's *Páta* or Node, is not noticed in the foregoing passage of that book; and, as the *Hindu* astronomers seem to entertain an idea of the subject different from that of its revolution through the *Platonic* year, I shall farther give a translation of what is mentioned, both in the original and commentary, concerning it.

The next requisite for the computation of the eclipse is the portion of the *Calpa* expired to the present time, which is determined in the following manner.

The *Súrya Siddhanta* is supposed to have been received through divine revelation, towards the close of the *Satya* age, at the end of which, 50 of the years of *Brahmá* were expired, and of the next *Calpa*, or day, 6 *Manwanteras*, 27 greater

greater *Yugs*, and the *Satya* age of the 28th *Yug*, together with the *Sandhya* or twilight at the beginning of the *Calpa*; the aggregate of which several periods is 1970784000 years elapsed of the *Calpa* to the beginning of the last *Treta* age; to which add the *Treta* and *Dwapar* ages, together with the years elapsed of the present *Cali* age, for the whole amount of sydereal years from the beginning of the *Calpa* to the present *Bengal* year. But in the foregoing quotation it is observed, from that amount of years must be made a deduction of 47400 divine, or 17064000 human or sydereal years, the term of *Brahmá's* employment in the work of creation; for, as the universe was not completed, the planetary motions did not commence until that portion of the *Calpa* was elapsed.

This deduction appears to have been intended as a correction, which, without altering the date of the *Calpa*, as settled, probably, by yet more ancient astronomers, might (joined perhaps with other regulations) bring the computed places of the planets to an agreement with their observed places, when the *Súrya Siddhánta* was written; and, as the arguments of its commentator in support of the propriety of it, without prejudice to other authors, contain some curious particulars, I hope I may be excused for departing from my immediate object to insert a translation of them.

“ In the *Súrya Siddhánta*, *Sóma Siddhánta*, *Prajápeti*, *Vasísh't'ha*, and other *Sástras*,
 “ this deduction is required to be made from the *Calpa*, because at the end of that
 “ term, the planetary motions commenced. The son of JISHNU, who understood
 “ four *Védas*, and BHA'SCARA'CHÁRYA, considered these motions as commencing
 “ with the *Calpa*: it may seem strange that there should be such a disagreement.
 “ Some men say: as it is written that the *Calpa* is the day of BRAHMA', and as a
 “ day is dependent on the rising and setting of the sun, the motion of the sun and
 “ planets must have begun with the *Calpa*; and therefore BRAHMAGUPTA should
 “ be followed; but I think otherwise. The *Calpa* or BRAHMA's day is not to be
 “ understood as analogous to the solar day, otherwise than as containing a determined
 “ portion of time; neither is it at all dependent on the commencement of the *Calpa*;
 “ but, being composed of the same periods as the latter, it will not end until the term
 “ of years here deducted shall be expired of the next *Calpa*. The motions of the
 “ *Gráhas* must therefore be computed from the point of time here stated as the be-
 “ ginning of BRAHMA's day, and not, as BRAHMAGUPTA and others direct, from
 “ the beginning of the *Calpa*, which will not be found to answer.

“ Other men say, that rules derived from the *Ganita Sástra* and agreeing with ob-
 “ servation, are right; that any period deduced from such a mode of computation,

“ and

“and the planets determined to have been then in the first of *Mésba*, may be af-
 “fumed ; that it will therefore answer either way, to consider these motions as be-
 “ginning with the *Calpa*, or after the above-mentioned period of it was expired.
 “This, however, is not true ; for in the instance of *Mangala* there will be found a
 “great difference, as is here shown. The revolutions of *Mangala* in a *Calpa* accord-
 “ing to BRAHMAGUPTA are 2296828522, and, by the rule of proportion, the revo-
 “lutions of *Mangala* in 17064000 years are 9072472, 7^{Signs} 28' 0" 16*. For any other
 “planet, on trial, a similar disagreement will be found, and the proposition of com-
 “puting from either period must be erroneous. Moreover, of what use is it to make
 “computations for a space of time, when the planets and their motions were not in
 “being ?

“It might however from the foregoing circumstances, be imputed to BRAHMAGUP-
 “TA and the rest, that they have given precepts through ignorance, or with intent to
 “deceive—That, having stated the revolutions of the planets different from the account
 “revealed by SURYA, they must certainly have been in error—That BRAHMAGUP-
 “TA could not have counted the revolutions from the beginning of the *Calpa* ; nei-
 “ther could he from the mean motion of the planets have so determined them.—He
 “was a mortal, and therefore could not count the revolutions.—Although the rule of
 “proportion should be granted to have served his purpose for the revolutions of the
 “planets, yet it certainly could not for those of their *Mandócbcha*, because it was not
 “within the term of a man's life to determine the mean motion of the *Mandócbcha* ;
 “and this assertion is justified by the opinion of BHA'SCARA'CHA'RYA. But the rule
 “of proportion could not have answered even for the planets ; for, although their
 “mean motion be observed one day, and again the next, how can a man be certain
 “of the exact time elapsed between the two observations ? And if there be the small-
 “est error in the elapsed time, the rule of proportion cannot answer for such great
 “periods. An error of the $\frac{1}{100000000}$ part of a second (*Vicalà*) in one day amounts
 “to forty degrees † in the computation of a *Calpa*, and the mistake of $\frac{1}{16}$ of a re-
 “spiration in one *Saura* year makes a difference in the same period of 20000 days.
 “That it is therefore evident, BRAHMAGUPTA's motive, for directing the plane-
 “tary motions to be computed as commencing with the *Calpa*, was to deceive man-
 “kind, and that he had not the authority of the *Munis*, because he differs from the

* Because	$\frac{2296828522 \times 17064000}{4320000000}$	=	Revolutions 9072472	S.	°	'	"		
						7	28	0	16.

† The error would be more than 49°.

“ *Súrya Siddhánta*, *Bráhma Siddhánta*, *Sóma Siddhánta*; from VASISHT’HA and other *Munis*.

“ Such opinions would have no foundation, as I shall proceed to show. BRAHMAGUPTA’s rules are consistent with the practice of the *Pandits* his predecessors; and he formed them from the *Purana Vishnu Dhermóttara*, wherein is contained the *Bráhma Siddhánta*; and the periods given by ARYABHATTA are derived from the *Parásera Siddhánta*: the precepts of the *Munis* are therefore the authorities of BRAHMAGUPTA, ARYABHATTA, and BHÁSCARA’CHÁRYA, whose rules cannot be deceitful. The *Munis* themselves differed with regard to the number of *Sávan* days in a *Yug*, which is known from the *Pancha Siddhánta* composed by VARA A’CHÁRYA, wherein are proposed two methods of computing the sun’s place, the one according to the *Súrya Siddhánta*, the other according to *Rómacá Siddhánta*; whence it appears, that there were different rules of computation even among the *Munis*. It is also mentioned in the *Ticà* on the *Varáha Sanbitá*, that, according to the *Paulastya Siddhánta*, there was formerly a different number of *Sávan* days estimated in a *Yug*. The maxims therefore of BRAHMAGUPTA and the other two, agreeing with those of the *Munis*, are right; but, should it even be supposed, that the *Munis* themselves could be mistaken, yet BRAHMAGUPTA and the other two had the sanction of the *Védas*, which in their numerous *Sác’has* (branches) have disagreements of the same kind; and, according to the *Sácalya Sanbitá*, BRAHMA, in the revelation he made to NA’RED, told him, although a circumstance or thing were not perceptible to the senses, or reconcilable to reason, if authority for believing it should be found in the *Védas*, it must be received as true.

“ If a planet’s place, computed both by the *Súrya Siddhánta* and *Parásera Siddhánta*, should be found to differ, which rule must be received as right? I answer, that which agrees with his place by observation; and the *Munis* gave the same direction. If computations from the beginning of the *Calpa*, and from the period stated in the *Súrya Siddhánta* give a difference, as appears in the instance of *Mangala*, which of the two periods to be computed from is founded in truth? I say, it is of no consequence to us which; since our object is only to know which period answers for computation of the planetary places in our time, not at the beginning of the *Calpa*. The difference found in computing according to BRAHMAGUPTA and the *Munis* must be corrected by an allow-
“ ance

“ ance of *Bija*; or by taking that difference as the *csbépa*; but the books of the
 “ *Munis* must not be altered, and the rules given by BRAHMAGUPTA, VARA-
 “ CHA’RYA, and A’RYABHATTA may be used with such precautions. Any person
 “ may compose a set of rules for the common purposes of astronomy; but, with
 “ regard to the duties necessary in eclipses, the computation must be made by the
 “ books of the *Munis*, and the *Bija* applied; and in this manner it was that VA-
 “ RA’HA, A’RYABHATTA, BRAHMAGUPTA, and CE’SAVA SAMVATSARA, hav-
 “ ing observed the planets and made due allowance of *Bija*, composed their books.

“ GANE’S A mentions, that the *Grabas* were right in their computed places in
 “ the time of BRAHMA’, A’CHA’RYA, VASISHT’HA, CASYAPA, and others by the
 “ rules they gave, but in length of time they differed; after which, at the close of
 “ the *Satya* age, SU’RYA revealed to MEYA a computation of their true places.
 “ The rules then received answered during the *Trétà* and *Dwápar* ages, as also did
 “ other rules formed by the *Munis* during those periods. In the beginning of the
 “ *Cali Yug*, PARA’SERA’S book answered; but A’RYABHATTA, many years after,
 “ having examined the heavens, found some deviation, and introduced a correction
 “ of *bija*. After him, when further deviations were observed, DURGA’ SINHA,
 “ MIHIRA and others made corrections. After them came the son of JISTNU
 “ and BRAHMAGUPTA and made corrections. After them CE’SAVA settled the
 “ places of the planets, and, sixty years after CE’SAVA, his son GANE’S A made
 “ corrections.”

We have now, according to the *Hindu* system, the mean motion of the planets, their nodes and apses, and the elapsed time since they were in conjunction in the first of *Mésba*, with which, by the rule of proportion, to determine their mean longitude for any proposed time of the present year. It is however observed in the *Súrya Siddhánta*, that to assume a period so great is unnecessary; for use the computation may be made from the beginning of the *Trétà* age, at which instant all the *Grabas*, or moveable points in the heavens, were again in conjunction in *Mésba*, except the apogees and ascending nodes, which must, therefore, be computed from the creation. The same is true of the beginning of the present *Cali* age; for the greatest common divisor of the number of days composing the *Mabà Yug* and the planetary revolutions in that period, is four, which quotes 394479457 days or 1080000 years, and the *Trétà* and *Dwápar* ages contain together just that number of years. The present *Hindu* astronomers therefore find it unnecessary to go farther
 back

back than the beginning of the *Cali Yug* * in determining the mean longitude of the planets themselves; but for the position of their apfides and nodes, the elapsed time since the creation must be used; or at least in instances, as of the sun, when the numbers 387 and 432000000 are incommensurable but by unity. I have however in the accompanying computation, taken the latter period in both cases.

For the equation of the mean to the true anomaly, in which the solution of triangles is concerned, and which is next to be considered, the *Hindus* make use of a canon of sines constructed according to the *Surya Siddhanta* in the following manner.—“ Divide the number of minutes contained in one sign 1800 by eight, the quotient 225' is the first *Jyāpinda*, or, the first of the twenty-fourth portions of half the string of the bow. Divide the first *Jyāpinda* by 225', the quotient 1' deduct from the dividend, and the remainder 224' add to the first for the second *Jyāpinda* 449'. Divide the second *Jyāpinda* by 225', the quotient being 1' and the fraction more than half a minute, deduct 2' from the foregoing remainder 224' and add the remainder, so found, to the second for the third *Jyāpinda* 671'. Divide this by 225', the quotient 3' deduct from the last remainder 222'; the remainder so found 219' add to the third for the fourth *Jyāpinda* 890'. Divide this by 225' and the quotient deduct from the last remainder, the remainder so found add to the fourth for the fifth *Jyāpinda* 1105, and proceed in this manner until the twenty-four *Cramajyās* † are completed, which will be as follows:

1	2	3	4	5	6	7	8	9	10	11	12
225,	449,	671,	890,	1105,	1315,	1520,	1719,	1910,	2093,	2267,	2431,
2585,	2728,	2859,	2978,	3084,	3177,	3256,	3321,	3372,	3409,	3431,	3438.

For the *utcramayā* ‡, the twenty-third *cramajyā* deducted from the *trijyā* or twenty-fourth *cramajyā*, leaves the first *utcramayā*; the twenty-second deducted from the twenty-third leaves the second *utcramayā*; the twenty-first from the twenty-second leaves the third; the twentieth from the twenty-first leaves the fourth. In the same manner proceed until the *utcramayā*'s are com-

* Neither do they in computing by the formulas in common use go farther back than to some assigned date of the era *Saca*, but, having the planets' places determined for that point of time, they compute their mean places and other requisites for any proposed date afterwards by tables, or by combinations of figures contrived to facilitate the work: as in *Grabalāgharva*, *Siddhanta Rabasja* and many other books. An inquirer into *Hindu* astronomy having access to such books only, might easily be led to assert that the *Brāhmins* compute eclipses by set forms couched in enigmatical verses, out of which it would be difficult to develop their system of astronomy; and this I apprehend was the case with *Monf. SONNERAT*. The *Jyōtish Pandits* in general, it is true, know little more of astronomy than they learn from such books, and they are consequently very ignorant of the principles of the science: but there are some to be met with, who are better informed.

† *Cramajyās*, Right Sines.

‡ *Utcramayās*, Versed Sines.

“ pleted ; which will be as follows: ¹ 7, ² 29, ³ 66, ⁴ 117, ⁵ 182, ⁶ 261, ⁷ 354, ⁸ 460, ⁹ 579,
 “ ¹⁰ 710, ¹¹ 853, ¹² 1007, ¹³ 1171, ¹⁴ 1345, ¹⁵ 1528, ¹⁶ 1719, ¹⁷ 1928, ¹⁸ 2123, ¹⁹ 2233, ²⁰ 2548, ²¹ 2767,
 “ ²² 2989, ²³ 3213, ²⁴ 3438.” So far the *Sūrya Siddhānta* on the subject of the fines. The commentator shows how they are geometrically constructed: “ with a radius
 “ describe a circle, the periphery of which divide into 21600 equal parts or mi-
 “ nutes. Draw North and South, and East and West lines through the centre:
 “ set off contrariwise from the east point, 225 on the periphery, and draw a string
 “ from those extremities across the *trijyā* * . The string is the *jyā*, and its half the
 “ *ardebajyā* called *jivā*. The *Pandits* say, a planet's place will correspond with the
 “ *ardebajyā*, by which, therefore, computations of their places are always made,
 “ and by the term *jyā* is always understood the *ardebajyā*. The first *jyā* will be
 “ found to contain 449 minutes, and the operation, repeated to twenty-four divi-
 “ sions, will complete the *cramajyā*. In each operation, the distance contained
 “ between the *jyā* and its arc, or, that line which represents the arrow of a bow,
 “ must be examined, and the number of minutes therein contained taken for the
 “ *utcramajyā*. The circle may represent any space of land; the *bbujajyā* † is the
 “ *bbuja*; the *cotijyā* the *cōti*, and the *trijyā* the *carna*. The square of the *bbujajyā*
 “ deducted from the square of the *trijyā* leaves the square of the *cotijyā*; the root
 “ of which is the *cotijyā*; and, in the same manner, from the *cotijyā* is determined
 “ the *bbujajyā*. The *cōtyutcramajyā* deducted from the *trijyā* leaves the *bbujacra-*
 “ *majyā*. The *bbujōtcramajyā* deducted from the *trijyā* leaves the *cōticramajyā*.
 “ When the *bbujajyā* is the first division of the *trijyā*, the *cotijyā* is the twenty-
 “ three remaining divisions, which *cotijyā* deducted from the *trijyā* leaves the
 “ *bbujōtcramajyā*. On this principle are the *jyās* given in the text †: they may be
 “ determined by calculation also, as follows:

“ The *trijyā* take as equal to 3438 minutes and containing twenty-four *jyāpin-*
 “ *das*: its half is the *jyā* of one sign or 1719': which is the eighth *jyāpinda* or the
 “ sixteenth *cotijyāpinda*. The square of the *trijyā* multiply by three, and divide
 “ the product by four, the square root of the quotient is the *jyā* of two signs or
 “ 2977'. The square root of half the square of the *trijyā* is the *jyā* of one sign
 “ and an half (45°) or 2431'; which deducted from the *trijyā* leaves the *utcra-*

* *Trijyā*, the Radius.

† *Bbujajyā*, the Sine complement.

‡ A diagram might here be added for illustration, but it must be unnecessary to any one who has the smallest know-
 ledge of geometry.

“ *mayjà* 1007. By this *utcramayjà* multiply the *trijjà*; the square root of half
 “ the product is the *jjà* of 22°, 30', or 1315'. The square of this deduct from
 “ the square of the *trijjà*, the square root of the difference is the *jjà* of 67°, 30',
 “ or 3177, which is the *côtijjà* of 22°, 30', equal to 1315'. This *bbujajjà* and
 “ *côtijjà* deducted severally from the *trijjà*, leaves the *utcramayjà* of each, 2123',
 “ and 261'.—&c.”

This is sufficient to show, that the *Hindus* have the right construction of the
 fines, although they do not appear, from any thing I can learn, ever to have car-
 ried it farther than to twenty-four divisions of the quadrant, as in the following
 table. Instances of the like inaccuracy will occur in the course of this paper. The
 table of fines may perhaps be more clearly represented in the following manner.

Right Sines, the Radius containing 3438 Minutes.

<i>Arc.</i>	<i>Sine.</i>	<i>Arc.</i>	<i>Sine.</i>	<i>Arc.</i>	<i>Sine.</i>
1 <i>st</i> = 225' = 3° 45'	225	9 <i>th</i> = 2025' = 33° 45'	1010	17 <i>th</i> = 3825' = 63° 45'	3084
2 <i>d</i> = 450' = 7 30	449	10 <i>th</i> = 2250' = 37 30	2093	18 <i>th</i> = 4050' = 67 30	3177
3 <i>d</i> = 675' = 11 15	671	11 <i>th</i> = 2475' = 41 15	2267	19 <i>th</i> = 4275' = 71 15	3256
4 <i>th</i> = 900' = 15 —	890	12 <i>th</i> = 2700' = 45 —	2431	20 <i>th</i> = 4500' = 75 —	3321
5 <i>th</i> = 1125' = 18 45	1105	13 <i>th</i> = 2925' = 48 45	2585	21 <i>st</i> = 4725' = 78 45	3376
6 <i>th</i> = 1350' = 22 30	1315	14 <i>th</i> = 3150' = 52 30	2728	22 <i>d</i> = 4950' = 82 30	3409
7 <i>th</i> = 1575' = 26 15	1520	15 <i>th</i> = 3275' = 56 15	2859	23 <i>d</i> = 5175' = 86 15	3431
8 <i>th</i> = 1800' = 30 —	1719	16 <i>th</i> = 3600' = 60 —	2978	24 <i>th</i> = 5400' = 90 —	3438

Verfed Sines.

<i>Arc.</i>	<i>Sine.</i>	<i>Arc.</i>	<i>Sine.</i>	<i>Arc.</i>	<i>Sine.</i>
1 <i>st</i> = 225' = 3° 45'	7	9 <i>th</i> = 2025' = 33° 45'	579	17 <i>th</i> = 3825' = 63° 45'	1928
2 <i>d</i> = 450' = 7 30	29	10 <i>th</i> = 2250' = 37 30	710	18 <i>th</i> = 4050' = 67 30	2123
3 <i>d</i> = 675' = 11 15	66	11 <i>th</i> = 2475' = 41 15	853	19 <i>th</i> = 4275' = 71 15	2233
4 <i>th</i> = 900' = 15 —	117	12 <i>th</i> = 2700' = 45 —	1007	20 <i>th</i> = 4500' = 75 —	2548
5 <i>th</i> = 1125' = 18 45	182	13 <i>th</i> = 2925' = 48 45	1171	21 <i>st</i> = 4725' = 78 45	2767
6 <i>th</i> = 1350' = 22 30	261	14 <i>th</i> = 3150' = 52 30	1345	22 <i>d</i> = 4950' = 82 30	2989
7 <i>th</i> = 1575' = 26 15	354	15 <i>th</i> = 3275' = 56 15	1528	23 <i>d</i> = 5175' = 86 15	3213
8 <i>th</i> = 1800' = 30 —	466	16 <i>th</i> = 3600' = 60 —	1719	24 <i>th</i> = 5400' = 90 —	3438

For the fines of the intermediate arcs, take a mean proportion of the tabular dif-
 ference, as for the sine of 14°, which is between the third and fourth tabular arcs,
 or 165 minutes exceeding the third; therefore 225' being the difference of those
 arcs,

arcs, and 219 the difference of their fines, $\frac{165 \times 219}{225} = 160', 36''$, or a mean proportional number, to be added to the fine of the third tabular arc, for the fine required of 14° or $831' 36''$. In the sexagesimal arithmetick, which appears to be universally used in the *Hindu* astronomy, when the fraction exceeds half unity, it is usually taken as a whole number; thus, $831', 35'', 35''$, would be written $831', 36''$.

To account for the apparent unequal motion of the planets, which they suppose to move in their respective orbits through equal distances in equal times, the *Hindus* have recourse to excentrick circles, and determine the excentricity of the orbits of the sun and moon with respect to that circle, in which they place the earth as the centre of the universe, to be equal to the fines of their greatest anomalistical equations, and accordingly that the delineation of the path of either may be made in the following manner:

Describe a circle, which divide as the ecliptick into signs, degrees, and minutes; note the place of the *Mandochcha*, or higher apsis, which suppose in γ . Draw a diameter to that point, and set off, from the centre \ominus towards the place of the apogee, the excentricity equal to the fine of the greatest equation, which of the sun is $130' 32''$. Here the excentricity is represented much greater, that the figure may be better understood. Round the point E, as the centre, describe the excentrick circle FGHI, which is the sun's orbit, and in the point H, where it is cut by the line $\ominus \gamma$ prolonged, is the place of the *Mandochcha*, or higher apsis, and in the opposite point F is the lower. From the place of the apogee H, set off its longitude in reverse, or contrary to the order of the signs, for the beginning of *Aries*, and divide this circle, as the former, into signs and degrees. Note the sun's mean longitude in each circle, as suppose in *Gemini*, and from both points draw right lines to the earth at \ominus : according to the *Hindu* system, which appears to be the same as the *Ptolemaick*, the angle $a \ominus C$, will be the mean anomaly, the angle $b \ominus C$, the true anomaly, and the angle $a \ominus b$, their difference, or the equation of the mean to the true place; to be subtracted in the first six signs of anomaly, and added in the last six. The *Europeans* in the old astronomy found the angle $b \ominus C$ by the following proportion, and which subtracted from $a \ominus C$ left the equation, which, as the *Hindus*, they inserted in tables calculated for the several degrees of the quadrant;—as the co-fine of the mean anomaly $\ominus e = Ed$ added to the excentricity $E\ominus$, is to the fine of the mean anomaly $ae = bd$; so is radius, to the tangent of the true anomaly: or, in the right-angled triangle $d \ominus b$, in which are given $d \ominus$ and bd ,

if

Fig. 1.

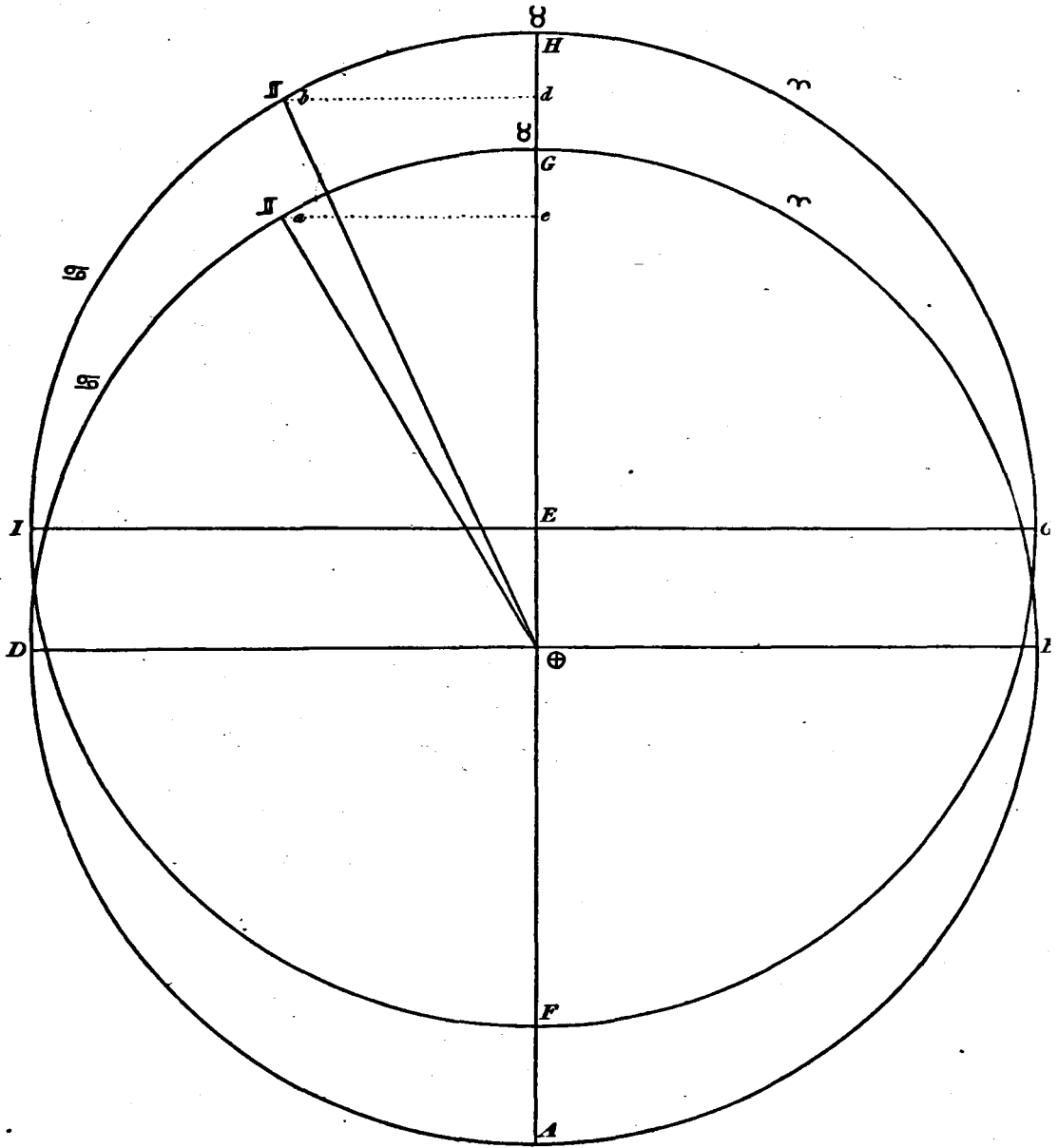
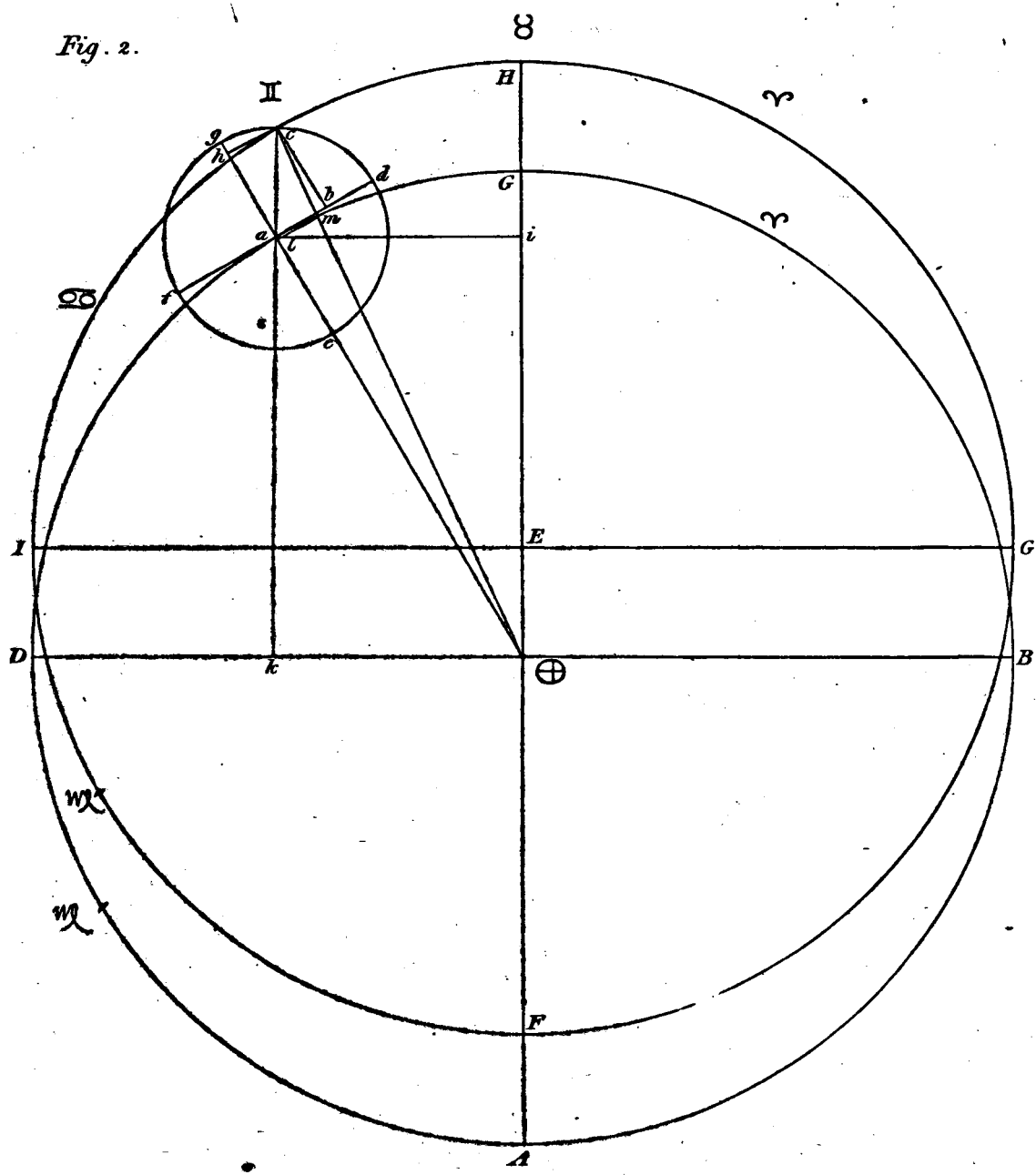


Fig. 2.



if $d\oplus$ be made radius, bd will be the tangent of the angle $b\oplus d$, required. The *Hindus* who have not the invention of *tangents*, take a different method, on principles equally true. They imagine the small circle or epicycle, $cdef$, drawn round the planet's mean place a with a radius equal to the excentricity, which in this case, of the sun, is $130' 30''$, and whose circumference in degrees, or equal divisions of the deferent $ABCD$, will be in proportion as their semi-diameters; or, as $\oplus C = 3438'$, to $ABCD = 360^\circ$, so $ag = 130' 32''$, to $efgd = 13^\circ 40'$, which is called the *paridbi-ansa* or *paridbi* degrees. In the same proportion also will be the correspondent sines bc and ai , and their co-sines cb and lk , which are therefore known by computation, in minutes, or equal parts of the radius $a\oplus$, which contains, as before mentioned $3438'$. In the right-angled triangle $b\oplus c$, right-angled at b , there are given the sides $b\oplus (= a\oplus + cb$, because $cb = ba$), and bc ; to find the hypotenuse $c\oplus$, by means of which the angle $a\oplus m$ may be determined; for its sine is lm , and, in the similar triangles $bc\oplus$ and $lm\oplus$, as $c\oplus$ is to $m\oplus$, so is bc to lm , the sine of the angle of equation. From the third to the ninth signs of anomaly, the cosine cb must be subtracted from the radius $3438'$ for the side $b\oplus$.

It is, however, only in computing the retrogradations and other particulars respecting the planets *Mercury*, *Venus*, *Mars*, *Jupiter* and *Saturn*, where circles greatly excentrick are to be considered, that the *Hindus* find the length of the *carna* or hypotenuse $c\oplus$; in other cases, as for the anomalistical equations of the sun and moon, they are satisfied to take bc as equal to the sine lm , their difference, as the commentator on the *Surya Siddhanta* observes, being inconsiderable.

Upon this hypothesis are the *Hindu* tables of anomaly computed with the aid of an adjustment, which, as far as I know, may be peculiar to themselves. Finding, that, in the first degree of anomaly both from the higher and lower apsis, the difference between the mean and observed places of the planets was greater than became thus accounted for, they enlarged the epicycle in the apogee and perigee, proportionably to that observed difference, for each planet respectively, conceiving it to diminish in inverse proportion to the sine of the mean anomaly, until at the distance of three signs, or half way between those points, the radius of the epicycle should be equal to the excentricity or sine of the greatest equation. This assumed difference in the magnitude of the epicycle, they called the difference of the *paridbianfa*, between *vishama* and *sama*, the literal meaning of which is *odd* and *even*. From the first to the third sign of anomaly, or rather in the third, a planet is in *vishama*; from the third to the sixth, or in the perigee, in *sama*; in the ninth sign, in

in *visbhama*; and in the twelfth, or the apogee, in *sama*. The *paridbi* degrees, or circumference of the epicycle, in *sama* are, of the sun 14° in *visbhama* $13^\circ 40'$; of the moon in *sama* 32° , in *visbhama*, $31^\circ 40'$; the difference assigned to each between *sama* and *visbhama*, $20'$.

To illustrate these matters by examples, let it be required to find the equation of the sun's mean, to his true place in the first degree of anomaly. The sine of 1° is considered as equal to its arc, or 60 .—The circumference of the epicycle in *sama*, or the *apogee*, is 14° , but diminishing in this case towards *visbhama*, in inverse proportion to the sine of anomaly.—Therefore, as radius 3438 is to the difference between *sama* and *visbhama* $20'$, so is the sine of anomaly $60'$ to the diminution of the epicycle in the point of anomaly proposed, $20''$ ($=\frac{60'+20'}{3438}$) which subtracted from 14° leaves $13^\circ 59' 40''$. Then, as the circumference of the great circle 360° is to the circumference of the epicycle $13^\circ 59' 40''$; so is the sine of anomaly $60'$ to its correspondent sine in the epicycle *bc*, which, as was observed, is considered as equal to *lm*, or true sine of the angle of equation $2' 19'' 56'''$ ($=\frac{13^\circ 59' 40'' + 60'}{360^\circ}$), which, in the *Hindu* canon of sines, is the same as its arc, and is therefore the equation of the mean to the true place in 1° of anomaly, to be added in the first six signs and subtracted in the last six.

For the equation of the mean to the true place in $5^\circ 14'$ of anomaly. The sine of $5^\circ 14'$ is $313' 36'' 8'''$ and $\frac{313' 36'' 8''' + 20' = 6272' 2'' 40'''}{3438} = 1' 49''$, to be deducted from the *paridbi* degrees in *sama*.— $14^\circ 1' 49'' = 13^\circ 58' 11''$, and $\frac{313' 36'' 8''' + 13^\circ 58' 11'' = 4379' 59'' 37'''}{360^\circ} = 14' 9'' 59'''$ the sine of the angle of equation, which is equal to its arc.

For the same in 14° of anomaly. The sine of 14° is $831' 36''$ $\frac{811' 36'' \times 20'}{3438} = 4' 50''$, and, $\frac{14^\circ - 4' 50'' \times 831' 36''}{360^\circ} = 32' 9''$ the sine of the angle of equation.

For the same in two signs of anomaly. The sine of 60° is $2978' \frac{2078' \times 20'}{3438} = 17' 19''$, and $\frac{14^\circ - 17' 19'' \times 2978'}{360^\circ} = 113' 25'' 20'''$, the sine of the equation, equal to its arc.

For the equation of the mean to the true place of the moon in 1° of anomaly. The *paridbi* degrees of the moon in *sama* are 32° , in *visbhama* $31^\circ 40'$, the difference $20'$. The sine of 1° is $60'$ and $\frac{60' \times 20'}{3438} = 21''$, to be deducted from the *paridbi* degrees in *sama*, $32^\circ - 21'' = 31^\circ 59' 39''$. $\frac{31^\circ 59' 39'' + 60'}{360^\circ} = 5' 20''$, the equation required.

For

For the same in ten degrees of anomaly. The sine of 10° is $597 \frac{597 \times 20'}{3438} = 3' 28''$, and $\frac{32^\circ - 3' 28'' \times 507'}{360^\circ} = 52' 58''$, the equation required.

For the same in three signs of anomaly. The sine of 90° is the radius or $3438'$, and $\frac{3438' \times 20'}{3438'} = 20'$, $\frac{32^\circ - 20' \times 3438'}{360^\circ} = 302' 25''$, the sine of the greatest angle of equation, equal to the radius of the epicycle in this point of anomaly, the arc corresponding with which is $302' 45''$, the equation required.

For the equation of the mean to the true motion in these several points of anomaly, say, as radius 3438 , is to the mean motion, so is the co-sine cb of the anomalistical angle gac in the epicycle, to the difference between the mean and apparent motion, or the equation required, to be subtracted from the mean motion in the first three signs of anomaly; added, in the next six; and subtracted in the last three.

EXAMPLE, for the sun, in $5^\circ 14'$ of anomaly. The co-sine of $5^\circ 14'$ in the *Hindu canon* is $3422' 17'' 52'''$. The *paridbi* circle in this point found before is $13^\circ 58' 11''$; and $\frac{3422' 17'' 52''' + 13^\circ 58' 11''}{360^\circ} = 132' 48''$, the co-sine cb in the epicycle; then, as radius $3438'$ is to the sun's mean motion $59' 8''$ per day, or $59' 8''$ per *danda*; so is the co-sine $cb = 132' 48''$, to the equation required, $2' 17''$ per day, or $2' 17''$ per *danda*. The motion of the sun's apsis is so slow as to be neglected in these calculations; but that of the moon's is considered, in order to know her mean motion from her apogee, which is $783' 54''$.

In this manner may be determined the equation of the mean to the true anomaly and motion for each degree of the quadrant, and which will be found to agree with the tables of *Macaranda*. The following tables are translated from that book:

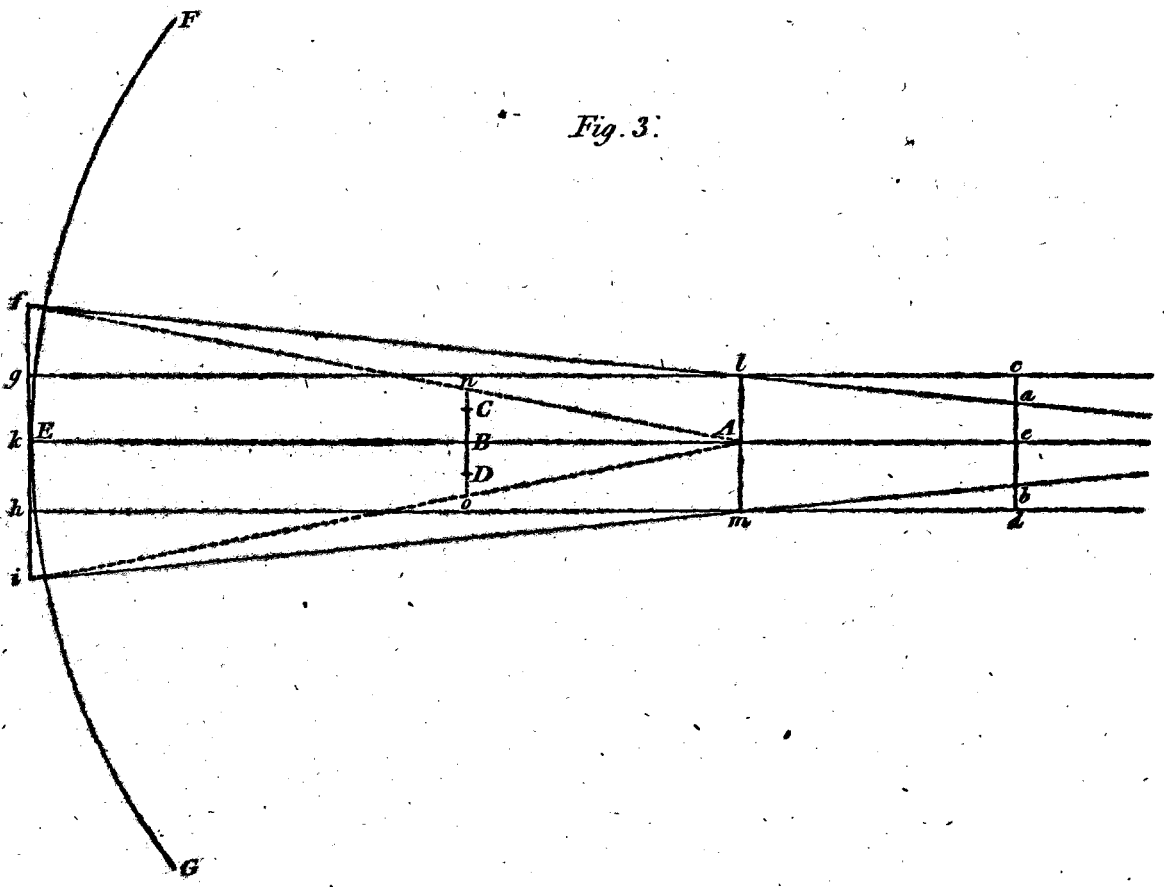
Solar Equations, Ravi p'hala.

Anomaly.	Eq. of the mean to the true place.			Eq. of the mean to the true motion.			Anomaly.	Eq. of the mean to the true place.			Eq. of the mean to the true motion.		
	o	i	"	o	i	"		o	i	"	o	i	"
1	2	20	2 18	31	1 8	—	1 55	61	1 54	30	1 4		
2	4	40	2 18	32	1 9	57	1 53	62	1 55	34	1		
3	7	—	2 18	33	1 11	57	1 53	63	1 56	35	58		
4	9	19	2 17	34	1 13	47	1 51	64	1 57	34	57		
5	11	37	2 17	35	1 15	40	1 51	65	1 58	34	55		
6	13	56	2 17	36	1 17	32	1 49	66	1 59	30	55		
7	16	15	2 16	37	1 19	23	1 47	67	2	—	23	52	
8	18	33	2 16	38	1 21	11	1 45	68	2	1 14	49	52	
9	20	51	2 15	39	1 22	57	1 43	69	2	2 4	46	49	
10	23	7	2 14	40	1 24	42	1 42	70	2	2 51	43	46	
11	25	23	2 14	41	1 26	26	1 40	71	2	3 35	41	43	
12	27	39	2 13	42	1 28	7	1 38	72	2	4 17	39	41	
13	29	55	2 13	43	1 29	46	1 36	73	2	4 57	37	39	
14	32	10	2 12	44	1 31	23	1 34	74	2	5 35	35	37	
15	34	24	2 11	45	1 32	58	1 32	75	2	6 12	32	35	
16	36	37	2 11	46	1 34	32	1 30	76	2	6 45	31	32	
17	38	39	2 10	47	1 36	4	1 29	77	2	7 17	28	31	
18	41	1	2 9	48	1 37	35	1 28	78	2	7 45	25	28	
19	43	12	2 8	49	1 39	6	1 28	79	2	8 12	23	25	
20	45	22	2 7	50	1 40	36	1 26	80	2	8 35	22	23	
21	47	31	2 6	51	1 42	3	1 23	81	2	8 58	20	22	
22	49	39	2 6	52	1 43	26	1 19	82	2	9 18	18	20	
23	51	47	2 5	53	1 44	45	1 16	83	2	9 36	15	18	
24	53	53	2 3	54	1 46	2	1 14	84	2	9 51	12	15	
25	55	57	2 2	55	1 47	17	1 13	85	2	10 3	10	12	
26	58	1	2 1	56	1 48	33	1 13	86	2	10 13	8	10	
27	1	—	2 1	57	1 49	47	1 12	87	2	10 20	6	8	
28	1 2	53	1 58	58	1 51	—	1 11	88	2	10 27	4	6	
29	1 4	3	1 57	59	1 52	12	1 11	89	2	10 31	1	4	
30	1 6	2	1 56	60	1 53	25	1 8	90	2	10 32	—	1	

Lunar Equations, Chandra p'hala.

Anomaly.	Eq. of the mean to the true place.			Eq. of the mean to the true motion.			Anomaly.	Eq. of the mean to the true place.			Eq. of the mean to the true motion.		
	o	i	"	o	i	"		o	i	"	o	i	"
1	5	26	69 39	31	2 36	37	59 20	61	4 25	26	33 41		
2	10	40	69 38	32	2 41	11	58 41	62	4 27	36	32 39		
3	16	—	69 31	33	2 45	36	58 —	63	4 29	59	31 35		
4	21	19	69 28	34	2 49	58	57 19	64	4 32	19	30 29		
5	26	36	69 21	35	2 54	20	56 37	65	4 34	37	29 22		
6	31	54	69 13	36	2 58	39	55 56	66	4 36	47	28 13		
7	37	12	69 4	37	3 2	54	55 14	67	4 38	54	27 7		
8	42	29	68 54	38	3 7	5	54 30	68	4 40	54	26 1		
9	47	44	68 43	39	3 11	12	53 44	69	4 42	50	24 55		
10	52	18	68 28	40	3 15	16	52 58	70	4 44	40	23 49		
11	58	11	68 11	41	3 19	18	51 26	71	4 46	24	22 42		
12	1 3	23	67 52	42	3 23	24	50 57	72	4 48	5	21 34		
13	1 8	40	67 35	43	3 27	26	50 48	73	4 49	38	20 24		
14	1 13	45	67 17	44	3 30	54	49 46	74	4 51	9	19 14		
15	1 18	53	66 55	45	3 34	39	48 54	75	4 52	53	18 3		
16	1 24	—	66 38	46	3 38	21	48 —	76	4 53	54	16 51		
17	1 29	5	66 18	47	3 41	58	47 5	77	4 55	6	15 38		
18	1 34	9	65 57	48	3 45	32	46 9	78	4 56	15	14 25		
19	1 39	10	65 36	49	3 48	59	45 13	79	4 57	17	13 14		
20	1 44	9	65 14	50	3 52	24	44 19	80	4 58	13	12 3		
21	1 49	17	64 50	51	3 55	46	43 27	81	4 59	6	10 53		
22	1 54	3	64 24	52	3 59	2	42 32	82	4 59	53	9 41		
23	1 58	3	63 56	53	4 2	13	41 37	83	5	—	8 34		
24	2 3	47	63 24	54	4 5	18	40 41	84	5	1 8	7 14		
25	2 8	35	62 53	55	4 8	18	39 44	85	5	1 40	6 2		
26	2 13	22	62 22	56	4 11	16	38 47	86	5	2 3	4 51		
27	2 18	6	61 48	57	4 14	11	37 50	87	5	2 20	3 40		
28	2 22	47	61 13	58	4 17	—	36 51	88	5	2 56	2 37		
29	2 27	35	60 35	59	4 19	46	35 48	89	5	2 44	1 44		
30	2 32	2	59 56	60	4 22	29	34 48	90	5	2 48	—		

Fig. 3.



Having the true longitude of the sun and moon, and the place of the node, determined by the methods explained, it is easy to judge, from the position of the latter, whether at the next conjunction or opposition there will be a solar, or a lunar, eclipse; in which case the *tit'bi*, or date of the moon's synodical month, must be computed, from thence to determine the time counted from midnight of her full or change. Her distance in longitude from the sun, divided by 720', the minutes contained in a *tit'bi*, or the thirtieth part of 360°, the quotient shows the *tit'bi* she has passed, and the fraction, if any, the part performed of the next, which, if it be the fifteenth, the difference between that fraction and 720' is the distance she has to go to her opposition, which will be in time proportioned to her actual motion, and that time being determined, her longitude, the longitude of the sun, and place of the node may be known for the instant of full moon, or middle of the lunar eclipse. The *Hindu* method of computing these particulars is so obvious in the accompanying instance, as to require no further description here, and the same may be said with respect to the declination of the sun, and the latitude of the moon.

It is evident from what has been explained, that the *Pandits*, learned in the *Jyōtish Śāstra*, have truer notions of the form of the earth and the economy of the universe than are ascribed to the *Hindus* in general; and that they must reject the ridiculous belief of the common *Brāhmens*, that eclipses are occasioned by the intervention of the monster *Rābu*, with many other particulars equally unscientific and absurd. But, as this belief is founded on explicit and positive declarations contained in the *Vēdas* and *Purānas*, the divine authority of which writings no devout *Hindu* can dispute, the astronomers have some of them cautiously explained such passages in those writings as disagree with the principles of their own science, and, where reconciliation was impossible, have apologized, as well as they could, for propositions necessarily established in the practice of it, by observing, that certain things, as stated in other *Śāstras*, "might have been so formerly and may be so still; but for astronomical purposes, astronomical rules must be followed." Others have with a bolder spirit attacked and refuted unphilosophical opinions: BHA'SCARA argues, that it is more reasonable to suppose the earth to be self-balanced in infinite space, than that it should be supported by a series of animals, with nothing assignable for the last of them to rest upon; and NERASINHA, in his commentary, shows that by *Rābu* and *Cētu*, the head and tail of the monster, in the sense they generally bear, could only be meant the position of the moon's nodes

and the quantity of her latitude, on which eclipses do certainly depend; but he does not therefore deny the reality of *Rábu* and *Cétu*; on the contrary, he says, that their actual existence and presence in eclipses ought to be believed, and may be maintained, as an article of faith, without any prejudice to astronomy. The following *Śloca*, to which a literal translation is annexed, was evidently written by a *Jyótiṣh*, and is well known to the *Pandits* in general:

Vip'balányanyaśástráni, vivádastēṣhu cévalam :

Sap'balam jyótiṣham śástram, chandrárcau yatra śácṣināu.

Fruitless are all other *Śástras*; in them is contention only: Fruitful is the *Jyótiṣh Śástra*, where the sun and moon are two witnesses.

The argument of VARA'HA ACHA'RYA concerning the monster *Rábu* might here be annexed, but, as this paper will without it be sufficiently prolix, I shall next proceed to show, how the astronomical *Pandits* determine the moon's distance and diameter, and other requisites for the prediction of a lunar eclipse.

The earth they consider as spherical, and imagine its diameter divided into 1600 equal parts, or *Yójanas*. An ancient method of finding a circle's circumference was to multiply the diameter by three; but this being not quite enough, the *Munis* directed that it should be multiplied by the square root of ten. This gives for the equatorial circumference of the earth in round numbers 5059 *Yójanas*, as it is determined in the *Súrya Siddhánta*. In the table of fines, however, found in the same book, the radius being made to consist of 3438 equal parts or minutes, of which equal parts the quadrant contains 5400, implies the knowledge of a much more accurate ratio of the diameter to the circumference; for by the first it is as 1. to 3.1627, &c. by the last, as 1. to 3.14136; and it is determined by the most approved labours of the Europeans, as 1. to 3.14159, &c. In the *Puránas* the circumference of the earth is declared to be 500,000,000 *Yójanas*; and, to account for this amazing difference the commentator before quoted thought, "the *Yójan*
" stated in the *Súrya Siddhánta* contained each 100,000 of those meant in the *Pu*
" *ránas*; or perhaps, as some suppose, the earth was really of that size in some
" former *Calpa*; moreover, others say, that from the equator southward the earth
" increases in bulk: however, for astronomical purposes, the dimensions given by
" SU'RYA must be assumed." The equatorial circumference being assigned, the circumference of a circle of longitude in any latitude is determined. As radius

3738 is to the *Lambajyà* or sine of the polar distance, equal to the complement of the latitude to ninety degrees, so is the equatorial dimension 5059, to the dimension in *Yòjans* required.

Of a variety of methods for finding the latitude of a place, one is by an observation of the *palabbà*, or shadow projected from a perpendicular *Gnomon* when the sun is in the equator. The *Sancu* or *Gnomon* is twelve *angulas* or digits in length, divided each into sixty *vingulas*, and the shadow observed at *Benares* is $5 \overset{\text{A}}{\underset{\text{V}}{45}}$.

Then, by the proportion of a right-angled triangle $\sqrt{12 \cdot 12 + 5 \cdot 45} = 13 \overset{\text{A}}{\underset{\text{V}}{18}}$ *acsha-carna* (hypothenufe) or distance from the top of the *Gnomon* to the extremity of the shadow; which take as radius, and the projected shadow will be the sine of the zenith distance, in this case equal to the latitude of the place $\frac{3438 \cdot 5 + 5 \cdot 45}{13 \cdot 18} = 1487'$, the arc corre-

sponding with which, in the canon of sines, is $25^{\circ} 26'$, the latitude of *Benares*. The sine complement of the latitude is $3101' 57''$, and again by trigonometry

$\frac{3101' 57'' + 5059 \cdot 38}{3438} = 4565$, 4 *Yòjans* the circumference of a circle of longitude in the latitude of *Benares*.

The longitude is directed to be found by observation of lunar eclipses calculated for the first meridian, which the *Súrya Siddhánta* describes as passing over *Lancá*, *Róbitaca*, *Avanti*, and *Sannibita-saras*. *Avanti* is said by the commentator to be "now called *Ujjayini*," or *Ougein*, a place well known to the *Englisb* in the *Mab-ratta* dominions. The distance of *Benares* from this meridian is said to be sixty-four *Yòjan* eastward, and as 4565 *Yòjan*, a circle of longitude at *Benares*, is to sixty ^{*Danda Pale*} *dandas* the natural day, so is sixty-four *Yòjan*, to 0 50, the difference of longitude in time, which marks the time after midnight, when, strictly speaking, the astronomical day begins at *Benares* *. A total lunar eclipse was observed to happen at *Benares* fifty-one *palas* later than a calculation gave it for *Lancá*, and $\frac{51 + 4565 \cdot 4}{60} =$ sixty-four *Yòjana*, the difference of longitude on the earth's surface.

According to Rennel's Map, in which may be found *Ougein*, and agreeably to the longitude assigned to *Benares*, the equinoctial point *Lancá* falls in the eastern

* "This day (*astronomical day*) is accounted to begin at midnight under the *ré'bi* (meridian) of *Lancá*; and at all places east or west of that meridian, as much sooner or later as is their *difántera* (longitude) reduced to time, according to the *Súrya Siddhánta*, *Bráhma Siddhánta*, *Vasúdháta Siddhánta*, *Sóma Siddhánta*, *Paráshera Siddhánta*, and *Aryabbatta*. According to *Bráhmagupta* and others, it begins at sunrise; according to the *Rómachá* and others it begins at noon, and according to the *Artha Siddhánta* at sunset." (*Ticá* on the *Súrya Siddhánta*.)

ocean southward from *Ceylon* and the *Maldiva* islands. *Lancá* is fabulously represented as one of four cities built by *Dévatás* at equal distances from each other, and also from *Suméru* and *Bádawánal*, the north and south poles, whose walls are of gold, &c. and with respect to MEYA's performing his famous devotions, in reward of which he received the astronomical revelations from the sun recorded in the *Súrya Siddhánta*, the commentator observes: "he performed those devotions "in *Sálmala* a country a little to the eastward of *Lancá*: the dimensions of *Lancá* "are equal to one twelfth part of the equatorial circumference of the earth," &c. Hence perhaps on inquiry may be found whether by *Sálmala* is not meant *Ceylon*. In the history of the war of RA'MA with RA'WAN the tyrant of *Lancá*, the latter is said to have married the daughter of an *Asúra* named MEYA: but these disquisitions are foreign to my purpose.

For the dimensions of the moon's *cacsá* (orbit) the rule in the *Sanscrit* text is more particular, than is necessary to be explained to any person, who has informed himself of the methods used by *European* astronomers to determine the moon's horizontal parallax. In general terms, it is, to observe the moon's altitude, and thence with other requisites to compute the time of her ascension from the sensible *csbitija*, or horizon, and her distance from the sun when upon the rational horizon; by which to find the time of her passage from the one point to the other; or, in other words, "to find the difference in time between the meridian, to which the "eye referred her at rising, and the meridian she was actually upon;" in which difference of time she will have passed through a space equal to the earth's semidiameter or 800 *Yójan*: and by proportion, as that time is to her periodical month, so is 800 *Yójan* to the circumference of her *cacsá* 324000 *Yójan*. The errors arising from refraction, and their taking the moon's motion as along the sine instead of its arc, may here be remarked; but it does not seem that they had any idea of the first *, and the latter they perhaps thought too inconsiderable to be noticed. Hence it appears, that they made the horizontal parallax 53' 20"; and her distance from the earth's centre 51570 *Yójan*; for $\frac{800 + 1600}{324000} = 53' 20''$; and as 90° or 5400' is, to the radius 3438' so is one fourth of her orbit 81000 *Yójan*, to 51570, and $\frac{51570 \times 21600}{5059} = 220184$, the same distance in geographical miles. *European* astronomers compute the mean distance of the moon about 240000, which is something above a

*. But they are not wholly ignorant of opticks: they know the angles of *incidence* and *reflection* to be equal, and compute the place of a star or planet, as it would be seen reflected from water or a mirror.

fifteenth part more than the *Hindus* found it so long ago as the time of MEYA, the author of the *Súrya Siddhánta*.

By the *Hindu* system the planets are supposed to move in their respective orbits at the same rate; the dimensions therefore of the moon's orbit being known, those of the other planets are determined, according to their periodical revolutions, by proportion. As the sun's revolutions in a *Mahá Yug* 4320000 are to the moon's revolutions in the same cycle 5753336, so is her orbit 324000 *Yójan* to the sun's orbit 4331500 *Yójan*; and in the same manner for the *cacsbás* or orbits of the other planets. All true distance and magnitude derivable from parallax is here out of the question; but the *Hindu* hypothesis will be found to answer their purpose in determining the duration of eclipses, &c.

For the diameters of the sun and moon it is directed, to observe the time between the appearance of the limb upon the horizon, and the instant of the whole disc being risen, when their apparent motion is at a mean rate, or when in three signs of anomaly; then, by proportion, as that time is to a natural day, so are their orbits to their diameters respectively, which of the sun is 6500 *Yójan*; of the moon, 480 *Yójan*. These dimensions are increased or diminished, as they approach the lower or higher apsis, in proportion as their apparent motion exceeds or falls short of the mean, for the purpose of computing the diameter of the earth's shadow at the moon, on principles which may perhaps be made more intelligible by a figure.

Let the earth's diameter be $lm=gb=cd$; the distance of the moon from the earth AB, and her diameter, CD. By this system, which supposes all the planets moving at the same rate, the dimensions of the sun's orbit will exceed the moon's, in proportion as his period in time exceeds her's; let his distance be AE, and EFG part of his orbit. According to the foregoing computation also, the sun's apparent diameter fi , at this distance from the earth, is 6500 *Yójan*, or rather, the angle his diameter subtends, when viewed in three signs of anomaly, would be 6500 parts of the circumference of a circle consisting of 4331500, and described round the earth as a centre with a radius equal to his mean distance, which is properly all that is meant by the *vishcambba*, and which, therefore, is increased or diminished according to his equated motion. This in three signs of anomaly is equivalent to $32^{\circ} 24''$; for, as 4331500 to 360° , so 6500 to $32^{\circ} 24''$. The *Europeans* determine the same to be $32^{\circ} 22''$. In the same manner, the sun's *vishcambba* in the mean *cacsbà* of the moon, or the portion of her orbit in *Yójan*s, included in this angle, is found, as 4331500, is to 324000, so is 6500 to 486 *Yójan* or *n, o*, of use in solar eclipses;

eclipses; but this I am endeavouring to explain is a lunar one: It is evident, that the diameter of the earth's shadow at the moon will be $c, d, -c, a, +b, d$, or ab when her distance is Ae ; and that ca and bd will be found by the following proportion as Ak , is to $fi - gb = fg + bi$, so is Ae to $ca + bd$. But it has been observed, that Ak and fi are proportioned by the *Hindus* according to the moon's distance Ae , the apparent motion of the sun and moon and the angles subtended by their diameters. The *Hindu* rule therefore, states: as the sun's *vijcambba* or diameter is to the moon's, so is the difference of the diameters of the sun and earth in *Yójan's*, to a fourth number, equal to $ca + bd$ to be subtracted from the *súcti*, or $lm = cd$ to find ab ; also, that the number of *Yójan's*, thus determined as the diameters of the moon and shadow, may be reduced to minutes of a great circle by a divisor of fifteen. For, as the minutes contained in $360^\circ = 21600$, are to the moon's orbit in *Yójan* 324000, so is one minute to fifteen *Yójan*.

The diameter of the moon's disc, of the earth's shadow, and the place of the node being found, for the instant of opposition or full moon, the remaining part of the operation differs in no respect, that I know of, from the method of *European* astronomers to compute a lunar eclipse. The translation of the formula for this purpose in the *Súrya Siddhánta* is as follows. "The earth's shadow is always six signs distant from *Súrya*, and *Cbandra* is eclipsed, whenever at the *purñimà* the *páta* is found there; as is also *Súrya*, whenever at the end of the *amávásyà* the *páta* is found in the place of *Súrya*; or, in either case, when the *páta* is nearly so situated. At the end of the *amávásyà* *tít'bi* the signs, degrees, and minutes of *Súrya* and *Cbandra* are equal, and at the end of the *purñimà* *tít'bi* the difference is exactly six signs; take therefore the time unexpired of either of those *tít'bis*, and the motion for that time add to the *madhyama*, and the degrees and minutes of *Súrya* and *Cbandra* will be equal. For the same instants of time compute the place of the *páta* in its retrograde motion, and if it should be in conjunction with *Súrya* and *Cbandra*, then, as from the intervention of a cloud, there will be an obscurity of *Súrya* or of *Cbandra*. *Cbandra* from the west approaches the earth's shadow, which on entering, he is obscured. For the instant of the *purñimà*, from the half sum of the *chandramána* and the *tamóliptamána* subtract the *vicsbépa*, the remainder is the *cb'channa*. If the *cb'channa* is greater * than the *grabyamána*, the eclipse will be total, and if less, the eclipse will be propor-

* Or, when the *cb'channa* and *grabyamána* are equal, the eclipse is *total*.

"tionally

tionally less. The *grabya* and *grábaca* deduct and also add, square the difference and the sum severally; subtract the square of the *vicśbēpa* from each of those squares, and the square root of each remainder multiply by sixty; divide each product by the difference of the *gati* of *Súrya* and *Cbandra*; the first quotient will be half the duration of the eclipse in *dandas* and *palas*; and the second quotient will be half the *vimarárdbha* duration in *dandas* and *palas*," &c. The *cb'channa*, or portion of the disc eclipsed, is here found in degrees and minutes of a great circle; it may also be estimated in *digits*, but the *angulas* or *digits* of the *Hindus* are of various dimensions in different books.

The beginning, middle, and end of the eclipse may now be supposed found for the time in *Hindu* hours, when it will happen after midnight; but, for the corresponding hour of the civil day, which begins at sunrise, it is further necessary to compute the length of the artificial day and night; and, for this purpose, must be known the *ayanánśa* or distance of the vernal equinox from the first of *mēśha*, the sun's right ascension and declination, which several requisites shall be mentioned in their order:

Respecting the precession of the equinoxes and place of the colure, the following is a translation of all I can find on the subject in the *Súrya Siddhanta* and its commentary.

Text: "The *ayanánśa* moves eastward thirty times twenty in each *Mabá Yug*; by that number (600) multiply the *abargana* (number of mean solar days for which the calculation is made) and divide the product by the *śávan* days in a *Yug*, and of the quotient take the *bbuja*, which multiply by three, and divide the product by ten; the quotient is the *ayanánśa*. With the *ayanánśa* correct the *graba*, *cránti*, the *cb'báyà*, *cbáradala*, and other requisites to find the *pushti* and the two *vishvas*. When the *carna* is less than the *śúrya cb'báyà*, the *práccbacra* moves eastward, and the *ayanánśa* must be added; and when more, it moves westward, and the *ayanánśa* must be subtracted.

Commentary: "By the text, the *ayana bbagana* is understood to consist of 600 *bbaganas* (periods) in a *Mabá Yug*; but some persons say, the meaning is thirty *bbaganas* only, and accordingly that there are 30000 *bbaganas*. Also that BHA"SCAR ACHA'RYA observes, that, agreeably to what has been delivered by *Súrya*, there are 30000 *bbaganas* of the *ayanánśa* in a *Calpa*. This is erroneous; for it disagrees with the *Sástras* of the *Rishis*. The *Sácalya Sanbità* states that the *bbaganas* of the *Cránti páta* in a *Mabá Yug* are 600 eastward. The same is ob-

" served

“ served in the *Vasishtha Siddhanta*, and the rule for determining the *ayanansa* is as follows: the expired years divide by 600, of the quotient make the *bbuja*, which multiply by three, and divide the product by ten. The meaning of BHASCAR ACHARYA was not, that SURYA gave 30000 as the *bbagana*s of the *ayanansa* in a *Calpa*, the name he used being *Saura* not *Surya*, and applied to some other book. From the *naiansa* is known the *crantyanasa*, and from the *crantijya* the *bbujajya*, the arc of which is the *bbujanasa* of *Surya*, including the *ayanansa*: this for the first three months; after which, for the next three months, the place of *Surya*, found by this mode of calculation, must be deducted from six signs. For the next three months the place of *Surya* must be added to six signs, and for the last three months the place of *Surya* must be deducted from twelve signs. Thus from the shadow may be computed the true place of *Surya*. For the same instant of time compute his place by the *abargana*, from which will appear whether the *ayanansa* is to be added or subtracted. If the place found by the *abargana* be less than the place found by the shadow, the *ayanansa* must be added. In the present time the *ayanansa* is added. According to the author of the *Varasambhita*, it was said to have been formerly deducted*; and the southern *ayana* of *Surya* to have been in the first half of the *nacshatra Aslesha*†; and the northern *ayana* in the beginning of *Dhanishtha*: that in his time the southern *ayana* was in the beginning of *Carcata*, or Cancer; and the northern in the beginning of *Macara*, or Capricorn.

“ The *bbagana*s of the *ayanansa* in a *Mabá Yug* are 600, the *saura* years in the same period 4320000; one *bbagana* of the *ayanansa* therefore contains 7200 years. Of a *bbagana* there are four *padas*. First *pada*: when there was no *ayanansa*; but the *ayanansa* beginning from that time and increasing, it was added. It continued increasing 1800 years; when, it became at its utmost or

* “ It was said to have been formerly *rina*.” In the *Hindu* specious arithmetick, or algebra, *dhana* signifies affirmation, or addition, and *rina* negation or subtraction; the sign of the latter is a point placed over the figure or the quantity noted down; thus, 4 added to 7, is equal to 3. See the *bija ganita*, where the mode of computation is explained thus: when a man has four pieces of money, and owes seven of the same value, his circumstances reduced to the form of an equation or his books balanced, show a deficiency of three pieces.

† This describes the place of the solstitial colure; and according to this account of the *ayanansa*, the equinoctial colure must then have passed through the tenth degree of the *nacshatra Bbarani* and the $3^{\circ} 20'$ of *Visubha*. The circumstance, as it is mentioned in the *Varasambhita*, is curious and deserving of notice. I shall only observe here, that, although it does not disagree with the present system of the *Hindus* in regard to the motion of the equinoctial points, yet the commentator on the *Varasambhita* supposes that it must have been owing to some preternatural cause. The place here described of the colure is on comparison of the *Hindu* and *European* spheres about $3^{\circ} 40'$ eastward of the position, which it is supposed by Sir I. NEWTON on the authority of EUDOXUS to have had in the *primitive* sphere at the time of the Argonautick expedition.

“ twenty-seven degrees. *Second páda*: after this it diminished; but, the amount
 “ was still added, until, at the end of 1800 years more, it was diminished to no-
 “ thing. *Third páda*: the *ayanánśa* for the next 1800 years was deducted; and
 “ the amount deducted at the end of that term was twenty-seven degrees. *Fourth*
 “ *páda*: the amount deduction diminished; and at the end of the next term of
 “ 1800 years, there was nothing either added or subtracted. The *Munis*, having
 “ observed these circumstances, gave rules accordingly: if in the *śávan* days of a
 “ *Mabá Yug* there are 600 *bbaganas*, what will be found in the *abargana* proposed?
 “ which statement will produce *bbaganas*, signs, &c. reject the *bbaganas*, and take
 “ the *bbuja* of the remainder, which multiply by three and divide by ten, because
 “ there are four *pádas* in the *bbagana*; for if in 90°, there is a certain number
 “ found as the *bbuja*; when the *bbuja* degrees are twenty-seven, what will be found?
 “ and the numbers twenty-seven and ninety used in the computation being in the
 “ ratio of three to ten, the latter are used to save trouble.

“ There is another method of computing the *ayanánśa*; the *cránti-pátá-gáti* is
 “ taken at one minute per year; and according to this rule the *ayanánśa* increases
 “ to twenty-four degrees; the time necessary for which as *one páda* is 1440 years.
 “ This is the *gati* of the *nacśhatras* of the *cránti mandala*.

“ The *nacśhatra Révati* rises, where the *nári mandala* and the *śbitija* intersect*,
 “ but it has been observed to vary twenty-seven degrees north and south. The
 “ same variation is observed in the other *nacśhatras*: it is therefore rightly said, that
 “ the *chakra* moves eastward. The *chakra* means all the *nacśhatras*. The planets
 “ are always found in the *nacśhatras*, and the *cránti-páta-gati* is owing to them, not
 “ to the planets; and hence it is observed in the text, that the *páta* draws *chandra*
 “ to a distance equal to the *cránti* degrees.”

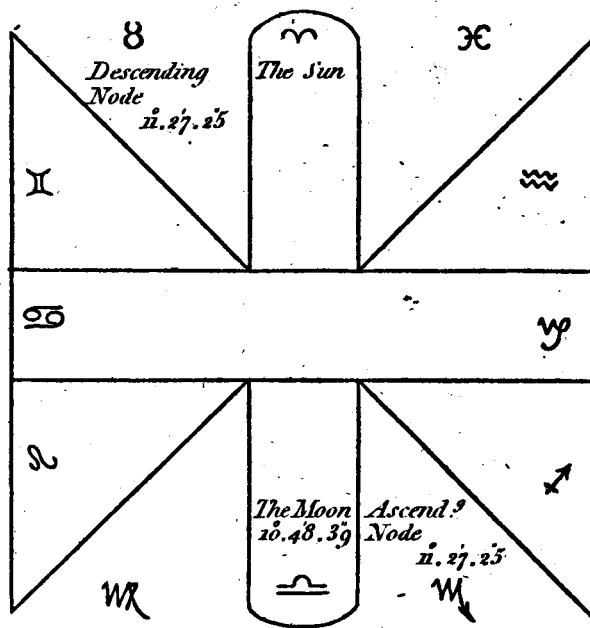
Here, to my apprehension, instead of a revolution of the equinoxes through all
 the signs in the course of the *Platonick* year, which would carry the first of *Vaiśákh*
 through all the seasons, is clearly implied a liberation of those points from the third
 degree of *Pisces* to the twenty-seventh of *Aries*, and from the third of *Virgo* to the

* This can happen only when there is no *ayanánśa*. The *nári mandala* is the equator. The *yóga* star of *Révati* is
 in the last of *Mina* (*Pisces*), or, which is the same, in the first of *Múśha* (*Aries*), and has no latitude in the *Hindu* tables.
 Hence from the *ayanánśa* and time of the beginning of the *Hindu* year may be known their *Zodiacal Stars*. *Révati*
 is the name of the twenty-seventh *Lunar* mansion, which comprehends the last 13° 20' of *Mina*. When the *ayanánśa*
 was 0, as at the creation, the beginning of the *Gali Yug*, &c. the colure passed through the *yóga* star of *Révati*. It
 is plain, that in this passage *Révati* applies either to the particular *yóga* star of that name, or to the last, or twenty-
 seventh, *Lunar* mansion in which it is situated. See a former note. In each *nacśhatra*, or planetary mansion, there is
 one star called the *yóga*, whose latitude, longitude and right ascension the *Hindus* have determined and inserted in their
 astronomical tables.

twenty-seventh of *Libra*, and back again, in 7200 years; but, as this must seem to *Europeans* an extraordinary circumstance to be stated in so ancient a treatise as the *Sūrya Siddhānta*, and believed by *Hindu* astronomers ever since, I hope the above quotations may attract the attention of those who are qualified for a critical examination of them, and be compared with whatever is to be found in other *Sāstras* on the same subject. Whatever may be the result of such an investigation, there is no mistaking the rule for determining the *ayanānta*, which was at the beginning of the present year $19^{\circ} 21'$, and consequently the vernal equinox in *Pisces* $19^{\circ} 39'$ of the *Hindu* sphere; or, in other words, the sun entered *Mēsha* or *Aries*, and the *Hindu* year began when he was advanced $19^{\circ} 21'$ into the northern signs, according to *European* expression.

The *ayanānta* added to the sun's longitude in the *Hindu* sphere, gives his distance from the vernal equinox: of the sun take the *bhuja*, that is, if it exceeds three signs, subtract it from six signs, if it exceeds six signs, subtract six from it; and if it exceeds nine signs, subtract it from twelve. The quantity so found will be the sun's distance from the nearest equinoctial point from which is found his declination—as radius is to the *paramāpacramajyā*, or sine of the greatest declination 24° , so is the sun's distance from the nearest equinoctial point to the declination sought; which will agree with the table of declination in present use, to be found in the tables of *Macaranda*, and calculated for the several degrees of the quadrant. The declination thus determined for one sign, two signs, and three signs, is $11^{\circ} 43' 20''$, $38'$, and the greatest declination or the angle of inclination of the ecliptick and equator 24° . The cosines of the same in the *Hindu* canon are 3366, 3217 and 3141; and, as the cosine of the declination for one sign, is to the cosine of the greatest declination, so is the sign of 30° to the sign of the right ascension for a point of the ecliptic at that distance from either of the two *visbhuvas*, or equinoctial points. In this manner is found the right ascension for the twelve signs of the ecliptick reckoned from the vernal equinox; and also, by the same management of triangles, the ascensional difference and oblique ascension for any latitude: which several particulars are inserted in the *Hindu* books as in the following table, which is calculated for *Bhāgalpur* on supposition that the *palabbā* or equinoctial shadow is $5^{\circ} 30'$. By the *Lagna* of *Lancā*, *Madhyama*, or mean *Lagna*, the *Hindus* mean those points of the equator which rise respectively with each thirtieth degree of the ecliptick counted from *Aries* in a right sphere, answering to the right ascension

Fig. 4.th



ascension in any latitude, by the *Lagna* of a particular place, the oblique ascension, or the divisions of the equator which rise in succession with each sign in an oblique sphere, and by the *chara* the ascensional difference.

Signs.	Lagna of Lancà.		Chara of Bhagalpur.		Ullagna.	
Hindu Names.	In respirations answering to minutes of the equator.	In palas or minutes of time 3600 to a Nachatra Day.	In respirations answering to minutes of the equator.	In palas or minutes of time 3600 to a Nachatra Day.	In respirations answering to minutes of the equator.	In palas or minutes of time 3600 to a Nachatra Day.
Mésha,	1670	278	327	55	1343	224
Vriṣha,	1795	299	268	45	1527	255
Mit'huna,	1935	323	110	18	1825	304
Carcata,	1935	323	110	18	2045	341
Sinha,	1795	299	268	45	2063	343
Canya,	1670	278	327	55	1997	333
Tulà,	1670	278	327	55	1997	333
Vriṣchica,	1795	299	268	45	2063	343
Dhanus,	1935	323	110	18	2045	341
Macara,	1935	323	110	18	1825	304
Cumbha,	1795	299	268	45	1527	255
Mina,	1670	278	327	55	1343	224
	21600	3600			21600	3600

The COMPUTATION of the ECLIPSE.

Let it be premised that the position of the sun, moon and nodes, by calculation, will on the first of next *Vaisâc'h* be as here represented in the *Hindu* manner, excepting the characters of the signs.

By inspection of the figure, and by considering the motion of the sun, moon, and nodes, it appears, that, when the sun comes to the sign *Tulà Libra*, corresponding with the month of *Cârtic*, the descending node will have gone back to *Aries*, and that consequently a *Lunar* eclipse may be expected to happen at the end of the *purimâ tit'bi*, or time of full moon, in that month.

FIRST OPERATION

To find the number of mean solar days from the creation to some part of the *purnimâ tit'bis* in *Cârtic* of the 4891st year of the *Cali Yug*.

Years expired of the <i>Calpa</i> to the end of the <i>Satya Yug</i> ,	1970784000
Deduct the term of BRAHMA'S employment in the creation,	17064000

From the creation, when the planetary motions began, to the end of the <i>Satya Yug</i> ,	1953720000
Add, the <i>Tréta Yug</i> ,	1296000
<i>Dwâpar Yug</i> ,	864000
Present year of the <i>Cali Yug</i> ,	4890

From the creation to the next approaching <i>Bengal</i> year,	1955884890
---------------------------------------------------------------	------------

Or Solar months ($\times 12$)	23470618680
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Add seven months,	72
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23470618680

As the solar months in a *Yug*, 51840000, are to the intercalary *lunar* months in that cycle 1593336, so are the solar months 23470618687, to their corresponding intercalary *lunar* months 721384677, which added together give 24192003364 lunations. This number multiplied by thirty produces 725760100920 *tit'bis* or *lunar* days, from the creation to the new moon in *Cârtic*, to which add fourteen *tit'bis* for the same, to the *purnimâ tit'bis* in that month 725760100934. Then, as the number of *tit'bis* in a *Yug*, 1603000080, is to their difference exceeding the mean solar days in that cycle (called *cfhaya tit'bis*) 25082252, so are 725760100934 *tit'bis* to their excess in number over the solar days 11356017987, which subtracted, leaves 714404082947, as the number of mean solar days from the creation, or when the planetary motions began, to a point of time which will be midnight under the first meridian of *Lancâ*, and near the time of full moon in *Cârtic* *. The first day after the creation being *Ravi-vâr*, or *Sunday*, divide the number of days by

* In the year of the *Cali Yug* 4891 corresponding with 1196 *Bengal* style, and with the month of *Osber* or *November* (hereafter to be determined) in the year of CHRIST 1789.

seven for the day of the week, the remainder after the division being two, marks the day *Sóma-vár*, or *Monday*.

SECOND OPERATION.

For the mean longitude of the sun, moon, and the ascending node. Say, as the number of mean solar days in a *Mahá-Yug*, is to the revolutions of any planet in that cycle, so are the days from the creation, to even revolutions, which reject, and the fraction if any, turned into signs, &c. is the mean longitude required.

1st. Of the Sun.

$$\frac{714404082947 \times 4320000}{1577917828} = (1955884890) \overset{\text{Revolutions.}}{6} \overset{\text{Signs.}}{22} \overset{\text{''}}{44} \overset{\text{'''}}{2} \overset{\text{''''}}{12}$$

2d. Of the Moon.

$$\frac{714404082947 \times 57753336}{1577917828} = (26147888255) 0 \overset{\text{''}}{21} \overset{\text{'''}}{21} \overset{\text{''''}}{58} \overset{\text{''''''}}{56}$$

3d. Of the Moon's Apogee.

$$\frac{714404082947 \times 488203}{1577917828} = (221034460) 11 \overset{\text{''}}{5} \overset{\text{'''}}{31} \overset{\text{''''}}{13} \overset{\text{''''''}}{35}$$

Correction of the *bija* add.

$$\frac{714404082947 \times 4}{1577917828} = (-----) 0 \overset{\text{''}}{37} \overset{\text{'''}}{37} \overset{\text{''''}}{52} \overset{\text{''''''}}{28}$$

$$11 \overset{\text{''}}{7} \overset{\text{'''}}{9} \overset{\text{''''}}{6} \overset{\text{''''''}}{3}$$

4th. Of the Moon's ascending Node.

$$\frac{714404082947 \times 232238}{1577917828} = (105147017) 4 \overset{\text{''}}{27} \overset{\text{'''}}{49} \overset{\text{''''}}{48} \text{---}$$

Correction of the *bija* add.

$$\frac{714404082947 \times 4}{1577917828} = (-----) 0 \overset{\text{''}}{1} \overset{\text{'''}}{37} \overset{\text{''''}}{52} \overset{\text{''''''}}{28}$$

$$4 \overset{\text{''}}{29} \overset{\text{'''}}{27} \overset{\text{''''}}{40} \overset{\text{''''''}}{28}$$

5th. Of the Sun's Apogee.

$$\frac{714404082947 \times 387}{1577917828} = (175-----) 2 \overset{\text{''}}{17} \overset{\text{'''}}{17} \overset{\text{''''}}{15} \text{---}$$

Of

	Mean longitude for midnight under the meridian of Lanka.	Deduct for the longi- tude of Bhágalpur as 8° 50' of the Equator east.	Mean longitude for midnight at Bhágalpur.
Of the Sun,	6s 21° 44' 2" 12"	1' 27"	6 21 42 35 12
Moon,	— 21 21 58 56	19 34	— 21 2 25 —
Node,	4 29 27 40 28	— 4	4 29 27 36 —
Sun's Apogee,	2 17 17 15 —	inconsiderable	2 17 17 16 —
Moon's Apogee,	11 7 9 6 3	— 9	11 7 8 57 —

THIRD OPERATION.

For the equated longitude of the Sun and Moon, &c.

1st. Of the Sun.

The mean longitude of the sun is 6s 21° 42' 35" 12"; of the apogee, 2 17 17 15; the difference, or mean anomaly, 4s 4° 25' 20"; its complement to 6 signs, or distance from the perigee, 1s 25° 34' 40"; the equation for which is required. This may either be taken from the foregoing table translated from *Maçaranda*, or calculated in the manner explained as follows:

The sine of 1s 25° 34' 40" is 2835' 31" and $\frac{2835' 31" \times 200}{3438} = 14' 30"$ to be subtracted from the *paridhi* degrees in *Jama*; 14°—14' 30" = 13° 53' 30", the circumference of the epicycle in this point of anomaly; and $\frac{13° 41' 30" \times 2835' 31"}{360°} = 108' 61"$ the sine of the angle of equation, considered as equal to its arc, or 1° 48' 6", to be deducted from the mean, for the true longitude; 6s 21° 42' 35" — 1° 48' 6" = 6s 19° 54' 29" for midnight agreeing with mean time; but as, in this point of anomaly, the true or apparent midnight precedes that estimated for mean time, for which the computation has been made, a proportionable quantity must be deducted from the sun's place, which is thus found. Say, as the minutes contained in the ecliptick are to the sun's mean motion in one day 59' 8", so is the equation of his mean to his true place 180' 6", to the equation of time required, 0' 18" ($= \frac{59' 8" \times 108' 6"}{21600}$) and 6s 19° 54' 29" — 18" = 6s 19° 54' 11" the sun's true longitude for the apparent midnight.

For the sun's true motion. The cosine of the sun's distance from the perigee is

* This longitude assigned to *Bhágalpur* is erroneous; but the error does not in the least affect the main object of the Paper.

1941' 0" 1", and $\frac{1941' 0'' \times 13' 43' 30''}{360^\circ} = 74'$ the cosine of the epicycle, and $\frac{59' 8'' \times 74''}{3438} = 1' 16''$ equation, to be added to the mean for the true motion $59' 8'' \times 1' 16'' = 60' 24''$ per day, or $60' 24''$ per *danda*.

2d. *Of the Moon.*

The moon's mean longitude for the mean midnight is $05' 21^\circ 2' 25''$, which exceeds her mean longitude for the true midnight, but $\frac{108 \times 790' 13''}{21600} = 3' 57''$ her motion in the difference of time between the mean and true midnight or $21^\circ 2' 25'' - 3' 57'' = 05' 20' 58' 28''$ mean longitude, for which the anomalistic equation is to be found. Place of the apogee $115' 7^\circ 8' 55''$, and the moon's distance from it $15' 13^\circ 49' 33''$. The sine of the latter, $2379' 39''$. By the rule before explained, $\frac{2379' 39'' \times 20''}{3438} = 13' 51''$ and $\frac{32^\circ - 13' 51'' \times 2379' 39''}{360} = 210'$, the sine of the angle of equation equal to its arc, or $3^\circ 30''$, to be subtracted, $05' 20' 58' 28'' - 3^\circ 30'' = 0^\circ 17' 28' 28''$ the moon's true place, agreeing with the true or apparent midnight.

For the moon's true motion. The cosine of her distance from the apogee 2479.13 . Circumference of the epicycle $31^\circ 46' 9''$, and $\frac{31^\circ 46' 9'' \times 2479' 13''}{360^\circ} = 218' 47''$ cosine in the epicycle. The moon's mean motion from her apogee is $790' 35'' - 6' 41'' = 783' 54''$, and $\frac{783' 54'' \times 218' 47''}{3438} = 49' 53''$ the equation of her mean to her true motion, to be subtracted, $790' 35'' - 49' 53'' = 740' 42''$ the moon's true motion per day, or $740' 42''$ per *danda*.

For the place of the moon's apogee reduced to the apparent midnight. The motion of the apogee is $6' 41''$ per day. $\frac{108' 6'' \times 6' 41''}{21600} = 2''$, $115' 7^\circ 8' 55'' - 2'' = 115' 7^\circ 8' 53''$ its place.

For the same of the node. Its motion per day is $3' 11''$, and $\frac{108' 6'' \times 3' 11''}{21600} = 1''$, and $45' 29^\circ 27' 36'' - 1'' = 45' 29^\circ 27' 35''$ its place.

The true longitude and motion, therefore, for the apparent time of midnight at *Bhagalpur*, 74404082947 solar days after the creation, or commencement of the planetary motions, will be

	Longitude.	Motion per Day.
Of the Sun,	06 19 54 11	60 24
Moon,	— 17 28 28	740 42
Sun's Apogee,	2 17 17 15	inconsiderable
Moon's Apogee,	11 7 8 53	6 41
Moon's Node,	— 4 29 27 35	3 11

FOURTH OPERATION.

Having the longitude and motion as above, to determine the *titi'bi* and time remaining unexpired to the instant of opposition or full moon.

The moon's longitude subtracted from the sun's leaves $55^{\circ} 27' 34'' 17''$, or $10654' 17''$, which divided by $720'$ the minutes in a mean *titi'bi* quotes fourteen even *titi'bi's* expired, and the fraction, or remainder $574' 17''$, is the portion expired of the 15th or *purnimà titi'bi*, which subtracted from $720'$ leaves $145' 43''$ remaining unexpired of the same; which, divided by the moon's motion per *dandà* from the sun, will give the time remaining unexpired from midnight to the instant of full moon with as much precision as the *Hindu* astronomy requires. Deduct the sun's motion $60' 24''$ per *dandà* from the moon's $740' 42''$, the remainder $680' 8''$, is the moon's motion from the sun; by this divide the part remaining unexpired of the *purnimà titi'bi* $145' 43''$.

$$\frac{145' 43'' = 524580'' \text{ D. P. } \overset{D. P.}{\div} 680' 8''}{680' 8'' = 40818''} = 12 \text{ } 51$$

therefore, 12 *dandas* 51 *palas* after midnight will be the end of the *purnimà titi'bi* or instant of opposition of the sun and moon.

FIFTH OPERATION.

Having the instant of opposition as above, to find the true longitude and motion of the sun and moon, the latitude of the latter, and the place of the node.

3. Add the mean motion of each for 12 51 to the mean place, found before for the true midnight; and for the mean places so found, compute again the anomalistical equations. This being but a repetition of operation, the third is unnecessary to be detailed. These several particulars are as follows:

	Mean longitude for midnight.	Mean longitude at full Moon.	Equation.	True longitude at full moon.
Of the Sun,	$6s 21^{\circ} 42' 17''$	$6s 21^{\circ} 54' 17''$	$1^{\circ} 47' 50''$	$6s 20^{\circ} 7' 7''$
Moon,	$— 20 58 28$	$— 23 47 47$	$3 40 20$	$— 20 7 27$
Moon's Apogee,	$11 7 8 55$	$11 7 10 21$		
Moon's Node.	$4 29 27 35$	$4 29 28 16$		

	Mean motion.	Equation.	True motion at full moon.
Of the Sun,	$59' 8''$	$\times 1' 16''$	$60' 24''$
Moon,	$79^{\circ} 35'$	$— 47' 28''$	$743 7$

Hence

Hence it appears, that at the opposition the moon will be near her descending node; for, $4s\ 29^{\circ}\ 28'\ 16'' + 6s = 10s\ 29^{\circ}\ 28'\ 16''$, the place of the descending node in antecedentia, and $12s - 10s\ 29^{\circ}\ 28'\ 16'' = 1s\ 0^{\circ}\ 31'\ 44''$ its longitude according to the order of the signs, and $1s\ 0^{\circ}\ 31'\ 44'' - 20^{\circ}\ 7'\ 27'' = 10^{\circ}\ 24'\ 17''$ the moon's distance from her descending node, which, being within the limit of a lunar eclipse, shews that the moon will be then eclipsed. For her latitude at this time, say, as radius, is to the inclination of her orbit to the ecliptick, $4^{\circ}\ 30'$ or $270''$, so is the sine of her distance from the node $620'\ 57''$; to her latitude $48'\ 45'' (= \frac{279'' + 620' \cdot 57''}{3438'})$.

SIXTH OPERATION.

From the elements now found, to compute the diameters of the moon and shadow, and the duration of the eclipse.

	Yojan.	
The Sun's mean diameter is	6500	
Moon's	480	
Earth's	1600	
Sun's mean motion,	59	8"
Moon's	790	35"
Sun's true motion,	60	24"
Moon's	743	7"
Moon's latitude,	48	45"

As the moon's mean motion is to her mean diameter, so is her true motion to her true diameter for the time of opposition $\frac{743' \cdot 7'' \times 480}{790 \cdot 35''} = 451\ 11\ Yojan$, which divided by fifteen quotes $30'\ 5''$ of a great circle.

As the sun's mean motion is to his mean diameter, so is his true motion to his diameter at the instant of opposition $\frac{60' \cdot 24'' \times 6500}{59' \cdot 8''} = 6639\ 14\ Yojan$.

As the moon's mean motion is the earth's diameter, so is the moon's equated motion to the *Súcbi*, or a fourth number, which must be taken as the earth's diameter, for the purpose of proportioning its shadow to the moon's distance and apparent diameter $\frac{160 \times 74' \cdot 7''}{790 \cdot 35''} = 1503\ 56\ Yojan$, the *Súcbi*.

Equated diameter of the sun,	6639 14
Of the Earth,	1503 56
	5039 14
Difference,	5039 14

As the sun's mean diameter is to the moon's mean diameter, so is the difference above 5039 14, to a fourth number, which deducted from the *Súcbi*, or equated diameter of the earth, leaves the diameter of the earth's shadow at the moon, $\frac{r}{6500} \times \frac{r}{5039 14} = 372. 7$, and $1503. 56 - 372. 7 = 1131, 49$ *Yójan*, which divided by fifteen quotes $75' 27''$ of a great circle, for the same.

From the half sum of the diameters of the moon and shadow $\frac{75' 27'' \times 30' 5''}{2} = 52' 46''$, subtract the moon's latitude $48' 45''$, the remainder is the *Cbck'anna*, or portion of the moon's diameter eclipsed, $4' 1''$ of a great circle, and by the nature of a right angled triangle, the square root of the difference of the squares of the moon's latitude, and the half sum of the diameters of the shadow and moon, will be the path of the moon's centre, from the beginning to the middle of the eclipse.

The diameter of the shadow is,	75 27
Of the moon, - - -	30 5
	105 32
Sum, -	105 32
	52 46
Half sum, -	52 46
	48 45

$\sqrt{52. 46^2 + 48. 45^2} = 20' 11''$ which, divided by the moon's motion from the sun, quotes the half duration of the eclipse, in *dandas* and *palas*, or *Hindu* mean solar hours, $\frac{20' 11'' \times 60}{682'' 43''} = 1 46 25$, which doubled is 3 32 50, the whole duration of the eclipse; which will be partial, the moon's latitude being greater than the difference between the semidiameters of the moon's disc and the earth's shadow.

SEVENTH OPERATION.

To find the position of the equinoctial colures, and thence the declination of the sun, the length of day and night, and the time counted from sunrise, or hour of the civil day when the eclipse will happen.

1st. For the *ayanánfa* or distance of the vernal equinox from the 1st of *Mesha*.

$\frac{714404082947 \times 600}{1577917828} = (271650) 8s 4^{\circ} 31' 30'' 52'''$ of which take the *bbuja* $8s 4^{\circ} 31' 30'' 52'''$ — $6s = 2s 4^{\circ} 31' 30'' 52'''$ which multiply by three, and divide by ten, $\frac{64^{\circ} 31' 30'' 52''' \times 3}{10} = 19^{\circ} 21' 27''$ the *ayanánfa*, which in the present age is added to the sun's longitude, to find his distance from the vernal equinox. The sun's equated longitude is $6s 19^{\circ} 54' 11''$, and $6s 19^{\circ} 54' 11'' \times 19^{\circ} 21' 27'' = 7s 9^{\circ} 15' 38''$ his distance from the vernal equinox.

2^d. For the declination, right ascension, and ascensional difference. The sun's place is $7s 9^{\circ} 15' 38''$, and $1s 9^{\circ} 15' 38''$ his distance from the autumnal equinox; the sine of which is $2174' 41''$, and as radius is to the sine of the greatest declination 24° , termed the *paramápáramajyà* $1397'$, so is $2174. 41$ to the sine of his declination $883' 40''$, the arc corresponding with which, in the canon of sines, is $14^{\circ} 53'$, $(\frac{110^{\circ} \times 2174' 41''}{3438} = 883' 40'')$. The equinoctial shadow at *Bhágapur* is $5, 30$ and, as the *Gnomon* of twelve *angalas* is to the equinoctial shadow, so is the sine of the declination $883. 40$, to the *csbitijyà*, $\frac{5 \times 30 \times 883' 40''}{5438} = 405' 1''$. And as the cosine of the declination is to radius, so is the *csbitijyà*, to the sine of the *chara* or ascensional difference $\frac{405' 1'' \times 3438}{3322. 36} = 419' 4''$, its arc is $419' 56''$ the ascensional difference.

3^d. For the length of the day and night.

The modern *Hindus* make their computations in mean solar time; the *Súrya Siddhánta* directs, that they be made in sydereal time. A sydereal day contains sixty *dandas*; each *dandas*, sixty *viculas*; and each *vicula* six respirations, in all 21600 respirations answering to the minutes of the equator. A *nacshatra* day is exceeded in length by the *stvan* or solar day, by reason of the sun's proper motion in the ecliptick, the former measures time equably, but the latter varies in its length from the inequality of the sun's motion, and the obliquity of the ecliptick. The sun's equated motion for the middle of the eclipse was found $60' 24''$; and the oblique ascension for the eighth sign from the vernal equinox, in which he will be found at that time, is taken from the foregoing table 343 palas or 2058 respirations.

As

As the number of the minutes contained in one sign 1800, is the number of respirations, or the arc of the equator in minutes answering to the oblique ascension of the sign the sun is in 2058, as above, so is the equated motion 60' 24", to the excels in respirations of the *śavan* or solar day over the *nacshatra* or sydereal day $\frac{2058' \times 60' 24''}{1800} = 69' 3''$, which added to 21600' gives the length of the solar day by civil account from sunrise to sunrise, sydereal time 21669. 3 respirations. From one fourth of this deduct the ascensional difference, the sun being declined towards the south pole, for the semidiurnal arc; and add it for the seminocturnal arc. The former is 4997' 19" and the latter 5837' 11"; which may be reduced to *dandas* or *Hindu* hours by a division of 360. Hence half the day is $13 \overset{D}{5} \overset{P}{2} \overset{V}{5} 3$, and half the night $16 \overset{D}{1} \overset{P}{2} \overset{V}{5} 2$. The whole day added to half the night shows the hour counted from the preceding sunrise to midnight $43 \overset{D}{5} \overset{P}{8} \overset{V}{3} 8$, to which add the time at midnight unexpired of the *ṣurnimā tī' bi*, for the hour of the civil day corresponding with the middle of the eclipse. The hour from midnight to the end of the *ṣurnimā tī' bi* is already found $12 \overset{D}{5} \overset{P}{1}$ in mean solar time, and to reduce it to sydereal time, say, as 21600' is to $21600' \times 59' 8''$, so is $12 \overset{D}{5} \overset{P}{1}$, to sidereal hours $12 \overset{D}{5} \overset{P}{3}$, equal to $12 \overset{D}{5} \overset{P}{1}$ solar hours.

From the preceding sunrise to midnight is,	-	-	-	-	-	$43 \overset{D}{5} \overset{P}{8} \overset{V}{3} 8$
At midnight will remain of the <i>ṣurnimā tī' bi</i>	-	-	-	-	-	$12 \overset{D}{5} \overset{P}{1}$
Hour of the civil day at the middle of the eclipse,	-	-	-	-	-	$56 \overset{D}{5} \overset{P}{2}$
Deduct the half duration,	-	-	-	-	-	$1 \overset{D}{4} \overset{P}{6} \overset{V}{2} 5$
Beginning of the eclipse,	-	-	-	-	-	$55 \overset{D}{5} \overset{P}{3} 5$
Add the whole duration,	-	-	-	-	-	$3 \overset{D}{3} \overset{P}{2} \overset{V}{5} 0$
End of the eclipse,	-	-	-	-	-	$58 \overset{D}{8} \overset{P}{3} \overset{V}{2} 5$

And the day and night containing together $60 \overset{D}{1} \overset{P}{1} \overset{V}{3} 0$, the eclipse should end $33 \overset{D}{5} \overset{P}{5}$ before sunrise according to this calculation.

The first day after the creation according to the *Hindus* was *ravi-vār* or *Sunday*: the number of days, for which the above calculation has been made, is 714404082947, which divided by seven, the number of days in a week are 12057726135 weeks and two days; the astronomical day therefore of *śoma-vār* or *Monday*, will end at midnight

midnight preceding the eclipse; but the *soma-vár* by civil computation will continue to the next ensuing sunrise, and this *soma-vár* by calculating the number of days elapsed from the instant the sun entered the sign *Tulà*, to his advance of $19^{\circ} 54'$ on that sign, will be found to fall on the 19th of the month of *Cártic*, answering to the 3d of November.

The time of full moon and the duration of the eclipse, found by this computation differ considerably from the Nautical Almanack. The *Siddhánta Rahasya* and *Grahálághava*, comparatively modern treatises, are nearer the truth, yet far from correct. The *Hindus*, in determining these phenomena, are satisfied when within a few minutes of the true time.

A comparative statement of this eclipse as predicted in the Nautical Almanack with computations of it made by different *Hindu* books. Those marked * are made for different meridians, the last I believe for *Tirbùt*.

N A M E S.	Equated longitude for midnight at <i>Bháralpur</i> , supposed in $8^{\circ} 50'$ E. from <i>Lan.à</i> , and 88° E. from <i>Greenwich</i> .					
	<i>The Sun.</i>		<i>The Moon.</i>		<i>The Node.</i>	
	S.	° ' "	S.	° ' "	S.	° ' "
Súrya Siddhánta, Tables of Macaranda, * <i>Grahálághava</i> , Siddhánta <i>Rahasya</i> ,	6	19 54 11	—	17 28 28	1	— 31 44
	6	19 55 9	—	17 30 9	1	— 32 7
	6	19 54 29	—	17 16 25	1	— 27-35
	Add to each the <i>ayarása</i> $19^{\circ} 21' 27''$ for the longitude counted according to <i>European</i> Astronomers from the Equinoctial colure.					
	S.	° ' "	S.	° ' "	S.	° ' "
Súrya Siddhánta, Tables of Macaranda, * <i>Grahálághava</i> , Siddhánta <i>Rahasya</i> ,	7	9 15 38	1	6 49 55	1	19 53 11
	7	9 16 36	1	6 52 36	1	19 53 54
	7	9 15 56	1	6 37 52	1	19 49 2
Nautical Almanack,	7	10 47 8	1	7 50 58	1	19 45 30
	From midnight to the middle of the Eclipse.			Duration of the Eclipse.		
	<i>Hindu time.</i>		<i>English time.</i>		<i>Hindu time.</i>	
	D.	P. V.	H.	M.	S.	D. P. V. H. M. S.
Súrya Siddhánta, Tables of Macaranda, * <i>Grahálághava</i> , Siddhánta <i>Rahasya</i> , * <i>Grahana Malá</i> , a Catalogue of Eclipses,	12	53 —	5	9	12	3 12 50 1 17 8
	*14	50 —	5	56	—	4 50 — 1 46 20
	13	53 —	5	33	—	5 18 — 1 56 36
	16	6 —	6	26	24	4 58 — 1 49 16
	16	6 —	6	26	24	5 26 — 2 10 24
Nautical Almanack,	16	— 37	6	24	15	5 22 2½ 2 9 —

XVI.

ON THE ANTIQUITY OF INDIAN ZODIAC.—*See the Works of Sir William Jones, Vol. I. p. 333.*

XVII.

AN ACCOUNT OF THE KINGDOM OF NEPAL, BY FATHER GIUSEPPE, PREFECT OF THE ROMAN MISSION.

Communicated by JOHN SHORE, Esq.

THE kingdom of *Népál* is situated to the north east of *Patna* at the distance of ten or eleven days' journey from that city. The common road to it lies through the kingdom of *Macwanpur*; but the missionaries and many other persons enter it on the *Bettia* quarter. Within the distance of four days' journey from *Népál* the road is good in the plains of *Hindustán*, but in the mountains it is bad, narrow, and dangerous. At the foot of the hills the country is called *Teriáni*: and there the air is very unwholesome from the middle of *March* to the middle of *November*; and people in their passage catch a disorder called, in the language of that country, *Aul*, which is a putrid fever, and of which the generality of people, who are attacked with it, die in a few days; but on the plains there is no apprehension of it. Although the road be very narrow and inconvenient for three or four days at the passes of the hills, where it is necessary to cross and recross the river more than fifty times, yet, on reaching the interior mountain before you descend, you have an agreeable prospect of the extensive plain of *Népál*, resembling an amphitheatre covered with populous towns and villages: the circumference of the plain is about 200 miles, a little irregular, and surrounded by hills on all sides, so that no person can enter or come out of it without passing the mountains.

There are three principal cities in the plain, each of which was the capital of an independent kingdom; the principal city of the three is situated to the northward of the plain, and is called *Cat'bmándú*: it contains about 18,000 houses; and this kingdom from south to north extends to the distance of twelve or thirteen days' journey as far as the borders of *Tibet*, and is almost as extensive from east to west. The king of *Cat'bmándú* has always about 50,000 soldiers in his service. The second
city

city to the south west of *Cat'hmándú* is called *Lelit Pattan*, where I resided about four years; it contains near 24,000 houses; the southern boundary of this kingdom is at the distance of four days' journey, bordering on the kingdom of *Macwanpur*. The third principal city to the east of *Lelit Pattan* is called *B'batgán*; it contains about 12,000 families, extends towards the east to the distance of five or six days' journey, and borders upon another nation, also independent, called *Cirátas*, who profess no religion. Besides these three principal cities, there are many other large and less considerable towns or fortresses, one of which is *Timi* and another *Cipoh*, each of which contains about 8,000 houses, and is very populous: all those towns both great and small are well built; the houses are constructed of brick, and are three or four stories high; their apartments are not lofty; they have doors and windows of wood well worked and arranged with great regularity. The streets of all their towns are paved with brick or stone, with a regular declivity to carry off the water. In almost every street of the capital towns there are also good wells made of stone, from which the water passes through several stone canals for the public benefit. In every town there are large square varandas well built, for the accommodation of travellers and the publick: these varandas are called *Pali*, and there are also many of them as well as wells in different parts of the country for publick use. There are also, on the outside of the great towns, small square reservoirs of water faced with brick, with a good road to walk upon, and a large flight of steps for the convenience of those who choose to bathe. A piece of water of this kind on the outside of the city of *Cat'hmándú* was at least 200 feet long on each side of the square, and every part of its workmanship had a good appearance.

The religion of *Népal* is of two kinds: the more ancient is professed by many people who call themselves *Baryesu*; they pluck out all the hair from their heads; their dress is of coarse red woollen cloth, and they wear a cap of the same: they are considered as people of the religious order, and their religion prohibits them from marrying, as it is with the *Lamas* of *Tibet*, from which country their religion was originally brought; but in *Népal* they do not observe this rule, except at their discretion; they have large monasteries, in which every one has a separate apartment or place of abode; they observe also particular festivals, the principal of which is called *Yátrà* in their language, and continues a month or longer according to the pleasure of the king. The ceremony consists in drawing an idol, which at *Lelit Pattan* is called *BAGHERO**, in a large and richly ornamented car, covered with gilt

* I suppose the name of *Bhagavat* or *Grihna*; but *Bhárja* is *Mahadeva*, and *Bajri* or *Vajri* means the *Thunderer*.
copper:

copper: round about the idol stand the king and the principal *Baryesus*; and in this manner the vehicle is almost every day drawn through some one of the streets of the city by the inhabitants, who run about beating and playing upon every kind of instrument their country affords, which make an inconceivable noise.

The other religion, the more common of the two, is that of the *Brábmens*, and is the same as is followed in *Hindustán*, with the difference that in the latter country the *Hindus* being mixed with the *Mohammedans*, their religion also abounds with many prejudices, and is not strictly observed, whereas in *Népál*, where there are no *Muselmans* (except one *Cashmirian* merchant) the *Hindu* religion is practised in its greatest purity: every day of the month they class under its proper name, when certain sacrifices are to be performed, and certain prayers offered up in their temples: the places of worship are more in number in their towns than, I believe, are to be found in the most populous and most flourishing cities of *Christendom*; many of them are magnificent according to their ideas of architecture, and constructed at a very considerable expence; some of them have four or five square cupolas, and in some of the temples two or three of the extreme cupolas, as well as the doors and windows of them, are decorated with gilt copper.

In the city of *Lelit Pattan* the temple of *BAGHERO* was contiguous to my habitation, and was more valuable, on account of the gold, silver and jewels it contained, than even the house of the king: besides the large temples there are also many small ones, which have stairs, by which a single person may ascend, on the outside all around them; and some of those small temples have four sides, others six, with small stone or marble pillars polished very smooth, with two or three pyramidal stories, and all their ornaments well gilt, and neatly worked according to their ideas of taste: and I think, that, if *Europeans* should ever go into *Népál*, they might take some models from those little temples, especially from the two which are in the great court of *Lelit Pattan*, before the royal palace: on the outside of some of their temples there are also great square pillars or single stones from twenty to thirty feet high, upon which they place their idols superbly gilt. The greatest number of their temples have a good stone staircase in the middle of the four squares, and, at the end of each flight of stairs, there are lines cut out of stone on both sides: around about their temples there are also bells, which the people ring on particular occasions; and when they are at prayers, many cupolas are also quite filled with little bells hanging with cords in the inside about the distance of a foot from each other, which make a great noise on the quarter where the wind conveys the sound.

There

There are not only superb temples in their great cities but also within their castles.

To the eastward of *Cat'bmándú* at the distance of about two or three miles there is a place called *Tolu*, by which there flows a small river, the water of which is esteemed holy according to their superstitious ideas, and thither they carry people of high rank, when they are thought to be at the point of death: at this place there is a temple, which is not inferior to the best and richest in any of the capital cities. They also have it on tradition, that, at two or three places in *Népál*, valuable treasures are concealed under ground: one of those places they believe is *Tolu*, but no one is permitted to make use of them except the king, and that only in cases of necessity. Those treasures, they say, have been accumulated in this manner: when any temple had become very rich from the offerings of the people, it was destroyed, and deep vaults dug under ground one above another, in which the gold, silver, gilt copper, jewels, and every thing of value were deposited. When I was in *Népál*, *GAINPREJAS*, king of *Cat'bmándú*, being in the utmost distress for money to pay his troops, in order to support himself against *PRIT'HWINA'RA'YAN*, ordered search to be made for the treasures of *Tolu*; and, having dug to a considerable depth under ground, they came to the first vault, from which his people took to the value of a lac of rupees in gilt copper, with which *GAINPREJAS* paid his troops, exclusive of a number of small figures in gold or gilt copper, which the people who had made the search had privately carried off: and this I know very well; because one evening as I was walking in the country alone, a poor man, whom I met on the road, made me an offer of a figure of an idol in gold or copper gilt, which might be five or six sicca weight, and which he cautiously preserved under his arm, but I declined accepting it. The people of *GAINPREJAS* had not completely emptied the first vault, when the army of *PRIT'HWINA'RA'YAN* arrived at *Tolá*, possessed themselves of the place where the treasure was deposited, and closed the door of the vault, having first replaced all the copper there had been on the outside.

To the westward also of the great city of *Lelit Pattan* at the distance of only three miles, is a castle called *Banga*, in which there is a magnificent temple: no one of the missionaries ever entered into this castle, because the people who have the care of it, have such a scrupulous veneration for this temple, that no person is permitted to enter it with shoes on; and the missionaries, unwilling to shew such respect to their false deities, never entered it. But when I was at *Népál*, this castle

being in the possession of the people of *Gore'ba*, the commandant of the castle and of the two forts which border on the road, being a friend of the missionaries, gave me an invitation to his house, as he had occasion for a little physick for himself and some of his people: I then, under the protection of the commandant, entered the castle several times, and the people durst not oblige me to take off my shoes. One day, when I was at the commandant's house, he had occasion to go into the varanda, which is at the bottom of the great court facing the temple, where all the chiefs dependent upon his orders were assembled, and where also was collected the wealth of the temple; and, wishing to speak to me before I went away, he called me into the varanda. From this incident I obtained a sight of the temple, and then passed by the great court which was in front: it is entirely marble almost blue, but interspersed with large flowers of bronze well disposed to form the pavement of the great court yard, the magnificence of which astonished me, and I do not believe there is another equal to it in *Europe*.

Besides the magnificence of the temples, which their cities and towns contain, there are many other rarities. At *Cat'hmándú* on one side of the royal garden there is a large fountain, in which is one of their idols called *Nárdyan*. This idol is of blue stone, crowned and sleeping on a mattress also of the same kind of stone, and the idol and the mattress appear as floating upon the water. This stone machine is very large: and I believe it to be eighteen or twenty feet long and broad in proportion, but well worked and in good repair.

In a wall of the royal palace of *Cat'bmándú*, which is built upon the court before the palace, there is a great stone of a single piece, which is about fifteen feet long, and four or five feet thick; on the top of this great stone, there are four square holes at equal distances from each other: in the inside of the wall they pour water into the holes, and in the court side, each hole having a closed canal, every person may draw water to drink: at the foot of the stone is a large ladder, by which people ascend to drink; but the curiosity of the stone consists in its being quite covered with characters of different languages cut upon it. Some lines contain the characters of the language of the country; others the characters of *Tibet*; others *Persian*; others *Greek*, besides several others of different nations; and in the middle there is a line of *Roman* characters; which appears in this form AVTOMNEW INTER LHIVERT; but none of the inhabitants have any knowledge how they came there, nor do they know whether or not any *European* had ever been in *Népál* before

before the missionaries, who arrived there only the beginning of the present century. They are manifestly two *French* names of seasons, with an English word between them.

There is also to the northward of the city of *Car'hmándú* a hill called *Simbi*, upon which are some tombs of the *Lamas* of *Tibet*, and other people of high rank of the same nation: the monuments are constructed after various forms; two or three of them are pyramidal, very high and well ornamented; so that they have a very good appearance, and may be seen at a considerable distance; round these monuments are remarkable stones covered with characters, which probably are the inscriptions of some of the inhabitants of *Tibet*, whose bones were interred there. The natives of *Népal* not only look upon the hill as sacred, but imagine it is protected by their idols! and from this erroneous supposition, never thought of stationing troops there for the defence of it, although it be a post of great importance, and only at a short mile's distance from the city: but during the time of hostilities a party of *PRIT'HWINA'RAYAN's* troops being pursued by those of *GAINPREJAS*, the former, to save themselves, fled to this hill, and, apprehending no danger from its guardian idols, they possessed themselves of it and erected a fortification (in their own style) to defend themselves: in digging the ditches round the fort, which were adjoining to the tombs, they found considerable pieces of gold, with a quantity of which metal the corpses of the grandees of *Tibet* are always interred, and when the war was ended, I myself went to see the monuments upon the hills.

I believe that the kingdom of *Népal* is very ancient, because it has always preserved its peculiar language and independence; but the cause of its ruin is the dissension which subsists among the three kings. After the death of their sovereign the nobles of *Lelit Pattan* nominated for their king *GAINPREJAS*, a man possessed of the greatest influence in *Népal*; but some years afterwards they removed him from his government, and conferred it upon the king of *Bbatgán*; but he also a short time afterwards was deposed; and, after having put to death another king who succeeded him, they made an offer of the government to *PRIT'HWINA'RAYAN*, who had already commenced war. *PRIT'HWINA'RAYAN* deputed one of his brothers, by name *DELMERDEN SA'H*, to govern the kingdom of *Lelit Pattan*, and he was in the actual government of it, when I arrived at *Népal*; but the nobles perceiving that *PRIT'HWINA'RAYAN* still continued to interrupt the tranquillity of the kingdom, they disclaimed all subjection to him, and acknowledged for their sovereign *DELMERDEN SA'H*, who continued the war against his brother *PRIT'HWI-*

NA'RAYAN:

NARA'YAN: but some years afterwards, they even deposed DELMERDEN SA'H, and elected in his room a poor man of *Lelit Pattan*, who was of royal origin.

The king of *Bb'atgán*, in order to wage war with the other kings of *Népal*, had demanded assistance from PRIT'HWI'NA'RAYAN: but seeing that PRIT'HWI'NA'RAYAN was possessing himself of the country, he was obliged to desist, and to take measures for the defence of his own possessions, so that the king of *Górc'bà*, although he had been formerly a subject of GAINPREJAS, taking advantage of the dissensions, which prevailed among the other kings of *Népal*, attached to his party many of the mountain chiefs, promising to keep them in possession, and also to augment their authority and importance; and, if any of them were guilty of a breach of faith, he seized their country as he had done to the kings of *Marecajis*, although his relations.

The king of *Górc'bà* having already possessed himself of all the mountains which surround the plain of *Népal*, began to descend into the flat country, imagining he should be able to carry on his operations with the same facility and success, as had attended him on the hills; and, having drawn up his army before a town, containing about 8000 houses, situate upon a hill called *Cirtipur*, about a league's distance from *Cat'bmándú*, employed his utmost endeavours to get possession of it: the inhabitants of *Cirtipur* receiving no support from the king of *Lelit Pattan*, to whom they were subject, applied for assistance to GAINPREJAS, who immediately marched with his whole army to their relief, gave battle to the army of the king of *Górc'bà*, and obtained a complete victory. A brother of the king of *Górc'bà* was killed on the field of battle; and the king himself, by the assistance of good bearers, narrowly escaped with his life by fleeing into the mountains: after the action, the inhabitants of *Cirtipur* demanded GAINPREJAS for their king, and the nobles of the town went to confer with him on the business, but, being all assembled in the same apartment with the king, they were all surprized and seized by his people. After the seizure of those persons, GAINPREJAS, perhaps to revenge himself of these nobles, for having refused their concurrence to his nomination as king, privately caused some of them to be put to death; another, by name DANUVANTA, was led through the city in a woman's dress, along with several others, clothed in a ridiculous and whimsical manner, at the expence of the nobles of *Lelit Pattan*. They were then kept in close confinement for a long time: at last, after making certain promises, and interesting all the principal men of the country in their behalf, GAINPREJAS set them at liberty.

The king of *Górc'ba*, despairing of his ability to get possession of the plain of *Népal* by strength, hoped to effect his purpose by causing a famine, and with this design, stationed troops at all the passes of the mountains to prevent any intercourse with *Népal*; and his orders were most rigorously obeyed, for every person who was found in the road, with only a little salt or cotton about him, was hung upon a tree; and he caused all the inhabitants of a neighbouring village to be put to death in a most cruel manner: even the women and children did not escape, for having supplied a little cotton to the inhabitants of *Népal*; and, when I arrived in that country at the beginning of 1769, it was a most horrid spectacle to behold so many people hanging on trees in the road. However the king of *Górc'ba* being also disappointed in his expectations of gaining his end by this project, fomented dissensions among the nobles of the three kingdoms of *Népal*, and attached to his party many of the principal ones by holding forth to them liberal and enticing promises, for which purpose he had about 2000 *Bráhmens* in his service. When he thought he had acquired a party sufficiently strong, he advanced a second time with his army to *Cirtipur*, and laid siege to it on the north west quarter; that he might avoid exposing his army between the two cities of *Cat'bmándú*, and *Lelit Pattan*. After a siege of several months, the king of *Górc'ba* demanded the regency of the town of *Cirtipur*, when the commandant of the town, seconded by the approbation of the inhabitants, dispatched to him by an arrow a very impertinent and exasperating answer. The king of *Górc'ba* was so much enraged at this mode of proceeding, that he gave immediate orders to all his troops to storm the town on every side: but the inhabitants bravely defended it, so that all the efforts of his men availed him nothing; and, when he saw that his army had failed of gaining the precipice, and that his brother named *SURUPARATNA* had fallen wounded by an arrow, he was obliged to raise the siege a second time and to retreat with his army from *Cirtipur*. The brother of the king was afterwards cured of his wound by our father *MICHAEL ANGELO*, who is at present in *Bettia*.

After the action the king of *Górc'ba* sent his army against the king of *Lamji*, (one of the twenty-four kings who reign to the westward of *Népal*) bordering upon his own kingdom of *Górc'ba*: after many desperate engagements an accommodation took place, with the king of *Lamji*: and the king of *Górc'ba* collecting all his forces, sent them for the third time to besiege *Cirtipur*, and the army on this expedition was commanded by his brother *SURUPARATNA*. The inhabitants of *Cirtipur* defended themselves with their usual bravery, and after a siege of several months.

months, the three kings of *Népál* assembled at *Cat'bmándú* to march a body of troops to the relief of *Cirtipur*: one day in the afternoon they attacked some of the *Tanas* of the *Górc'biens*, but did not succeed in forcing them, because the king of *Górc'hà's* party had been reinforced by many of the nobility, who to ruin *GAINPREJAS* were willing to sacrifice their own lives. The inhabitants of *Cirtipur* having already sustained six or seven months siege, a noble of *Lelit Pattan* called *DANUVANTA* fled to the *Górc'hà* party, and treacherously introduced their army into the town: the inhabitants might still have defended themselves, having many other fortresses in the upper parts of the town to retreat to; but the people at *Górc'hà* having published a general amnesty, the inhabitants greatly exhausted by the fatigues of a long siege, surrendered themselves prisoners upon the faith of that promise. In the mean time the men of *Górc'hà* seized all the gates and fortresses within the town; but two days afterwards *PRIT'HWINARAYAN*, who was at *Navacúta* (a long day's journey distant) issued an order to *SURUPARATNA*, his brother, to put to death some of the principal inhabitants of the town, and to cut off the noses and lips of every one, even the infants, who were not found in the arms of their mothers; ordering at the same time all the noses and lips, which had been cut off, to be preserved, that he might ascertain how many souls there were, and to change the name of the town into *Naskatapur*, which signifies the town of cut-noses, the order was carried into execution with every mark of horror and cruelty, none escaping, but those who could play on wind instruments; although father *MICHAEL ANGELO*, who, without knowing that such an inhuman scene was then exhibited, had gone to the house of *SURUPARATNA*, interceded much in favour of the poor inhabitants: many of them put an end to their lives in despair; others came in great bodies to us in search of medicines, and it was most shocking to see many living people with their teeth and noses resembling the skulls of the deceased.

After the capture of *Cirtipur*, *PRIT'HWINARAYAN* dispatched immediately his army to lay siege to the great city of *Lelit Pattan*. The *Górc'biens*, surrounded half the city to the westward with their *Tanas*, and, my house being situated near the gate of that quarter, I was obliged to retire to *Cat'bmándú* to avoid being exposed to the fire of the besiegers. After many engagements between the inhabitants of the town of *Lelit Pattan*, and the men of *Górc'hà*, in which much blood was spilled on both sides, the former were disposed to surrender themselves, from the fear of having their noses cut off, like those at *Cirtipur*, and also their right hands, a barbarity the *Górc'biens* had threatened them with, unless they would surrender within five days. One night all the *Górc'biens* quitted the siege of *Lelit Pattan* to
pursue

pursue the *English* army, which, under the command of Captain KINLOCH, had already taken *Siduli*, an important fort at the foot of the *Népal* hills, which border upon the kingdom of *Tirbüt*: but Captain KINLOCH not being able to penetrate the hills, either on the *Siduli* quarter or by the pass at *Hareapur*, in the kingdom of *Macwanpur*, the army of *Górc'ba* returned to *Népal* to direct their operations against the city of *Cat'bmándú*, where GAINPREJAS was, who had applied for succour to the *English*. During the siege of *Cat'bmándú* the *Bráhmens* of *Górc'ba* came almost every night into the city, to engage the chiefs of the people on the part of their king, and the more effectually to impose upon poor GAINPREJAS, many of the principal *Bráhmens* went to his house, and told him to persevere with confidence, that the chiefs of the *Górc'ba* army were attached to his cause, and that even they themselves would deliver up their king PRIT'HWINA'RAYAN to his hands. Having by these artifices procured an opportunity of detaching from his party all his principal subjects, tempting them with liberal promises according to their custom, one night the men of *Górc'ba* entered the city without opposition, and the wretched GAINPREJAS, perceiving he was betrayed, had scarce time to escape with about three hundred of his best and most faithful *Hindustáni* troops towards *Lelit Pattan*, which place however he reached the same night.

The king of *Górc'ba* having made himself master of *Cat'bmándú* in the year 1768, persisted in the attempt of possessing himself also of the city of *Lelit Pattan*, promising all the nobles, that he would suffer them to remain in the possession of their property, that he would even augment it; and, because the nobles of *Lelit Pattan* placed a reliance on the faith of his promises, he sent his domestick priest to make this protestation; that, if he failed to acquit himself of his promise, he should draw curses upon himself and his family even to the fifth, past and succeeding generation, so that the unhappy GAINPREJAS and the king of *Lelit Pattan*, seeing that the nobility were disposed to render themselves subject to the king of *Górc'ba*, withdrew themselves with their people to the king of *B'batgàn*: when the city of *Lelit Pattan* became subject to the king of *Górc'ba*, he continued for some time to treat the nobility with great attention, and proposed to appoint a viceroy of the city from among them. Two or three months afterwards, having appointed the day for making his formal entrance into the city of *Lelit Pattan*, he made use of innumerable stratagems to get into his possession the persons of the nobility, and in the end succeeded; he had prevailed upon them to permit their sons to remain at court as companions of his son; he had dispatched a noble of each house to *Navarút*, or *New Fort*, pretending that the apprehensions he entertained of them had prevented his

his making a public entrance into the city; and the remaining nobles were seized at the river without the town, where they went to meet him agreeably to a prior engagement. Afterwards he entered the city, made a visit to the temple of BAGHERO, adjoining to our habitation, and passing in triumph through the city amidst immense numbers of soldiers, who composed his train, entered the royal palace, which had been prepared for his reception; in the mean time parties of his soldiers broke open the houses of the nobility, seized all their effects, and threw the inhabitants of the city into the utmost consternation: after having caused all the nobles who were in his power to be put to death, or rather their bodies to be mangled in a horrid manner, he departed with a design of besieging *B'batgán*, and we obtained permission, through the interest of his son, to retire with all the *Christians* into the possessions of the *English*.

At the commencement of the year 1769, the king of *Górc'ba* acquired possession of the city of *B'batgán*, by the same expedients to which he owed his former successes, and on his entrance with his troops into the city, GAINPREJAS, seeing he had no resource left to save himself, ran courageously with his attendants towards the king of *Górc'ba*, and, at a small distance from his palanquin, received a wound in his foot, which a few days afterwards occasioned his death. The king of *Lelit Pattan* was confined in irons till his death, and the king of *B'batgán*, being very far advanced in years, obtained leave to go and die at *Banares*. A short time afterwards the mother of GAINPREJAS also procured the same indulgence, having from old age already lost her eye-sight; but before her departure they took from her a necklace of jewels; as she herself told me, when she arrived at *Patna* with the widow of her grand-son: and I could not refrain from tears, when I beheld the misery and disgrace of this blind and unhappy queen.

The king of *Górc'ba*, having thus in the space of four years effected the conquest of *Népal*, made himself master also of the country of the *Cirátas* to the east of it, and of other kingdoms, as far as the borders of *Cócb Bibár*: after his decease, his eldest son PRATA'P SINH held the government of the whole country; but scarcely two years after on PRATA'P SINH's death, a younger brother, by name BAHADAR SA'H, who resided then at *Bettia* with his uncle DELMERDEN SA'H, was invited to accept of the government, and the beginning of his government was marked with many massacres. The royal family is in the greatest confusion, because the queen lays claim to the government in the name of her son, whom she had by PRATA'P SINH; and perhaps the oath violated by PRIT'HWINARA'YAN will in the progress of time have its effect. Such have been the successors of the kingdoms of *Népal*, of which PRITWINARA'YAN had thus acquired possession.

ON THE CURE OF PERSONS BITTEN BY SNAKES.

By JOHN WILLIAMS, *Esq.*

THE following statement of facts relative to the cure of persons bitten by snakes, selected from a number of cases, which have come within my own knowledge, require no prefatory introduction; as it points out the means of obtaining the greatest self-gratification the human mind is capable of experiencing; that of the preservation of the life of a fellow-creature, and snatching him from the jaws of death, by a method which every person is capable of availing himself of. Eau de Luce, I learn from many communications which I have received from different parts of the country, answers as well as the pure Caustick Alkali Spirit; and though, from its having some essential oils in its composition, it may not be so powerful, yet, as it must be given with water, it only requires to encrease the dose in proportion; and, so long as it retains its milky white colour, it is sufficiently efficacious.

From the effect of a ligature applied between the part bitten and the heart, it is evident that the poison diffuses itself over the body by the returning venous blood; destroying the irritability, and rendering the system paralytick. It is therefore probable that the Volatile Caustick Alkali in resisting the disease of the poison, does not act so much as a specifick in destroying its quality, as by counteracting the effect on the system, by stimulating the fibres, and preserving that irritability which it tends to destroy.

C A S E I.

In the month of *August*, 1780, a servant of mine was bitten in the heel, as he supposed, by a snake; and in a few minutes was in great agony, with convulsions about the throat and jaws, and continual grinding of teeth: having a wish to try the effects of Volatile Alkali in such cases, I gave him about forty drops of Eau de Luce in water, and applied some of it to the part bitten; the dose was repeated every eight or ten minutes, till a small phial-full was expended: it was near two hours before it could be said he was out of danger. A numbness and pricking sensation was perceived extending itself up to the knee, where a ligature was applied so tight as to stop the returning venous blood, which seemingly checked the progress of the deleterious poison. The foot and leg, up to where the ligature was made, were

stiff and painful for several days ; and, which appeared very singular, were covered with a branny scale.

The above was the first case in which I tried the effects of the Volatile Alkali, and, apprehending that the essential oils in the composition of Eau de Luce, though made of the strong Caustick Volatile Spirit, would considerably diminish its powers. I was induced, the next opportunity that offered, to try the effects of pure Volatile Caustick Alkali Spirit, and accordingly prepared some from Quicklime and the Sal Ammoniack of this country.

C A S E II.

In July, 1782, a woman of the *Brábmén* cast, who lived in my neighbourhood at *Cbunár*, was bitten by a *Cobra de Capello* between the thumb and fore-finger of her right hand : prayers and superstitious incantations were practised by the *Brábméns* about her till she became speechless and convulsed, with locked jaws, and a profuse discharge of saliva running from her mouth. On being informed of the accident, I immediately sent a servant with a bottle of the Volatile Caustick Alkali Spirit, of which he poured about a tea-spoon-full, mixed with water, down her throat, and applied some of it to the part bitten : the dose was repeated a few minutes after, when she was evidently better, and in about half an hour was perfectly recovered.

This accident happened in a small hut, where I saw the snake, which was a middle-sized *Cobra de Capello* : the *Brábméns* would not allow it to be killed. In the above case, no other means whatever were used for the recovery of the patient than are here recited.

C A S E III.

A woman-servant in the family of a gentleman at *Benares* was bitten in the foot by a *Cobra de Capello* : the gentleman immediately applied to me for some of the Volatile Caustick Alkali, which I fortunately had by me. I gave her about sixty drops in water, and also applied some of it to the part bitten : in about seven or eight minutes after, she was quite recovered. In the above case, I was not witness to the deleterious effect of the poison on the patient ; but saw the snake after it was killed.

C A S E IV.

In July, 1784, the wife of a servant of mine was bitten by a *Cobra de Capello* on the out-side of the little toe of her right foot. In a few minutes she became convulsed,

vulsed, particularly about the jaws and throat, with a continued gnashing of the teeth. She at first complained of a numbness extending from the wound upwards, but no ligature was applied to the limb. About sixty drops of the Volatile Caustick Spirit were given to her in water, by forcing open her mouth, which was strongly convulsed: in about seven minutes the dose was repeated, when the convulsions left her; and in three more she became sensible, and spoke to those who attended her. A few drops of the spirit had also been applied to the wound. The snake was killed and brought to me, which proved to be a *Cobra de Capello*.

C A S E V.

As it is generally believed, that the venom of snakes is more malignant during hot dry weather, than at any other season, the following case, which occurred in the month of *July*, 1788, when the weather was extremely hot, no rain, excepting a slight shower, having fallen for many months, may not be unworthy notice.

A servant belonging to an Officer at *Juanpoor*, was bitten by a snake on the leg, about two inches above the outer ankle. As the accident happened in the evening, he could not see what species of snake it was: he immediately tied a ligature above the part bitten, but was in a few minutes in such exquisite torture from pain, which extended up his body and to his head, that he soon became dizzy and senseless. On being informed of the accident, I sent my servant with a phial of the Volatile Caustick Alkali, who found him, when he arrived, quite torpid, with the saliva running out of his mouth, and his jaws so fast locked, as to render it necessary to use an instrument, to open them and administer the medicine. About forty drops of the Volatile Caustick Spirit were given to him in water, and applied to the wound; and the same dose repeated a few minutes after. In about half an hour he was perfectly recovered. On examining the part bitten, I could discover the marks of three fangs; two on one side, and one on the other; and, from the distance they were asunder, I should judge it a large snake. More than ten minutes did not appear to have elapsed from the time of his being bitten, till the medicine was administered. The wounds healed immediately, and he was able to attend to his duty the next day. Though the species of snake was not ascertained, yet I judge from the flow of saliva from the mouth, convulsive spasms of the jaws and throat, as well as from the marks of three fangs, that it must have been a *Cobra de Capello*; and, though I have met with five and six fangs of different sizes in snakes of that species,
I never

I never observed the marks of more than two having been applied in biting in any other case, which came within my knowledge.

C A S E VI.

In *September, 1786*, a servant belonging to Captain S——, who was then at *Benares*, was bitten in the leg by a large *Cobra de Capello*: he saw the snake coming towards him, with his neck spread out in a very tremendous manner, and endeavoured to avoid him; but, before he could get out of his way, the snake seized him by the leg, and secured his hold for some time, as if he had not been able to extricate his teeth. Application was immediately made to his master for a remedy, who sent to consult me; but, before I arrived, had given him a quantity of sweet oil, which he drank. So soon as I saw him, I directed the usual dose of Volatile Caustick Alkali to be given, which fortunately brought away the oil from his stomach, or it is probable that the stimulating effect of the Volatile Spirit would have been so much blunted by it, as to have become inefficacious: a second dose was immediately administered, and some time after a third. The man recovered in the course of a few hours. As oil is frequently administered as a remedy in the bite of snakes, I think it necessary to caution against the use of it with the Volatile Alkali, as it blunts the stimulating quality of the spirit, and renders it useless.

Of the numerous species of snakes which I have met with, not above six were provided with poisonous fangs; though I have examined many which have been considered by the natives as dangerous, without being able to discover any thing noxious in them.

The following is an instance of the deleterious effect of the bite of a snake called by the natives *Krait*, a species of the *Boa*, which I have frequently met with in this part of the country.

C A S E VII.

On the *16th September, 1788*, a man was brought to me who had been bitten by a snake, with the marks of two fangs on two of his toes; he was said to have been bitten above an hour before I saw him: he was perfectly sensible, but complained of great pain in the parts bitten, with an universal languor. I immediately gave him thirty drops of the Volatile Caustick Alkali Spirit in water, and applied some of it to the wounds: in a few minutes he became easier, and in about half an hour was carried away by his friends, with perfect confidence in his recovery, without having
taken

taken a second dose of the medicine, which indeed did not appear to have been necessary; but, whether from the effect of the bite of the snake, or the motion of the dooly on which he was carried, I know not; but he became sick at the stomach, threw up the medicine, and died in about a quarter of an hour after. The man said, that the snake came up to him while he was sitting on the ground; and that he put him away with his hand once, but that he turned about and bit him as described: the snake was brought to me which I examined; it was about two feet and a half long, of a lightish brown colour on the back, a white belly, and annulated from end to end, which 208 abdominal, and forty-six tail scuta. I have met with several of them from thirteen inches to near three feet in length: it had two poisonous fangs in the upper jaw, which lay naked, with their points without the upper lip. It does not spread its neck like the *Cobra de Capello*, when enraged; but is very active and quick in its motion.

I have seen instances of persons bitten by snakes, who have been so long without assistance, that, when they have been brought to me, they have not been able to swallow, from convulsions of the throat and fauces, which is, I observe, a constant symptom of the bite of the *Cobra de Capello*: and indeed I have had many persons brought to me who had been dead some time; but never knew an instance of the Volatile Caustick Alkali failing in its effect, where the patient has been able to swallow it.

 XIX.

ON SOME ROMAN COINS FOUND AT NELORE.

To the PRESIDENT *of the* ASIATICK SOCIETY.

SIR,

I HAVE the honour to present you with an extract of a letter from Mr. ALEXANDER DAVIDSON, late Governor of *Madras*, giving an account of some *Roman Coins and Medals* lately found near *Nelôr*, together with a drawing of them copied from one transmitted by Mr. DAVIDSON; which, I imagine, may be acceptable to the *Asiatick* Society.

I have the honour to be,

Sir,

Your most obedient humble servant,

S. DAVIS.

Calcutta, March 20, 1788.

EXTRACT OF A LETTER FROM ALEXANDER DAVIDSON, ESQ.

DATED MADRAS, JULY 12, 1787.

A PEASANT near *Nelòr*, about 100 miles north-west of *Madràs*, was ploughing on the side of a stony craggy hill: his plough was obstructed by some brickwork: he dug, and discovered the remains of a small *Hindu* temple, under which a little pot was found with *Roman* Coins and Medals of the second century.

He sold them as old gold; and many no doubt were melted, but the *Nawáb* AMIRUL UMARA recovered upwards of thirty of them. This happened while I was governor; and I had the choice of two out of the whole. I chose an ADRIAN and a FAUSTINA.

Some of the TRAJANS were in good preservation. Many of the Coins could not have been in circulation: they were all of the purest gold, and many of them as fresh and beautiful as if they had come from the Mint but yesterday: some were much defaced and perforated, and had probably been worn as ornaments on the arm and others pending from the neck.

I send you drawings of my two Coins, and have no Objection to your publishing an account of them in the Transactions of the *Asiatick* Society. I received my information respecting them from the young *Nawáb*, and if my name be necessary to authenticate the facts I have related, you have my permission to use it.

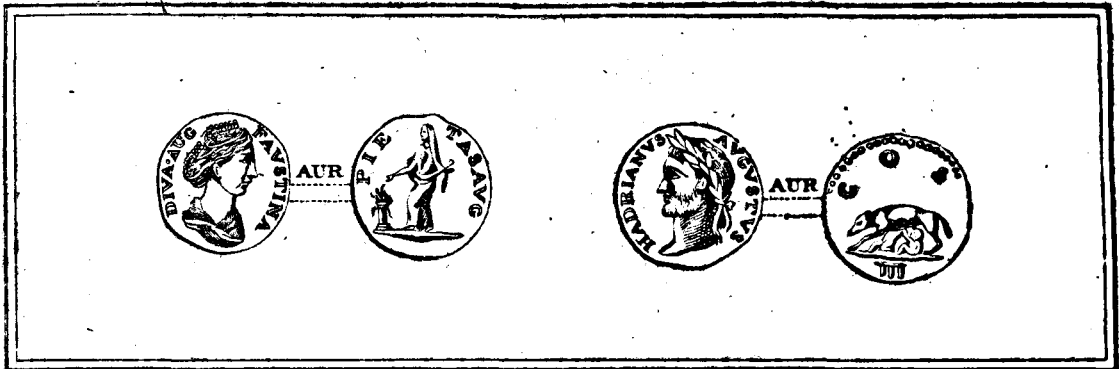
XX.

ON TWO HINDU FESTIVALS, AND THE INDIAN SPHINX.

By the late COLONEL PEARSE, May 12, 1785.

I BEG leave to point out to the Society, that the *Sunday* before last was the Festival of BHAVA'NI, which is annually celebrated by the *Gópas* and all other *Hindus*, who keep horned cattle for use or profit; on this feast they visit gardens, erect a pole in the fields, and adorn it with pendants and garlands. The *Sunday* before last was our *first* of *May*, on which the same rites are performed by the same class of people in *England*, where it is well known to be a relique of ancient superstition in that country: it should seem, therefore, that the religion of the East and the old religion

of



of *Britain* had a strong affinity. BHAVANI has another festival; but that is not kept by any one set of *Hindus* in particular, and this is appropriated to one class of people; this is constantly held on the ninth of *Baisac'h*; ~~which does not always fall on our first of May, as it did this year.~~ Those members of the Society, who are acquainted with the rules which regulate the festivals, may be able to give better information concerning this point: I only mean to point out the resemblance of the rites performed here and in *England*, but must leave abler hands to investigate the matter further, if it should be thought deserving of the trouble. I find, that the festival, which I have mentioned, is one of the most ancient among the *Hindus*.

I. During the *Huli*, when mirth and festivity reign among *Hindus* of every class, one subject of diversion is to send people on errands and expeditions, that are ~~to end in disappointment, and raise a laugh at the expence of the person sent.~~ The *Huli* is always in *March*, and the last day is the greatest holiday: all the *Hindus*, who are on that day at *Jagannat'h*, are entitled to certain distinctions, ~~which they hold to be of such importance,~~ that I found it expedient to stay there till the end of the festival; and I am of opinion, and so are the rest of the officers, that I saved above five hundred men by the delay. The origin of the *Huli* seems lost in antiquity; and I have not been able to pick up the smallest account of it.

If the rites of MAYDAY shew any affinity between the religion of *England* in times past and that of the *Hindus* in these times, may not the custom of making *April-fools*, on the first of that month, indicate some traces of the *Huli*? I have never yet heard any account of the origin of the *English* custom; but it is unquestionably very ancient, and is still kept up even in great towns, though less in them than in the country: with us it is chiefly confined to the lower classes of people; but in *India* high and low join in it; and the late SHUJA'UL DAULAH, I am told, was very fond of making *Huli-fools*, though he was a *Muselman* of the highest rank. They carry it here so far, as to send letters making appointments, in the names of persons, who, it is known, must be absent from their house at the time fixed on; and the laugh is always in proportion to the trouble given.

III. At *Jagannat'h* I found the *Sphinx* of the *Egyptians*, and present the Society with a drawing of it. MURARI Pandit, who was deputy *Faujdar* of *Balasor*, attended my detachment on the part of the *Mabratas*: he is now the principal *Faujdar*, and is much of the gentleman, a man of learning, and very intelligent. From him I learned, that the *Sphinx*, here called *Singh*, is to appear at the end of

the

the world, and, as soon as he is born, will prey on an elephant: he is, therefore, figured seizing an elephant in his claws, and the elephant is made small, to show that the *Singh*, even a moment after his birth, will be very large in proportion to it.

When I told MURARI, that the *Egyptians* worshipped a bull and chose the God by a black mark on his tongue, and that they adored birds and trees, he immediately exclaimed “ their religion then was the same with ours; for we also chose our “ *sacred bulls* by the *same marks*; we reverence the *bansa*, the *garura*, and other “ birds; we respect the *pippal* and the *vata* among trees, and the *tulasi* among “ shrubs; but as for onions (which I had mentioned), they are eaten by low men, “ and are fitter to be eaten than worshipped.”

REMARK BY THE PRESIDENT.

Without presuming to question the authority of MURARI *Pandit*, I can only say that several *Bráhmans*, now in *Bengal*, have seen the figure at *Jagannát's*, where one of the gates is called *Sinbadwar*; and they assure me, that they always considered it as a mere representation of a *Lion* seizing a young elephant; nor do they know, they say, any sense for the word *Sinba*, but a *Lion*, such as Mr. HASTINGS kept near his garden. The *Húli*, called *Hólácà* in the *Védas*, and *P'balgútsava* in common *Sanscrit* books, is the festival of the vernal season, or *Naurúz* of the *Persians*.

XXI.

A SHORT DESCRIPTION OF CARNICOBAR, BY MR. G. HAMILTON.

Communicated by Mr. ZOFFANY.

THE island, of which I propose to give a succinct account, is the northernmost of that cluster in the *Bay of Bengal*, which goes by the name of the *Nicobars*. It is low, of a round figure, about forty miles in circumference, and appears at a distance as if entirely covered with trees: however, there are several well cleared and delightful spots upon it. The soil is a black kind of clay, and marshy. It produces in great abundance, and with little care, most of the tropical fruits, such as pine-apples, plantains, papayas, cocoa-nuts, and areca-nuts; also excellent yams,
and

and a root called *cachu*. The only four-footed animals upon the island are hogs, dogs, large rats, and an animal of the lizard kind, but large, called by the natives *tolonqui*; these frequently carry off fowls and chickens. The only kind of poultry are hens, and those not in great plenty. There are abundance of snakes of many different kinds, and the inhabitants frequently die of their bites. The timber upon the island is of many sorts, in great plenty, and some of it remarkably large, affording excellent materials for building or repairing ships.

The natives are low in stature, but very well made, and surprizingly active and strong; they are copper-coloured, and their features have a cast of the *Malay*; quite the reverse of elegant. The women in particular are extremely ugly. The men cut their hair short, and the women have their heads shaved quite bare, and wear no covering but a short petticoat, made of a sort of rush or dry grass, which reaches half way down the thigh. This grass is not interwoven, but hangs round the person something like the thatching of a house. Such of them as have received presents of cloth-petticoats from the ships, commonly tie them round immediately under the arms. The men wear nothing but a narrow strip of cloth about the middle, in which they wrap up their privities so tight that there hardly is any appearance of them. The ears of both sexes are pierced when young, and by squeezing into the holes large plugs of wood, or hanging heavy weights of shells, they contrive to render them wide, and disagreeable to look at. They are naturally disposed to be good-humoured and gay, and are very fond of sitting at table with *Europeans*, where they eat every thing that is set before them; and they eat most enormously. They do not care much for wine, but will drink bumpers of arrack as long as they can see. A great part of their time is spent in feasting and dancing. When a feast is held at any village, every one that chooses goes uninvited, for they are utter strangers to ceremony. At those feasts they eat immense quantities of pork, which is their favourite food. Their hogs are remarkably fat, being fed upon the cocoa-nut kernel and sea-water: indeed all their domestic animals, fowls, dogs, &c. are fed upon the same. They have likewise plenty of small sea-fish, which they strike very dextrously with lances, wading into the sea about knee deep. They are sure of killing a very small fish at ten or twelve yards distance. They eat the pork almost raw, giving it only a hasty grill over a quick fire. They roast a fowl, by running a piece of wood through it, by way of spit, and holding it over a brisk fire, until the feathers are burnt off, when it is ready for eating, in their taste. They never drink water; only cocoa-nut milk and a liquor called *soura*,
 U U which

which oozes from the cocoa-nut tree after cutting off the young sprouts or flowers. This they suffer to ferment before it is used, and then it is intoxicating, to which quality they add much by their method of drinking it, by sucking it slowly through a small straw. After eating, the young men and women, who are fancifully dressed with leaves, go to dancing, and the old people surround them smoking tobacco and drinking *foura*. The dancers, while performing, sing some of their tunes, which are far from wanting harmony, and to which they keep exact time. Of musical instruments they have only one kind, and that the simplest. It is a hollow bamboo about $2\frac{1}{2}$ feet long and three inches in diameter, along the outside of which there is stretched from end to end a single string made of the threads of a split cane, and the place under the string is hollowed a little to prevent it from touching. This instrument is played upon in the same manner as a guitar. It is capable of producing but few notes; the performer however makes it speak harmoniously, and generally accompanies it with the voice.

What they know of physick is small and simple. I had once occasion to see an operation in surgery performed on the toe of a young girl, who had been stung by a scorpion or centipede. The wound was attended with a considerable swelling, and the little patient seemed in great pain. One of the natives produced the under jaw of a small fish, which was long, and planted with two rows of teeth as sharp as needles: taking this in one hand, and a small stick by way of hammer in the other, he struck the teeth three or four times into the swelling, and made it bleed freely: the toe was then bound up with certain leaves, and next day the child was running about perfectly well.

Their houses are generally built upon the beach in villages of fifteen or twenty houses each; and each house contains a family of twenty persons and upwards. These habitations are raised upon wooden pillars about ten feet from the ground; they are round, and, having no windows, look like bee-hives, covered with thatch. The entry is through a trap-door below, where the family mount by a ladder, which is drawn up at night. This manner of building is intended to secure the houses from being infested with snakes, and rats, and for that purpose the pillars are bound round with a smooth kind of leaf, which prevents animals from being able to mount; besides which, each pillar has a broad round flat piece of wood near the top of it, the projecting of which effectually prevents the further progress of such vermin as may have passed the leaf. The flooring is made with thin strips of bamboos laid at such distances from one another, as to leave free admission for
light

light and air, and the inside is neatly finished and decorated with fishing lances, nets, &c.

The art of making cloth of any kind is quite unknown to the inhabitants of this island; what they have is got from the ships that come to trade in cocoa-nuts. In exchange for their nuts (which are reckoned the finest in this part of *India*) they will accept of but few articles; what they chiefly wish for is cloth of different colours, hatchets and hanger blades, which they use in cutting down the nuts. Tobacco and arak they are very fond of, but expect these in presents. They have no money of their own, nor will they allow any value to the coin of other countries, further than as they happen to fancy them for ornaments; the young women sometimes hanging strings of dollars about their necks. However they are good judges of gold and silver, and it is no easy matter to impose baser metals upon them, as such.

They purchase a much larger quantity of cloth, than is consumed upon their own island. This is intended for the *Cboury* market. *Cboury* is a small island to the southward of theirs, to which a large fleet of their boats sails every year about the month of *November*, to exchange cloth for *Canoes*; for they cannot make these themselves. This voyage they perform by the help of the sun and stars, for they know nothing of the compass.

In their disposition there are two remarkable qualities. One is their entire neglect of compliment and ceremony, and the other, their aversion to dishonesty. A *Carnicobarian* travelling to a distant village upon business or amusement, passes through many towns in his way without perhaps speaking to any one: if he is hungry or tired he goes up into the nearest house, and helps himself to what he wants, and sits till he is rested, without taking the smallest notice of any of the family, unless he has business or news to communicate. Theft or robbery is so very rare amongst them, that a man going out of his house, never takes away his ladder, or shuts his door, but leaves it open for any body to enter that pleases, without the least apprehension of having any thing stolen from him.

Their intercourse with strangers is so frequent, that they have acquired in general the barbarous *Portuguese* so common over *India*; their own language has a sound quite different from most others, their words being pronounced with a kind of stop, or catch in the throat, at every syllable. The few following words will serve to shew those who are acquainted with other *Indian* languages, whether there is any similitude between them.

A man

A SHORT DESCRIPTION

A man,	<i>Kegonia.</i>	To eat,	<i>Gnia.</i>
A woman,	<i>Kecanna.</i>	To drink,	<i>Okk.</i>
A child,	<i>Cbu.</i>	Yams,	<i>T'ocla.</i>
To laugh,	<i>Ayelaur.</i>	To weep,	<i>Poing.</i>
A canoe,	<i>App.</i>	A pine apple,	<i>Frung.</i>
A house,	<i>Albanum.</i>	To sleep,	<i>Loom loom.</i>
A fowl,	<i>Hayám.</i>	A dog,	<i>T'amam.</i>
A hog,	<i>Hown.</i>	Fire,	<i>T'amia.</i>
Fish,	<i>Ka.</i>	Rain,	<i>Koomra.</i>

They have no notion of a God, but they believe firmly in the devil and worship him from fear. In every village there is a high pole erected with long strings of ground-rattans hanging from it, which, it is said, has the virtue to keep him at a distance. When they see any signs of an approaching storm, they imagine that the devil intends them a visit, upon which many superstitious ceremonies are performed. The people of every village march round their own boundaries, and fix up at different distances small sticks split at the top, into which split they put a piece of cocoa-nut, a wisp of tobacco, and the leaf of a certain plant: whether this is meant as a peace-offering to the devil, or a scarecrow to frighten him away, does not appear.

When a man dies, all his live stock, cloth, hatchets, fishing lances, and in short every moveable thing he possessed is buried with him, and his death is mourned by the whole village. In one view this is an excellent custom, seeing it prevents all disputes about the property of the deceased amongst his relations. His wife must conform to custom by having a joint cut off from one of her fingers; and, if she refuses this, she must submit to have a deep notch cut in one of the pillars of her house.

I was once present at the funeral of an old woman. When we went into the house, which had belonged to the deceased, we found it full of her female relations; some of them were employed in wrapping up the corpse in leaves and cloth, and others tearing to pieces all the cloth which had belonged to her. In another house hard by, the men of the village, with a great many others from the neighbouring towns, were sitting drinking *soura* and smoking tobacco. In the mean time two stout young fellows were busy digging a grave in the sand near the house. When the women had done with the corpse, they set up a most hideous howl, upon which the people began to assemble round the grave, and four men went up into the house to bring down the body; in doing this they were much interrupted by a
young

young man, son to the deceased, who endeavoured with all his might to prevent them, but finding it in vain, he clung round the body, and was carried to the grave along with it: there, after a violent struggle, he was turned away and conducted back to the house. The corpse being now put into the grave, and the lashings, which bound the legs and arms, cut, all the live stock, which had been the property of the deceased, consisting of about half a dozen hogs, and as many fowls, was killed, and flung in above it; a man then approached with a bunch of leaves stuck upon the end of a pole, which he swept two or three times gently along the corpse, and then the grave was filled up. During the ceremony, the women continued to make the most horrible vocal concert imaginable: the men said nothing. A few days afterwards, a kind of monument was erected over the grave, with a pole upon it, to which long strips of cloth of different colours were hung.

Polygamy is not known among them; and their punishment of adultery is not less severe than effectual. They cut, from the man's offending member, a piece of the foreskin proportioned to the frequent commission or enormity of the crime.

There seems to subsist among them a perfect equality. A few persons, from their age, have a little more respect paid to them; but there is no appearance of authority one over another. Their society seems bound rather by mutual obligations continually conferred and received; the simplest and best of all ties.

The inhabitants of the *Andamans* are said to be *Cannibals*. The people of *Carnicobar* have a tradition among them, that several canoes came from *Andaman* many years ago, and that the crews were all armed, and committed great depredations, and killed several of the *Nicobarians*. It appears at first remarkable, that there should be such a wide difference between the manners of the inhabitants of islands so near to one another; the *Andamans* being savage *Cannibals*, and the others, the most harmless inoffensive people possible. But it is accounted for by the following historical anecdote, which, I have been assured, is matter of fact. Shortly after the *Portuguese* had discovered the passage to *India* round the *Cape of Good Hope*, one of their ships, on board of which were a number of *Mozambique* negroes, was lost on the *Andaman* islands, which were till then uninhabited. The blacks remained in the island and settled it: the *Europeans* made a small shallop in which they sailed to *Pegu*. On the other hand, the *Nicobar* islands were peopled from the opposite main, and the coast of *Pegu*; in proof of which the *Nicobar* and *Pegu* languages are said, by those acquainted with the latter, to have much resemblance.

XXII.

THE DESIGN OF A TREATISE ON THE PLANTS OF INDIA. — *See the Works of Sir William Jones, Vol. II. p. 1.*

XXIII.

ON THE DISSECTION OF THE PANGOLIN.

In a Letter to GENERAL CARNAC from ADAM BURT, Esq.

Communicated by the GENERAL.

S I R,

IN compliance with your desire, I most willingly do myself the honour to present to you my observations and reflections on the dissection of one of those animals, of which we have a print, with a very short account, in the FIRST VOL. of the TRANSACTIONS of the ASIATIC SOCIETY. The animal, from which that likeness has been taken, was sent by Mr. LESLIE, from *Cbitra*, to the president Sir WILLIAM JONES. It is distinguished in the TRANSACTIONS by a name, which I do not at present remember; but probably the animal is of the same genus with the *Manis*, as described in the former edition of the ENCYCLOPÆDIA BRITANNICA, or, perhaps, not different from the *Pangolin* of BUFFON.

The representation of this animal in the MEMOIRS of the ASIATIC SOCIETY, makes it unnecessary for me to enter into any general description of its external figure and appearance. There are on each foot five claws, of which the outer and inner are small when compared with the other three. There are no distinct toes; but each nail is moveable by a joint at its root. This creature is extremely inoffensive. It has *no teeth*; and its feet are unable to grasp. Hence it would appear, that nature, having furnished it with a coat of mail for its protection, has, with some regard to justice, denied it the powers of acting with hostility against its fellow-creatures. The nails are well adapted for digging in the ground; and the
animal

animal is so dextrous in eluding its enemies by concealing itself in holes and among rocks that it is extremely difficult to procure one.

The upper jaw is covered with a cross cartilaginous ridge, which though apparently not at all suited to any purposes of mastication, may, by encreasing the surface of the palate, extend the sense of taste. The œsophagus admitted my forefinger with ease. The tongue at the bottom of the mouth is nearly about the size of the little finger, from whence it tapers to a point. The animal at pleasure protrudes this member a great way from the mouth. The tongue arises from the ensiform cartilage, and the contiguous muscles of the belly, and passes in form of a round distinct muscle from over the stomach, through the thorax, immediately under the sternum; and interior to the windpipe in the throat. When dissected out, the tongue could be easily elongated so as to reach more than the length of the animal, exclusive of its tail. There is a cluster of salivary glands seated around the tongue, as it enters the mouth. These will necessarily be compressed by the action of the tongue; so as occasionally to supply a plentiful flow of their secretion.

The stomach is *cartilagineus*, and analogous to that of the gallinaceous tribe of birds. It was filled with small stones and gravel, which in this part of the country are almost universally calcareous. The inner surface of the stomach was rough to the feel, and formed into folds, the interstices of which were filled with a frothy secretion. The guts were filled with a sandy pulp, in which, however, were interspersed a few distinct small stones. No vestiges of any animal or vegetable food could be traced in the whole primæ viæ. The gall-bladder was distended with a fluid resembling in colour and consistence the dregs of beer.

The subject was a female: its dugs were two, seated on the breast. The uterus and organs of generation were evidently those of a viviparous animal.

Forcibly struck with the phenomena, which this quadruped exhibited, my imagination at once overleaped the boundaries, by which science endeavours to circumscribe the productions and the ways of nature; and, believing with BUFFON, *que tout ce qui peut être est*, I did not hesitate to conjecture, that this animal might possibly derive its nourishment from mineral substances. This idea I accordingly hazarded in an address to Colonel KYD: the spirit of inquiry natural to that gentleman could be ill satisfied by ideas thrown out apparently at random; and he soon called on me to explain my opinion and its foundation.

Though we have perhaps no clear idea of the manner in which vegetables extract their

their nourishment from earth, yet the fact being so, it may not be unreasonable to suppose, that some animal may derive nutriment by a process somewhat similar. It appears to me, that facts produced by SPALLANZANI directly invalidate the experiments, from which he has drawn the inference, that fowls swallow stones merely from stupidity; and that such substances are altogether unnecessary to those animals. He reared fowls, without permitting them ever to swallow sand or stones; but he also established the fact, that carnivorous animals may become frugivorous, and herbivorous animals may come to live on flesh. A wood-pigeon he brought to thrive on putrid meat. The experiment on fowls, then, only corroborates the proof, that we have it in our power by habits to alter the natural constitution of animals. Again that eminent investigator of truth found, that fowls died when fed on stones alone; but surely that fact is far short of proving, that such substances are not agreeable to the original purposes of nature in the digestive process of these animals. When other substances shall have been detected in the stomach of this animal, my inference, from what I have seen, must necessarily fall to the ground. But if, like other animals with muscular and cartilaginous stomachs, this singular quadruped consume grain, it must be surprizing that no vestige of such food was found present in the whole alimentary canal, since in that thinly-inhabited country, the wild animals are free to feed without intrusion from man. Nor can it be inferred from the structure of the stomach, that this animal lives on ants or on insects. Animals devoured as food, though of considerable size and solidity, with a proportionally small extent of surface to be acted on by the gastric juice and the action of the stomach, are readily dissolved and digested by animals possessing not a cartilaginous, but a membranaceous, stomach, as for instance a frog in that of a snake.

In the stomach many minerals are soluble, and the most active things which we can swallow. Calcareous substances are readily acted on. Dr. PRIESTLEY has asked, "May not phlogistic matter be the most essential part of the food and support of both vegetable and animal bodies?" I confess, that Dr. PRIESTLEY's finding cause to propose the question, inclines me to suppose, that the affirmative to it may be true. Earth seems to be the basis of all animal matter. The growth of the bones must be attended with a constant supply, and in the human species there is a copious discharge of calcareous matter thrown out by the kidneys and salivary glands. May not the quadruped in question derive phlogiston from earth; salt, from mineral substances? And, as it is not deprived of the power of drinking water, what else is necessary to the subsistence of his corporeal machine?

Considering

Considering the scaly covering of this animal, we may conceive, that it may be at least necessary for its existence, on that account, to imbibe a greater proportion of earth than is necessary to other animals. It may deserve consideration, that birds are covered with feathers, which in their constituent principles approach to the nature of horn and bone. Of these animals the gallinaceous tribe swallow stones; and the carnivorous take in the feathers and bones of their prey: the latter article is known to be soluble in the membranaceous stomachs; and hence is a copious supply of the earthy principles. In truth I do not know, that any thing is soluble in the stomach of animals, which may not be thence absorbed into their circulating system, and nothing can be so absorbed without affecting the whole constitution.

What I have here stated is all that I could advance to the Colonel, but my opinion has been since not a little confirmed by observing the report of experiments by M. BRUQUATELLI of *Pavia*, on the authority of M. CRELL, by which we learn, that some birds have so great a dissolvent power in the gastric juice as to dissolve in their stomachs flints, rock crystal, calcareous stones, and shells.

I beg only farther to observe, that some things in BUFFON's description of the Pangolin, not apparently quite applicable to this animal, might have been owing to his description being only from the view of a dried preparation, in which the organs of generation would be obliterated and the dugs shrivelled away so as to be imperceptible: else that elegant philosopher could not have asserted that, "*tous les animaux quadrupedes, qui sont couverts d'écailles, sont ovipares.*"

Excuse my prolixity, which is only in me the necessary attendant of my superficial knowledge of things. In ingenuofness, however, I hope that I am not inferior to any man; and I am proud to subscribe myself,

Sir,

Your most obedient and humble servant,

ADAM BURT.

GVA, September 14, 1780.

A LETTER FROM DOCTOR ANDERSON TO SIR WILLIAM JONES.

DEAR SIR,

THE male *Lac* insect having hitherto escaped the observation of naturalists, I send the enclosed description made by Mr. WILLIAM ROXBURGH, Surgeon on this establishment, and Botanist to the Honourable Company, in hopes you will give it a place in the publication of your Society, as Mr. ROXBURGH's discovery will bring *Lac* a Genus into the Class Hemiptera of LINNÆUS.

I am, with esteem,

Dear Sir,

Your very obedient servant,

JAMES ANDERSON.

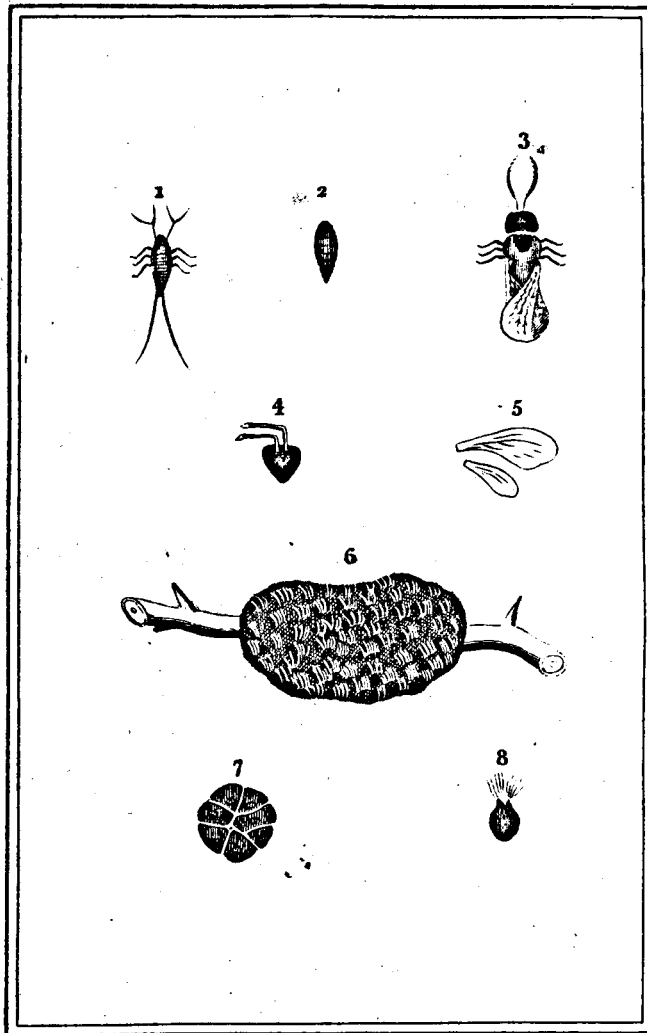
FORT ST. GEORGE, *January 2, 1790.*

XXIV.

ON THE LA'CSHĀ, OR LAC INSECT.

By Mr. W. ROXBURGH.

SOME pieces of very fresh-looking lac, adhering to small branches of *mimosa cinerea*, were brought me from the mountains on the 20th of last month. I kept them carefully, and to-day the 4th of *December*, fourteen days from the time they came from the hills, myriads of exceedingly minute animals were observed creeping about the lac, and branches it adhered to, and more still issuing from small holes over the surface of the cells: other small and perforated excrescences were observed with a glass amongst the perforations, from which the minute insects issued, regularly two to each hole, and crowned with some very fine white hairs. When the hairs were rubbed off, two white spots appeared.—The animals, when single, ran about pretty briskly, but in general they were so numerous as to be crowded over one another. The body is oblong, tapering most towards the tail, below plain, above convex, with a double, or flat margin: laterally on the back part of the thorax are two small tubercles which may be the eyes: the body behind the thorax is
crossed



crossed with twelve rings: legs six: feelers (antennæ) half the length of the body, jointed, hairy, each ending in two hairs as long as the antennæ: rump, a white point between two terminal hairs, which are as long as the body of the animal. The mouth I could not see. On opening the cells, the substance that they were formed of cannot be better described, with respect to appearance, than by saying it is like the transparent amber, that beads are made of: the external covering of the cells may be about half a line thick, is remarkably strong and able to resist injuries: the partitions are much thinner: the cells are in general irregular squares, pentagons and hexagons, about an eighth of an inch in diameter, and $\frac{1}{4}$ deep: they have no communication with each other: all those I opened, during the time the animals were issuing, contained in one half, a small bag filled with a thick red jelly-like liquor replete with what I take to be eggs; these bags, or utriculi, adhere to the bottom of the cells, and have each two necks, which pass through perforations in the external coat of the cells, forming the forementioned excrescences, and ending in some very fine hairs. The other half of the cells have a distinct opening, and contain a white substance, like some few filaments of cotton rolled together, and numbers of the insects themselves ready to make their exit: several of the same insects I observed to have drawn up their legs and to lie flat: they did not move on being touched, nor did they show any signs of life with the greatest irritation.

December 5. The same minute hexapodes continue issuing from their cells in numbers; they are more lively, of a deepened red colour, and fewer of the motionless sort. To day I saw the mouth: it is a flattened point about the middle of the breast, which the little animal projects on being compressed.

December 6. The male insects I have found to-day: a few of them are constantly running among the females most actively: as yet they are scarce more, I imagine, than one to 5000 females, but twice their size. The head is obtuse; eyes black, very large; antennæ clavated, feathered, about $\frac{1}{2}$ the length of the body: below the middle an articulation, such as those in the legs; colour between the eyes a beautiful shining green: neck very short: body oval, brown: abdomen oblong, the length of body and head: legs six: wings membranaceous, four, longer than the body, fixed to the sides of the thorax, narrow at their insertions, growing broader for $\frac{1}{3}$ of their length, then rounded: the anterior pair is twice the size of the posterior: a strong fibre runs along their anterior margins: they lie flat like the wings of a common flie, when it walks or rests: no hairs from the rump: it springs most actively to a considerable distance on being touched: mouth in the under part
of

of the head: maxillæ transverse. To-day the female insects continue issuing in great numbers, and move about as on the 4th.

December 7. The small red insects still more numerous, and move about as before: winged insects, still very few, continue active. There have been fresh leaves and bits of the branches of both *mimosa cinerea* and *corinda* put into the wide mouthed bottle with them: they walk over them indifferently without showing any preference nor inclination to work nor copulate. I opened a cell whence I thought the winged flies had come, and found several, eight or ten, more in it, struggling to shake off their incumbrances: they were in one of those utriculi mentioned on the 4th, which ends in two mouths, shut up with fine white hairs, but one of them was open for the exit of the flies; the other would no doubt have opened in due time: this utriculus I found now perfectly dry, and divided into cells by exceeding thin partitions. I imagine, before any of the flies made their escape, it might have contained about twenty. In these minute cells with the living flies, or whence they had made their escape, were small dry dark coloured compressed grains, which may be the dried excrements of the flies.

NOTE by the PRESIDENT.

The *Hindus* have six names for *Lac*; but they generally call it *Lacsba* from the multitude of small insects, who, as they believe, discharge it from their stomachs, and at length destroy the tree on which they form their colonies: a fine *Pippala* near *Crisbnanagar* is now almost wholly destroyed by them.

XXV.

THE SEVENTH ANNIVERSARY DISCOURSE, ON THE CHINESE.

—See the Works of Sir William Jones, Vol. I. p. 95.

XXVI.

THE TRANSLATION OF AN INSCRIPTION IN THE MAGA LANGUAGE ENGRAVED ON A SILVER PLATE FOUND IN A CAVE NEAR ISLA'MABA'D.

Communicated by JOHN SHORE, Esq.

ON the 14th of *Mágha* 904, *Cbáñdi Láb Rájà* *, by the advice of *Bowangari Rauli*, who was the director of his studies and devotions, and in conformity to the sentiments of twenty-eight other *Raulis*, formed the design of establishing a place of religious worship; for which purpose a cave was dug, and paved with bricks, three cubits in depth, and three cubits also in diameter, in which were deposited one hundred and twenty brazen images of small dimensions, denominated *Tabmúdas*; also, twenty brazen images larger than the former, denominated *Lángúda*; there was likewise a large image of stone called *Lángúdagári*, with a vessel of brass in which were deposited two of the bones of *T'bácur*: on a silver plate were inscribed the *Hauoa*, or the mandates of the deity; with that also styled *Taumab Cbuckfowna Tabma*, to the study of which twenty-eight *Raulis* devote their time and attention; who, having celebrated the present work of devotion with festivals and rejoicings, erected over the cave a place of religious worship for the *Magas* in honour of the deity.

God sent into the world BUDDHA AVATAR to instruct and direct the steps of angels and of men; of whose birth and origin the following is a relation: when BUDDHA AVATAR descended from the region of souls in the month of *Mágh*, and entered the body of MAHA'MAYA, the wife of SOOTAH DANNAH, Rájà of *Cailàs*, her womb suddenly assumed the appearance of clear transparent crystal, in which BUDDHA appeared, beautiful as a flower, kneeling and reclining on his hands. After ten months and ten days of her pregnancy had elapsed, MAHA'MAYA solicited permission from her husband the Rájà to visit her father, in conformity to which the roads were directed to be repaired and made clear for her journey; fruit-trees were planted; water vessels placed on the road-side; and great illuminations prepared for the occasion. MAHA'MAYA then commenced her journey, and ar-

* Perhaps, *Sándilyab*.

rived at a garden adjoining to the road, where inclination led her to walk and gather flowers : at this time, being suddenly attacked with the pains of child-birth, she laid hold on the trees for support, which declined their boughs at the instant, for the purpose of concealing her person, while she was delivered of the child ; at which juncture BRAHMA himself attended with a golden vessel in his hand, on which he laid the child, and delivered it to INDRA, by whom it was committed to the charge of a female attendant ; upon which the child, alighting from her arms, walked seven paces, whence it was taken up by MAHA'MAYA and carried to her house, and on the ensuing morning, news were circulated of a child being born in the *Raja's* family. At this time TAPASWI *Muni*, who, residing in the woods, devoted his time to the worship of the deity, learned by inspiration that BUDDHA was come to life in the *Raja's* palace : he flew through the air to the *Raja's* residence, where, sitting on a throne, he said, "I have repaired hither for the purpose of visiting the child." BUDDHA was accordingly brought into his presence : the *Muni* observed two feet fixed on his head, and, divining something both of good and bad import, began to weep and to laugh alternately. The *Raja* then questioned him with regard to his present impulse, to whom he answered : "I must not reside in the same place with BUDDHA, when he shall arrive at the rank of AVATAR : this is the cause of my present affliction, but I am even now affected with gladness by his presence, as I am hereby absolved from all my transgressions." The *Muni* then departed ; and, after five days had elapsed, he assembled four *Pandits* for the purpose of calculating the destiny of the child ; three of whom divined, that, as he had marks on his hand resembling a wheel, he would at length become a *Raja Chacraverti* ; another divined, that he would arrive at the dignity of *Avatar*.

The boy was now named SA'CYA, and had attained the age of sixteen years ; at which period it happened, that the *Raja* CHUHIDA'N had a daughter named VASUTA'RA, whom he had engaged not to give in marriage to any one, till such time as a suitor should be found, who could brace a certain bow in his possession, which hitherto many *Rajas* had attempted to accomplish without effect. SA'CYA now succeeded in the attempt, and accordingly obtained the *Raja's* daughter in marriage, with whom he repaired to his own place of residence.

One day, as certain mysteries were revealed to him, he formed the design of relinquishing his dominion ; at which time a son was born in his house whose name was RAGHU. SA'CYA then left his palace with only one attendant and a horse, and, having

having crossed the river GANGA, arrived at *Balucali*, where, having directed his servant to leave him and carry away his horse, he laid aside his armour.

When the world was created, there appeared five flowers, which BRAHMA deposited in a place of safety: three of them were afterwards delivered to the three *T'bacurs*, and one was presented to SA'CYA, who discovered that it contained some pieces of wearing apparel, in which he clothed himself, and adopted the manners and life of a mendicant. A traveller one day passed by him with eight bundles of grass on his shoulders, and addressed him, saying, "A long period of time has elapsed, since I have seen the *T'bacur*; but now since I have the happiness to meet him, I beg to present him an offering consisting of these bundles of grass." SA'CYA accordingly accepted of the grass, and reposed on it. At that time there suddenly appeared a golden temple containing a chair of wrought gold, and the height of the temple was thirty cubits, upon which BRAHMA alighted, and held a canopy over the head of SA'CYA: at the same time INDRA descended with a large fan in his hand, and NA'GA, the *Raja* of serpents with shoes in his hand, together with the four tutelary deities of the four corners of the universe; who all attended to do him service and reverence. At this time likewise the chief of *Asurs* with his forces arrived, riding on an elephant, to give battle to SA'CYA, upon which BRAHMA, INDRA, and the other deities deserted him and vanished. SA'CYA, observing that he was left alone, invoked the assistance of the Earth; who, attending at his summons, brought an inundation over all the ground, whereby the *Asur* and his forces were vanquished and compelled to retire.

At this time five holy scriptures descended from above, and SA'CYA was dignified with the title of *BUDDHA Avatâr*. The scriptures confer powers of knowledge and retrospection, the ability of accomplishing the impulses of the heart, and of carrying into effect the words of the mouth. SA'CYA resided here, without breaking his fast, twenty-one days, and then returned to his own country, where he presides over *Rajàs*, governing them with care and equity.

Whoever reads the *Cáric*, his body, apparel, and the place of his devotions must be purified; he shall be thereby delivered from the evil machinations of demons and of his enemies; and the ways of redemption shall be open to him. *BUDDHA Avatâr* instructed a certain *Rauli* by name ANGULI MĀLA in the writings of the *Cáric*, saying, "whoever shall read and study them, his soul shall not undergo a transmigration," and the scriptures were thence called *Anguli Málà*. There were likewise five other books of the *Cáric* denominated *Vachanam*, which if any one peruse

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peruse, he shall thereby be exempted from poverty and the machinations of his enemies ; he shall also be exalted to dignity and honours, and the length of his days shall be protracted : the study of the *Cáric* heals afflictions and pains of the body, and whoever shall have faith therein, heaven and bliss shall be the reward of his piety.

XXVII.

A SUPPLEMENT TO THE ESSAY ON INDIAN CHRONOLOGY. See
the Works of Sir William Jones, Vol. I. p. 315.

XXVIII.

ON THE SPIKENARD OF THE ANCIENTS. See *the Works of Sir William Jones, Vol. II. p. 9.*

APPENDIX.

METEOROLOGICAL DIARY,

KEPT AT CALCUTTA,

By *HENRY TRAIL, Esq.*

From 1st February 1784, to 31st December 1785.

REMARKS.

IN the following Diary of the Weather, begun the 1st of February 1784, every change in the air was marked down with the greatest precision three times every day, and always nearly at the same hours, viz. at sun-rising at three, or half past three o'clock in the afternoon, and at eleven o'clock at night.

While the wind continued southerly, the Thermometer was placed in a Verandah open to the Esplanade, where there was at all times a free circulation of air; and when the wind became northerly, the instrument was removed to the opposite side of the house, and equally exposed, as in the preceding part of the year.

The Barometer continued always in the same place.

The Hygrometer made use of, was a bit of fine sponge, suspended in a scale (on the end of a steel-yard) first prepared for more easily imbibing the moisture, by dipping it in a solution of Salt of Tartar, afterwards drying it well, and bringing it to an equilibrium by a weight in the opposite scale, at a time when the atmosphere appeared to have the least degree of moisture.

A semicircular scale at the top, divided from 0 to 90° on each side, with the needle of the yard, pointed out the quantity of moisture gained or lost daily; but in the following Diary the degrees of moisture have seldom been taken down.

Y y.

Every

Every fall of rain was likewise taken, and the quantity in cubick inches daily noted down.

The winds were also observed; and the figures 0, 1, 2, 3, 4, denote the force thereof.

Here it may be remarked; that at sun-rising, there is seldom or ever any wind; but no sooner is the air a little rarefied by its rays, than a little breeze begins, and this generally increases till about noon, when again it begins to lose its force, and dies away, from the same cause.

In order to ascertain the influence of the Moon upon the weather, the mean temperature, as well as the weight of the atmosphere of each quarter, is accurately marked down by taking in the three days preceding, and the three days after the change with the intermediate day. From these, the density is discovered, by the following rule given by Dr. *Bradely*, viz.

A, altitude of barometer; B, altitude of thermometer; D, density.

$$\frac{A}{B + 350} = D \text{—or density.}$$

N. B. In this, the mean morning density is only taken. However, the mean density for the whole may be found by the same rule.

January 1, 1785. From an examination of one year's observations on the influence of the Moon on the mercury in the Barometer, it does not appear that there is any certain rule to be laid down regarding it. However, it may be affirmed that the direction of the winds has more effect upon it, as we never fail to see the mercury highest when the wind blows from the NW; in a lesser degree from the N, and lowest of all when it proceeds from the SE quarters.

A P P E N D I X.

A GENERAL STATE of the WEATHER, for FEBRUARY 1784.

	M.	N.	E.	
Greatest altitude of the Thermometer, - - - - -	75 ^o	86	76	} 74 $\frac{1}{2}$ Mean temperature;
Least ditto, - - - - -	66	70	68	
Mean ditto, - - - - -	72	79	73	
Clear, - - - - -	3 days.			
Cloudy, - - - - -	26 do.			
N ^o days on which it rained, 8 do.				
Quantity of rain, - - - - -	4-2 Inch.			

THIS month, the wind very variable, and the atmosphere for the most part cloudy, and sometimes several days succeeding without any sun—the air also damp and cold. Frequently thunder; and on the 8th, there was a fall of hail in the afternoon accompanied with thunder.
THE mornings generally foggy.

C A L C U T T A, F E B R U A R Y, 1784

Day.	Thermometer.			Mean morning density, of each quarter of the Moon.	Rain Inch.	Wind.		Appearance of the air.	REMARKS.
	M.	N.	E.			Point.	Force		
1	68	75	72	} Full M. 70 $\frac{3}{4}$	}	W	0	Cloudy,	SUNDAY.
2	68	78	73			N	0	ditto,	Heavy, with a great appearance of rain.
3	67	74	69			NE	0	ditto,	Ditto.
4	68	77	68			S	0	ditto,	Ditto.
5	71	79	72			SW	1	ditto,	Ditto.
6	72	80	74			NW	1	ditto,	A thick fog all day.
7	71	82	75			S	2	Clear,	
8	70	80	74	} L. Q. 71 $\frac{1}{2}$	}		1	Cloudy,	Some hail in the afternoon with thunder.
9	74	80	75				2	ditto,	A great appearance of rain; very dark.
10	75	80	74				2	ditto,	Ditto few drops of rain
11	71	77	75				1	ditto,	Ditto ditto.
12	73	79	76				1	ditto,	Ditto ditto.
13	73	80	74				3	ditto,	Much thunder this morning with a heavy shower.
14	74	80	75				2	ditto,	
15	70	82	72				1	ditto,	
16	72	78	74				2	ditto,	
17	70	81	72				0	Clear,	
18	69	76	72	} New M. 70 $\frac{3}{4}$	}	var.	1	Hazy,	A few drops of rain.
19	69	79	74			S	0	ditto,	
20	70	77	75			W	2	ditto,	
21	73	77	74				1	Cloudy,	Very gloomy, and a great appearance of rain; very close, no sun all day.
22	70	75	73				0	Hazy,	Ditto.
23	70	83	75				0	ditto,	
24	72	84	74				0	Cloudy,	
25	71	76	73	} F. Q. 67 $\frac{3}{4}$	}		1	ditto,	Clear at intervals.
26	68	70	68				0	ditto,	Ditto.
27	67	74	69				0	ditto,	Very thick.
28	67	79	71				1	ditto,	Thunder, very moist and wet.
29	66	78	71				2	Clear,	Very chilly.
mean	72	79	73		4.2	var.	2	Cloudy,	Mean state of the atmosphere.

A P P E N D I X.

A GENERAL STATE of the WEATHER, for MARCH.

Greatest altitude of Thermometer, - - - - -	M.	N.	E.	} 79½ Mean temperature.
Least ditto, - - - - -	84	89	85	
Mean ditto, - - - - -	66	75	71	
Clear, - - - - -	75	84	79	
Cloudy, - - - - -				16 days.
Rain, - - - - -				15 do.
Quantity of do. - - - - -				3 do.
				1-8 inch.

THE wind almost continually southerly, and strong blasts towards the end of the month—the weather throughout clear and serene, and heavy dews at night, which indeed must always be the case, when they are preceded by a clear warm sun.

IN blowing weather dews are seldom seen, the moisture as it falls being dispelled by the wind.
THE heat of the earth this month, about mid-day, about 120°.

C A L C U T T A, M A R C H 1784.

Day.	Thermometer.			Mean morning heat, at each quarter of the Moon.	Rain Inch	Wind.		Appearance of the air.	REMARKS.
	M	N	E.			Point.	Force		
1	66	80	71	Fall M. 70 ½	1	SW	1	Clear,	MONDAY.
2	67	80	71			W	1	ditto,	Moist.
3	70	82	76			S	2	ditto,	Thunder, but no rain.
4	72	85	76			W	4	Cloudy,	Thunder, early this morning.
5	73	84	74			SE	0	Hazy,	
6	71	83	74				2	Cloudy,	
7	70	78	74				1	ditto,	Great appearance of rain.
8	69	75	74			S	1	Clear,	
9	70	80	74				1	ditto,	The weather very fine and dry
10	70	82	75				0	ditto,	Ditto.
11	70	83	75	L. Q. 73 ⅔	var.		2	ditto,	Ditto.
12	69	85	75				1	ditto,	Ditto.
13	70	88	79			S	3	ditto,	Ditto.
14	75	86	81				1	ditto,	The morning foggy.
15	76	86	80				0	Cloudy,	Very close and sultry.
16	79	86	81				0	Clear,	Ditto.
17	78	86	81				0	ditto,	Ditto.
18	79	87	83				0	Hazy,	Ditto.
19	80	88	83				3	Clear,	The wind high.
20	80	86	82			New M. 79 ⅓	0.3		3
21	77	85	83	W	3			ditto,	Ditto.
22	80	86	83	S	2			Clear,	
23	80	88	84		0			Cloudy,	Moist.
24	80	89	83		1			ditto,	Do.
25	81	88	85		1			ditto,	Very thick.
26	83	80	84		1			ditto,	A great appearance of rain.
27	84	86	80		4			ditto,	The wind boisterous.
28	77	82	81		3			ditto,	Ditto.
29	78	81	81	F. Q. 80 ⅔	0.5				2
30	79	86	83				1	Clear,	
31	80	84	81				1	ditto,	
mean	75	84	79		1.8	S	3	Clear.	Mean state of the atmosphere.

A P P E N D I X.

A GENERAL STATE of the WEATHER, for APRIL 1784.

	M.	N.	E.	} 86½ Mean temperature.
Greatest altitude of the Thermometer, - - - - -	86	97	87	
Loud ditto, - - - - -	71	87	79	
Mean ditto, - - - - -	83	91	85	
Clear, - - - - -	14	days.		
Cloudy, - - - - -	16	ditto,		
Rain, - - - - -	6	ditto,		
Quantity of ditto, - - - - -	3-1	inch.		

THE prevailing Wind this month, as well as the former, South; the mean heat of the earth at mid-day, 126°. Blowing and heavy weather in general, and frequent thunder storms about the end, although many of the nights were close and sultry.

THE thunder storms that generally prevail at this time of the year, always happen in the afternoon or evening, and come from the NW, and are attended with loud peals and heavy fall of rain. Before these storms begin, the clouds become very dark and low, and the winds being thus confined between the clouds and earth, must, of course, be greatly augmented.

C A L C U T T A, A P R I L 1784.

Day.	Thermometer.			Mean morning beat, at each quarter of the Moon.	Rains.	Wind.		Appearance of the air.	REMARKS.
	M.	N.	E.			Point.	Force		
1	79	89	85	} Full M. 82: $\frac{6}{7}$		S	1	Clear,	THURSDAY.
2	81	87	83				0	ditto,	
3	81	91	85				4	Cloudy,	Difagreeable blowing weather.
4	83	89	85				3	ditto,	Ditto.
5	83	89	86				3	ditto,	Ditto.
6	83	88	85				4	Cloudy,	Ditto.
7	83	91	86				3	Hazy,	Ditto.
8	83	91	85				2	Clear,	
9	84	92	86				1	ditto,	
10	84	94	87				0	ditto,	The night very close.
11	85	97	87	0	ditto,	Ditto.			
12	86	95	87	} L. Q. 84 $\frac{1}{2}$	SE	0	ditto,	Hard blowing weather with much dust.	
13	85	93	85			0	ditto,		
14	86	92	83			3	ditto,	Ditto.	
15	83	91	85			3	Cloudy,		
16	83	90	86			3	ditto,	A heavy thunder storm, in the evening.	
17	84	89	80			4	ditto,	High wind.	
18	80	88	79			2	ditto,	Very close.	
19	74	87	85			3	ditto,	Strong wind.	
20	83	90	85			0	Clear,	Ditto.	
21	83	91	86			} New M. 81 $\frac{1}{2}$	SW	0	ditto,
22	83	92	85	3	ditto,				
23	83	93	87	0	Hazy,				
24	83	92	86	3	Clear,				
25	84	90	86	3	ditto,			With rain and thunder.	
26	84	89	84	4	Cloudy,			Ditto, from NW.	
27	80	88	85	4	ditto,			Ditto, Ditto.	
28	83	90	86	2	ditto,			Ditto.	
29	85	88	85	0	ditto,			High wind.	
30	84	89	85	3	ditto,				

mean | 83 | 91 | 85 | | 3.1 | S | 4 | Cloudy, | Mean state of the atmosphere.

A. P. P. E. N. D. I. X.

A GENERAL STATE of the WEATHER, for MAY 1784.

Greatest altitude of the Thermometer,	M.	N.	E.	} 84½ Mean temperature.
Least ditto,	85	93	88	
Mean ditto,	75	82	74	
Mean ditto,	81	89	84	
Clear, 7 days.				
Cloudy, 24 ditto.				
Rain, 14 ditto.				
Quantity of ditto, 9-6 inches.				

The Wind southerly, with a few pretty violent storms from the NW, at the beginning of the month, while the latter part was close, gloomy, and warm; but, in general, the whole month was exceedingly cloudy, and scarcely a single day of bright sun shine.

The Rains began on the 22d, and from that day to the end the nights were very close and sultry and the air very damp.

C A L C U T T A, M A Y 1784.

Day.	Thermometer.			Mean morning heat, at each quarter of the Moon.	Rain.	Wind.		Appearance of the air.	REMARKS.	
	M.	N.	E.			Point.	Force.			
1	82	86	82	Full M. 79 ⁶ / ₇	2.	S	3	Cloudy,	SATURDAY, a violent storm.	
2	77	88	74		1.		3	ditto,	Very heavy. Ditto, no sun.	
3	75	82	79		0.6		4	ditto,	Ditto.	
4	78	87	84		0.5		1	Hazy,	And close.	
5	82	89	84			1		1	ditto,	No sun all day.
6	81	90	85		0.4		2	ditto,	A thunder storm in the evening.	
7	84	90	85			3		3	ditto,	High wind at times.
8	82	90	86			3		3	Clear,	Ditto.
9	83	90	87		L. Q. 79 ⁶ / ₇	0.8		2	Hazy,	
10	84	90	87				SE	3	Cloudy,	Very thick and dark.
11	85	89	78	E			2	ditto,		
12	75	88	84	S			2	ditto,	A thunder storm in the evening.	
13	77	85	80	0.2	var.	1	ditto,			
14	75	85	83			S	0	ditto,	No wind.	
15	80	88	84	New M. 82 ⁶ / ₇	0.2		0	Clear,		
16	80	90	83			1	1	ditto,	Thunder in the evening.	
17	78	91	86			0	0	ditto,	The weather very close and still.	
18	83	91	87	F. Q. 81 ⁶ / ₇	0.6		0	ditto,	Ditto.	
19	84	90	87			1	1	ditto,	Ditto.	
20	85	92	87			1	1	Cloudy,	At intervals.	
21	85	93	88			0	0	Clear,	Very still.	
22	85	91	85	0.4		2	Cloudy,	Thunder in the evening.		
23	84	90	83			2	2	ditto,	Ditto.	
24	82	89	85	0.2		2	ditto,	Ditto.		
25	83	92	86			1	1	ditto,	Ditto.	
26	84	85	84			2	2	ditto,	Ditto.	
27	81	82	83	0.4	SE	2	ditto,	Ditto.		
28	80	86	83			NW	3	ditto,	A great appearance of rain.	
29	81	89	84			NW	2	ditto,	The nights very sultry.	
30	82	89	85	0.2	NW	3	ditto,	Ditto.		
31	83	92	86			S	2	ditto,	Thunder ditto.	
mean	81	89	84		9.6	S	2	Cloudy,	Mean state of the atmosphere.	

A P P E N D I X.

A GENERAL STATE of the WEATHER, for JUNE 1784.

	M.	N.	E.	} 83 Mean temperature.
Greatest altitude of the Thermometer, - - - - -	84	90	86	
Least ditto, - - - - -	77	80	78	
Mean ditto, - - - - -	81	85	83	
Clear, - - - - -	1 day.			
Cloudy, - - - - -	29 days.			
Rain, - - - - -	14 ditto.			
Quantity of ditto, - - - - -	17-4 inches.			

The wind, this month, inclining sometimes to the E of S. The atmosphere exceedingly moist and wet, and much rain from the 10th to 17th, the sky mostly clouded throughout, and very little variation in the temperature of the air.

C A L C U T T A, J U N E 1784.

Day.	Thermometer.			Mean heat at each quarter of the Moon.	Rain.	Wind.		Appearance of the air.	REMARKS.
	M.	N.	E.			Point.	Force		
1	82	82	82	Full M. 81 7	0.7	S	1	Cloudy,	TUESDAY, thunder.
2	80	86	84		1.2		1	ditto,	
3	82	84	83				1	ditto,	
4	82	85	82		0.2		1	ditto,	A gentle shower.
5	81	87	85	L. Q. 80 7		var.	0	ditto,	Close.
6	82	90	85		0.5		0	ditto,	
7	83	85	84		1.6	NE	1	ditto,	Several showers.
8	81	84	82				0	ditto,	
9	80	84	83	New M. 81 7	1.1		0	ditto,	No sun all day.
10	81	83	82		1.6	S	1	ditto,	Incessant rain all day.
11	79	80	80		4.6		3	ditto,	Ditto
12	78	78	78		0.1		1	ditto,	
13	77	80	80	F. Q. 82	0.4		2	ditto,	Thunder in the evening.
14	80	85	80		0.1	W	2	Hazy,	No sun all day.
15	81	85	82		2.5	var.	1	Cloudy,	Ditto.
16	80	82	79		0.8	S	0	ditto,	Ditto.
17	80	83	83				1	Hazy,	Ditto.
18	81	89	85				1	ditto,	Sun very faint.
19	81	88	85				1	ditto,	Very thick and no sun.
20	82	88	86				1	ditto,	The nights very close.
21	84	90	85			SE	1	ditto,	Ditto.
22	84	88	85				1	ditto,	Ditto.
23	82	88	85				1	ditto,	Ditto.
24	82	90	84				1	ditto,	Ditto.
25	83	90	86			var.	0	ditto,	Ditto.
26	83	89	84			SE	0	Cloudy,	Ditto.
27	82	87	84			S	0	Hazy,	Ditto.
28	83	87	83				0	Cloudy,	
29	81	81	81		2 1	var.	1	ditto,	Thunder.
30	81	88	83			S	3	Clear,	High wind.
mean	81	85	83		17.4	S&SE	1	Cloudy,	Mean state of the atmosphere.

A P P E N D I X.

A GENERAL STATE of the WEATHER, for JULY 1784.

Greatest altitude of Thermometer,	-	-	-	M.	N.	E.	} 83 Mean temperature.
Least ditto,	-	-	-	84.	90.	85.	
Mean ditto,	-	-	-	77.	77.	78.	
Mean ditto,	-	-	-	81.	85.	83.	
Clear,	-	-	1 day.				
Cloudy,	-	-	30 days.				
Rain,	-	-	20 ditto.				
Quantity of ditto,	-	-	15 Inches.				

THE prevailing wind SE, and the atmosphere, as the former month, exceeding thick and humid, and very little sun shine. The mean temperature, exactly the same as last month, and very little variation between the heat at mid-day, and that of the morning and evening. DURING the rains, the wind is often variable, but commonly it comes round to the Eastward when there falls much rain.

C A L C U T T A, JULY 1784.

Day.	Thermometer.			Mean morning heat, at each quarter of the Moon.	Rain.	Wind.		Appearance of the air.	REMARKS.	
	M.	N.	E.			Point.	Force.			
1	81	89	84	THURSDAY. Full M. 82	}	S	3	Clear,	The wind strong in the morning, but the nights very still and close.	
2	83	88	84.5			SE	2	Cloudy,		
3	83	83	83			2	ditto,			
4	80	86	84			3	ditto,			
5	84	89	84	L. Q. 82 1/2	}	2	Hazy,	The night very bright. Ditto thunder.		
6	84	88	84			1	Cloudy,			
7	83	85	84			0	ditto,			
8	82	85	84			0	ditto,			
9	82	86	84	New M. 79 1/2	}	0.1	1	ditto,	Ditto.	
10	82	80	85			0.1	1	ditto,		
11	83	86	83			1.1	var.	1		ditto,
12	82	86	84			0.9	1	ditto,		
13	83	86	84	F. Q. 79 5/7	}	0.3	2	ditto,	Several small showers.	
14	81	84	82			0.2	1	ditto,		
15	79	83	82			2.6	1	ditto,		
16	82	83	82			SE	0	ditto,		
17	78	83	82	}	}	0.9	1	ditto,	Rained all day.	
18	79	85	82			0.1	2	ditto,		
19	79	84	82			0.1	1	ditto,		
20	80	85	81			S	3	ditto,		
21	77	83	80	}	}	0.1	1	ditto,	Small rain, very dark. On the 7th, there had been no rain at Chunar, many persons sick, but chiefly among the Natives.	
22	79	84	82			SE	1	ditto,		
23	80	85	79			0.3	1	ditto,		
24	79	83	80			1.7	0	ditto,		
25	79	83	81	}	}	0.1	1	ditto,	Much thunder and lightning.	
26	80	86	82			0.1	1	ditto,		
27	81	86	83			0.2	1	ditto,		
28	81	86	84			E	1	ditto,		
29	83	86	83	}	}	SE	1	ditto,	Thunder.	
30	81	82	79			1.8	1	ditto,		
31	78	77	78			3.6	1	ditto,		
mean	81	85	83			15.	S & SE	1		Cloudy,

A P P E N D I X.

A GENERAL STATE of the WEATHER, for AUGUST 1784.

		M.	N.	E.	
THERMOMETER,	Greatest altitude, - - - - -	83°	89°	84°	} 82 $\frac{2}{3}$ Mean temperature.
	Least ditto, - - - - -	77	80	80	
	Mean ditto, - - - - -	81	85	82	
BAROMETER,	Greatest ditto, in. - - - - -	29.75	29.75	29.76	} Mean state of the atmosphere—29.57.
	Least ditto, - - - - -	29.57	29.56	29.61	
	Mean ditto, - - - - -	29.67	29.66	29.70	
	Greatest variation, - - - - -	.18	.19	.15	
	Mean density, - - - - -	.688	.682	.688	
HYGROMETER,	Greatest moisture, - - - - -	50°	45°	45°	} 686 density.
	Ditto drought, - - - - -	15	10	10	
	Mean drought and moisture, - - -	3d 28m	1d 18m	1d 15m	
	Clear - - - - -				5 days.
	Cloudy, - - - - -				26 ditto.
	Rain, - - - - -				23 ditto.
	Quantity ditto, - - - - -				16-9 inches.

The air still very moist, and very little sun shine, although the nights in general were very bright and fine: frequently thunder, and on the 22d, an exceeding loud peal early in the morning. The quantity of rain that fell this month was very considerable, and every thing imbibing the moisture to the highest degree.

The Barometer is almost invariably higher at night than in the morning, and lowest always at mid-day. The air being much loaded with moisture, the whole of this month, the variation of the mercury was very insensible. The same causes kept the Thermometer nearly stationary also.

C A L C U T T A, A U G U S T 1784.

Day.	Thermometer.			Barometer.			Hygrometer.						Rain.	Wind and Force.							
	M.	N.	E.	M.	N.	E.	M.		N.		E.			Point.	M.	N.	E.				
1	77	83	80	F. M.	29.64	29.64	29.73	10	15	10				1.2	S	0	1	0	Cloudy,		
2	80	86	82	SUN- DAY.	.69	.69	.73	15	15	5				0.4		0	1	0	ditto,		
3	81	86	83		.70	.63	.70	15	20							1	1	1	0	ditto,	
4	82	88	83		.66	.64	.66	15	25		20			0.4	SE	0	1	0	0	Clear,	
5	82	86	83	L. Q. 687	.64	.63	.71	15	30		15			0.3	E	1	1	0	0	Cloudy,	
6	81	86	83		.70	.70	.75	12	30	0				0.1	SE	1	1	1	0	ditto,	
7	82	86	83		.75	.70	.74	10	40		5			0.2		0	1	0	0	ditto,	
8	81	89	84		.74	.72	.72	10	35		10				S	1	2	1	1	Clear,	
9	82	87	83		.70	.70	.73	15	35		30					0	1	0	0	ditto,	
10	82	87	83		.73	.73	.75	40	40		30					1	0	1	0	ditto,	
11	83	82	83		.72	.72	.73	40	40		40			0.4		1	2	0	0	Cloudy,	
12	82	83	81		.70	.72	.74	45	2				8	0.7	SE	1	2	0	0	ditto,	
13	81	87	83		.72	.72	.76	15	10				10			0	1	1	1	ditto,	
14	81	83	81		.73	.73	.77	20	20	10				0.8		1	1	0	0	ditto,	
15	81	83	81	N. M. 689	.74	.72	.74	10		35		25	0.7	S	0	0	0	0	0	ditto,	
16	79	84	82		.70	.60	.64	40		35		25	1.5	SE	1	0	0	0	0	ditto,	
17	81	83	80		.60	.56	.61	25		40		30	2.5		1	1	0	0	0	ditto,	
18	79	83	80		.58	.56	.64	45		30		40	2.8		0	2	1	1	1	ditto,	
19	77	80	80		.65	.69	.74	45		45		30	0.8		1	1	1	1	1	ditto,	
20	78	84	81		.74	.75	.72	40		35		45	0.5		1	2	2	2	2	ditto,	
21	79	87	83		.72	.63	.69	50		15		35		SW	0	1	0	0	0	Clear,	
22	80	86	83		.65	.64	.69	45		25		12	1.9		2	0	0	0	0	Hazy,	
23	82	87	83		F. Q. 689	.67	.61	.67	30	0	0		20	0.2	S	0	0	0	0	0	Cloudy,
24	82	87	84			.64	.59	.66	30	0	0		5		SE	0	0	1	1	1	ditto,
25	83	86	84	.64		.64	.64	15	8		5	0.2		E	0	1	1	1	1	ditto,	
26	81	85	81	.60	.56	.63	10		5	10		0.3	SE	2	2	1	1	1	ditto,		
27	80	84	81	.60	.59	.62	8		5		6	0.1		2	3	2	2	2	ditto,		
28	80	85	83	F. M. 688	.59	.64	.65	10		15		20	0.2		2	3	2	2	2	ditto,	
29	81	87	83		.64	.68	.68	33	0	0		5	0.6	SW	3	3	3	3	3	ditto,	
30	81	85	83		.66	.66	.69	20		15		10		SW	2	2	2	2	2	ditto,	
31	80	84	83	.66	.69	.74	25		25		35	0.1	S	2	2	1	1	1	ditto.		
mean	81	85	82		29.67	29.66	29.70	3	28	1	18	1	15	16.9	S&SE	1	1	1	1	Cloudy.	

A P P E N D I X.

A GENERAL STATE of the WEATHER, for SEPTEMBER 1784.

THERMOMETER,	Greatest altitude, - - - - -	M.	N.	E.	} 82½ Mean temperature.
	Least ditto, - - - - -	84°	90°	85°	
	Mean ditto, - - - - -	76	77	78	
BAROMETER,	Greatest ditto, in. - - - - -	80	85	81½	} Mean state of the atmosphere—29.81.
	Least ditto, - - - - -	29.95	29.90	29.97	
	Mean ditto, - - - - -	29.72	29.68	29.75	
	Greatest variation, - - - - -	29.81	29.80	29.83	
	Mean density, - - - - -	0.23	0.22	0.22	
HYGROMETER,	Greatest moisture, - - - - -	.693	.685	.692	} .690 density.
	Ditto drought, - - - - -	.600	.600	.600	
	Ditto drought, - - - - -	.10	.40	.25	
	Mean density and moisture, - - - - -	½d 24m	10d 14m	5d 15m	
Clear, - - - - -	10 days,				
Cloudy, - - - - -	20 ditto.				
Rain, - - - - -	12 ditto.				
Quantity ditto, - - - - -	11-3 inches.				

The wind generally S and SE, much lightning in the evenings but not attended either with rain or thunder. The air still damp and cloudy, although the Barometer stood considerably higher than the preceding month.

It is worthy of observation, that upon the rains going off, the water falls in larger drops than at any other period of the season, and probably this may be occasioned from the height it has to fall: and in proof of this, the opposite stations of the Barometer need only be consulted, where it appears, that the weight of the atmosphere was greatly increased about the last period of the rains.

C A L C U T T A, S E P T E M B E R 1784.

Day.	Thermometer.			Barometer.			Hygrometer.			Rain.	Wind and Force.					
	M.	N.	E.	M.	N.	E.	M.	N.	E.		Point.	M.	N.	E.		
1	81	86	83	29.72	29.71	29.79	40		5	20		S	0	1	1	Cloudy.
2	81	89	84	.79	.82	.84	25	5		5		SE	0	1	0	Clear,
3	83	83	82	.84	.81	.84	25		20	5	2.0	SW	0	1	0	Cloudy,
4	81	87	83	.82	.78	.76	35		20	15			1	1	1	Hazy,
5	81	88	83	.74	.78	.75	30		20	20			1	1	0	ditto,
6	82	89	83	.75	.77	.78	20		20	5			0	1	1	Cloudy,
7	81	89	83	.77	.82	.81	25	15	0	20		S	1	1	1	Clear,
8	81	88	83	.80	.83	.80	15	12		10		S	0	1	1	ditto,
9	82	89	84	.79	.72	.78	5	30		5		SW	0	2	e	ditto,
10	82	90	83	.76	.72	.78	5	35		20		SE	0	1	2	ditto,
11	84	90	85	.78	.78	.81	10	40		25		NE	0	2	1	ditto,
12	84	87	84	.81	.80	.79	0	20		20	0.5		0	1	0	Cloudy &
13	81	87	83	.77	.75	.76	25	20		20		N	1	1	0	heavy,
14	82	84	82	.72	.68	.78	15	10		10		NE	1	1	1	ditto,
15	77	82	80	.77	.8c	.80	15	0	0	0	0.7	SE	1	1	1	ditto,
16	79	81	81	.78	.8c	.76	20		5	15	0.3		1	1	1	ditto,
17	79	80	79	.93	.70	.78	18		25	30	1.5		1	2	1	ditto,
18	77	81	78	.79	.77	.84	35		38	38	0.9		0	1	1	ditto,
19	76	77	78	.84	.89	.87	50		53	55	1.2		1	1	1	ditto,
20	78	80	79	.88	.89	.91	60		60	55	1.1		1	0	1	ditto,
21	78	80	78	.92	.89	.95	60		55	60	0.3	SE	1	1	1	ditto,
22	79	80	80	.95	.90	.97	60		45	45	1.1	E	1	0	0	ditto,
23	78	83	80	.94	.88	.92	45		30	35	0.1	SE	0	1	0	ditto,
24	79	84	80	.92	.84	.88	40		20	30		S	0	1	0	ditto,
25	79	85	80	.88	.84	.86	35		0	5		SE	0	1	0	ditto,
26	78	36	82	.87	.84	.86	20	20		5		SE	0	1	1	Clear,
27	8c	83	79	.80	.84	.80	5		0	5	1.6	var.	0	2	1	Cloudy,
28	79	85	82	.80	.77	.83	15	20		5		S	0	2	1	Clear,
29	80	88	84	.84	.81	.89	10	35		20		SE	0	1	1	ditto,
30	83	89	83	.85	.87	.93	5	35		15			0	1	0	ditto,

mean [80] [85] [81½] | 29.81 | 29.80 | 29.83 | ½ | 24 | 10 | 14 | 5 | 15 | 11.3 | SE & S | ½ | 1 | 1 | Cloudy.

A P P E N D I X.

A GENERAL STATE of the WEATHER, for OCTOBER 1784.

		M.	N.	E.	
THERMOMETER,	Greatest altitude, - - - - -	83	90	85	82 $\frac{1}{2}$ Mean temperature.
	Least ditto, - - - - -	74	77	76	
	Mean ditto, - - - - -	79	86 $\frac{1}{2}$	82 $\frac{1}{2}$	
BAROMETER,	Greatest ditto, in. - - - - -	30.04	30.00	30.02	Mean state of the atmosphere. — 29.91
	Least ditto, - - - - -	29.74	29.77	29.76	
	Mean ditto, - - - - -	29.92	29.91	29.92	
	Greatest variation, - - - - -	0.30	0.23	0.26	
HYGROMETER,	Mean density, - - - - -	.697	.686	.693	.692 density,
	Greatest moisture, - - - - -	48	25	30	
	Ditto drought, - - - - -	30	50	45	
	Mean moisture and drought, - - - - -	547m	30d 3m	24d 2m	
	Clear, - - - - - 19 days,				
	Cloudy, - - - - - 12 ditto,				
	Rain, - - - - - 3 days,				
	Quantity of ditto, - - - - - 0.8 inches,				

The air very clear and elastic, and heavy dews at night. The Barometer very high, and the wind W and NW. About the middle of the month, the mornings became a little foggy, which indicates the approach, or beginning, of the cold season: The atmosphere thin and dry, and cleared of its vapours; of course the mercury rose in the Barometer. As the difference between the day and the night heat begins now to be greater than in any of the eight preceding months, the fogs we have at this season of the year are by that means formed.

C A L C U T T A, O C T O B E R 1784.

Day.	Thermometer.			Mean density at each quarter of the Moon.	Barometer.			Hygrometer.						Rain.	Wind and Force.			
	M.	N.	E.		M.	N.	E.	M.		N.		E.			Point.	M.	N.	E.
1	83	89	82	F. R. I.	29.91	29.93	29.93	3	35	10	0.6	SE	0	3	1	Cloudy,		
2	81	82	80		.94	.90	.92	10	15	0	0.1	S	1	3	1	ditto,		
3	80	85	83		.90	.83	.87	15	15	5		SE	0	1	1	ditto,		
4	80	88	84	L. Q.	.83	.77	.86	15	25	15		S	0	2	0	ditto,		
5	82	88	84		.78	.78	.78	5	25	15	0.1	NE	0	3	0	ditto,		
6	81	90	83		.76	.78	.76	0	20	15		var.	0	1	1	Clear,		
7	82	87	82	692	.74	.77	.77	5	20	15			0	1	1	ditto,		
8	82	88	83		.77	.77	.83	5	40	35		W	0	1	0	Cloudy,		
9	80	89	82		.83	.87	.86	10	40	35		W	1	1	0	Clear,		
10	79	89	82	N. M.	.88	.87	.86	15	40	35			0	1	0	ditto,		
11	99	90	83		30.03	.96	30.	15	40	30			0	1	1	ditto,		
12	81	88	85		29.98	.94	29.97	25	25	15			0	2	0	ditto,		
13	81	89	85	702	.99	.92	.94	10	25	15			0	1	1	ditto,		
14	80	89	84		.93	.89	.92	10	30	15			1	1	0	ditto,		
15	80	87	82		.92	.92	.91	10	40	20			0	1	0	ditto,		
16	79	89	83	F. Q.	.91	.93	.93	10	35	30		SW	0	1	0	ditto,		
17	78	88	83		.94	30.	.94	0	35	30		SW	0	1	0	ditto,		
18	80	87	83		.94	29.97	.96	0	35	30		W	0	1	0	ditto,		
19	80	89	83	705	30.02	.98	30.01	0	40	25		NW	0	1	0	ditto,		
20	77	88	82		.04	.98	29.98	10	45	30			0	1	0	ditto,		
21	78	88	82		29.98	.96	.99	20	50	45			0	1	0	ditto,		
22	78	87	83	F. M.	30.	.99	.98	30	50	40			0	1	0	Cloudy,		
23	77	80	76		29.95	.94	.93	10	0	0	30.05	N	1	2	1	ditto,		
24	75	77	76		.88	.89	.92	40	25	25		NW	3	3	0	ditto,		
25	74	84	79	705	.92	.88	.93	35	5	5			1	1	0	ditto,		
26	76	83	80		.93	.90	.92	20	15	10			1	1	0	ditto,		
27	76	86	80		.92	.89	.94	5	30	20			1	1	1	Clear,		
28	75	86	80	705	.94	.94	.99	0	40	35			0	1	0	ditto,		
29	76	83	80		.99	30.	.99	10	35	30			0	1	0	ditto,		
30	75	85	80		.98	29.95	30.	10	40	40			0	2	0	ditto,		
31	75	85	80	mean	30.	30.	30.02	20	45	40			0	1	0	ditto,		
	79	86 $\frac{1}{2}$	82 $\frac{1}{2}$		29.29	29.91	29.92	5	17	30	1	22	2	0.8	WNW	1	1	1

A P P E N D I X.

GENERAL STATE of the WEATHER, for NOVEMBER 1784.

		M.	N.	E.	
THERMOMETER,	Greatest altitude	78°	86	80	76 Mean temperature,
	Least ditto,	66	76	71	
	Mean ditto,	71	80½	75½	
BAROMETER,	Greatest ditto, in.	30.78	30.05	30.08	30.00 mean state of the atmosphere.
	Least ditto,	29.60	29.88	29.92	
	Mean ditto,	30.00	29.99	30.02	
	Greatest variation,	00.52	00.17	00.16	
	Mean density,	.712	.696	.706	
HYGROMETER,	Greatest moisture,	40	15	15	702 density.
	Ditto drought,	45	55	50	
	Mean moisture and drought,	8m 10d	7m 35d	1m 23d	
	Clear,	23 days.			
	Cloudy,	7 ditto.			
	Rain,	1 ditto.			
	Quantity of ditto,	0-9 inches.			

The NW winds prevailed this month, but nothing remarkable in the changes of the atmosphere, although there were several appearances of rain in the course of it. The air more elastic than any of the former months, also more serene and dry. The foggy mornings still keep off.

In clear dry weather, there is always a very sensible change on the Barometer, two or three hours after sun rising; it being often near one-tenth of an inch higher about nine o'clock, than at six or sun rise. May not this be owing to the load of vapour condensed and kept near the surface of the earth from the coldness of the night, which as it is gradually rarefied by the heat of the sun, must increase the weight and spring of the atmosphere, and produce this variation? From hence, the Barometer is always higher in the evening before these watery particles fall, than in the morning when the air is replete.

C A L C U T T A, N O V E M B E R 1784.

Day.	Thermometer.			Mean density at each quarter of the Moon.	Barometer.			Hygrometer.			Rain.	Wind and Force.						
	M.	N.	E.		M.	N.	E.	l.	u.	d.		u.	d.	u.		Point.	M.	N.
174	85	80		MON.	30.02	29.99	30.03	20	1	45	35			NW	0	1	0	Clear.
277	85	80			.05	.96	.00	15		40	30							Cloudy.
377	86	80		L. Q.	.06	.98	.02	10		40	30							Clear.
476	85	80			.02	30.00	.03	0		35	35							Cloudy.
578	85	79		705	.06	29.97	.02	5		40	35							Clear.
676	84	80			.00	30.00	.02	0		40	35							ditto.
776	86	79		.02	.02	.02	20		45	45							ditto.	
873	82	78		.02	.02	.06	35		50	50							ditto.	
972	83	75		.02	.02	.06	45		55	50							ditto.	
1072	81	78		N. M.	.10	.08	.08	30		50	45		0.9	N	1	1	0	Cloudy.
1174	76	76			.12	.05	.07	15		0	35			NE	0	2	0	ditto.
1275	79	76		707	.07	.04	.05		40	15	15		N	0	1	0	Clear.	
1371	81	77			.05	29.98	.02		40	30		15		N	0	1	0	ditto.
1477	79	75		F. Q.	29.60	.89	29.92		10	25	20			NE	1	1	0	ditto.
1574	80	75			.91	.95	30.00		20	25	15							ditto.
1673	81	73		718	30.01	30.05	.07		20	40	15			N	0	1	0	ditto.
1756	80	72			.07	.03	.06		0	50	35			NE	1	2	1	ditto.
1867	78	74		F. M.	.04	.02	.04	15		45	40			NW	0	1	1	ditto.
1968	78	72			.03	29.99	.04	10		45	40			N	1	1	0	ditto.
2069	78	75		717	.03	30.02	.05	15		40	35			NW	0	1	0	ditto.
2159	79	74			.02	29.97	.02	5		40	35							ditto.
2253	78	73		F. M.	29.98	.93	29.97	0		40	30							Hazy.
2369	78	72			.97	.92	.94	0		5	35	15		N	1	1	0	Clear.
2470	78	73		717	.90	.88	.95		35	5			NW	1	1	0	Cloudy.	
2568	78	71			.92	.96	30.02		35	5	5	5						ditto.
2657	79	73		F. M.	30.03	30.03	.04		40	20	20							Clear.
2767	79	73			.00	.00	.05	20		35	30							ditto.
2869	80	75		717	.00	.00	.03	10		35	30							ditto.
2967	80	73			.02	29.99	.04	15		45	20			N	0	1	1	ditto.
3067	80	73		F. M.	.05	30.04	.08	20		50	30			NW	1	1	1	ditto.

mean 71½ | 80½ | 75½ | | 30.00 | 29.99 | 30.02 | 10 | 8 | 35 | ½ | 28 | 1 | 0.9 | NW | ½ | 1½ | ½ | Clear.

A P P E N D I X.

A GENERAL STATE of the WEATHER, for DECEMBER 1784.

		M.	N.	E.	
THERMOMETER,	Greatest altitude	69	79	73	68½ Mean heat.
	Least ditto,	58	68	65	
	Mean ditto,	63½	74	68½	
BAROMETER,	Greatest ditto,	30.17	30.14	30.17	30° 08 Mean state of the atmosphere.
	Least ditto,	30.02	30.00	30.02	
	Mean ditto,	30.09	30.07	30.09	
	Greatest variation,	00.15	00.14	00.15	
	Mean density,	.727	.709	.721	
HYGROMETER,	Mean moisture and drought,	24d.	43d.	33d.	.717 Mean density.
	Clear,	26 days.			
	Cloudy,	5 ditto.			
	Rain,	1 ditto.			
	Quantity of ditto,	0.05 inches.			

THE winds were constantly NW, except a few days, when it was inclined a little to the E, which always brings on cloudy thick weather. The whole month remarkably dry, and the atmosphere of such a density as greatly to exceed any of the former. At this season of the year, there is generally a thick disagreeable fog in the mornings and evenings; however, this month, on the contrary, has been very clear and serene, and but seldom thick fogs at either of these times.

C A L C U T T A, D E C E M B E R 1784.

Days	Thermometer.			Mean density at each quarter of the Moon.	Barometer.			Hygrometer.			Rain.	Wind and Force.					
	M.	N.	E.		M.	N.	E.	M.	N.	E.		Point.	M.	N.	E.		
1	65	79	72	L. Q. 721	30.07	30.10	30.10	20	45	30	0.05	NE	1	1	1	Cloudy,	
2	68	76	72		.07	.04	.07	40	50	30							ditto,
3	69	78	72		.03	.01	.06	20	40	20							ditto,
4	67	78	73		.06	.05	.09	15	30	15		NW	1	2	1		ditto,
5	65	79	72		.10	.08	.09	0	45	25			1	2	0		Clear,
6	65	75	70		.08	.05	.10	30	50	45			2	3	0		ditto,
7	63	75	68		.08	.03	.05	45	55	45			1	2	1		ditto,
8	61	74	58		.07	.04	.09	40	55	45			2	1	0		ditto,
9	51	75	69		.07	.06	.07	30	55	45			2	1	0		ditto,
10	62	75	68		.08	.06	.07	30	55	40			1	1	0		ditto,
11	61	75	58	N. M. 728	.07	.04	.08	30	55	45			1	1	0		ditto,
12	62	73	58		.09	.03	.08	20	40	35			1	0	0		ditto,
13	62	74	69		.08	.04	.05	10	40	40			0	0	0		ditto,
14	64	71	59		.05	.01	.04	20	35	25		N	0	0	0		Cloudy,
15	66	73	68		.04	.07	.08	20	40	35		NNE	1	1	0		ditto,
16	64	75	70		.09	.06	.08	30	45	40		NW	0	1	0		Clear,
17	67	75	70		.07	.01	.02	30	40	30			0	1	0		ditto,
18	66	76	72		.02	.00	.07	10	40	25		NE	0	2	0		ditto,
19	67	75	71		.06	.06	.07	0	50	25		W	0	1	0		ditto,
20	66	75	66		.06	.05	.08	25	55	40		NW	0	1	0		ditto,
21	65	74	67	F. Q. 725	.11	.10	.13	35	60	50			0	1	0		ditto,
22	61	71	65		.17	.13	.17	45	50	50			0	2	0		ditto,
23	58	71	65		.17	.12	.14	35	45	40			1	1	0		ditto,
24	60	72	66		.14	.13	.14	10	50	40			1	1	0		ditto,
25	60	72	68		.15	.14	.16	15	45	45			0	1	0		ditto,
26	61	73	68		.17	.14	.14	5	45	35			1	2	0		ditto,
27	61	73	68		.15	.13	.14	15	50	40			1	2	0		ditto,
28	60	72	67		.14	.10	.13	20	55	40			1	1	0		ditto,
29	60	70	65		.10	.10	.10	30	55	45		W	0	1	0		ditto,
30	60	69	65		.10	.06	.07	40	55	45		NW	0	1	0		ditto,
31	60	68	65	.08	.05	.06	40	55	45			0	1	0		ditto,	

mean 63½ 74 68½ | 30.09 30.07 30.09 24 | 48 | 38 | 0.05 | 1 1½ 1½

A P P E N D I X.

A GENERAL STATE of the WEATHER, for JANUARY 1785.

		M.	N.	E.	
THERMOMETER,	Greatest altitude,	70	78	74	66 Mean heat:
	Least ditto,	57	69	64	
	Mean ditto,	61	72	66½	
BAROMETER,	Greatest ditto,	30.17	30.14	30.17	Mean state of the atmosphere. —
	Least ditto,	29.98	29.97	30.03	
	Mean ditto,	30.08	30.07	30.09	
	Greatest variation,	00.19	00.17	00.14	
HYGROMETER,	Moisture and drought,	.732	.712	.723	722 Mean density.
	Clear,	29 days,	50 d.	40 d.	
	Cloudy,	2 ditto,			

THE atmosphere very dry and elastic.
 THE winds variable, but from the middle of the month were almost constantly from the SW and S, and often pretty strong.
 THE mercury in the Barometer stood very high till about the end of the month, when a very sensible change took place, both with regard to the warmth and serenity of the weather; frequent heavy dews about the same time.
 THE mornings always very foggy.
 THE medium heat of the sun at mid-day (the instrument being exposed five minutes) was 90°

C A L C U T T A, J A N U A R Y 1785.

Day.	Thermo- meter.			Barometer.			Hygrometer.			Rain.	Wind and Force.				
	M.	N.	E.	M.	N.	E.	M.	N.	E.		Point.	M.	N.	E.	
160	69	64		30.09	30.09	30.09	30	50	45		WN	0	1	0	Clear,
257	69	64	L. Q. 732	.09	.09	.11	40	50	45		NW	0	1	0	ditto,
360	71	65		.11	.06	.07	25	45	40			0	1	0	ditto,
459	69	65		.04	.04	.09	30	50	40		WNW	0	1	0	ditto,
563	70	66		.10	.08	.08	35	50	40			0	2	0	ditto,
664	70	66		.07	.08	.12	30	50	40		W	0	2	0	ditto,
763	72	67		.13	.13	.17	35	55	50		NW	0	2	0	ditto,
859	72	67		.14	.13	.10	35	60	50		N	1	2	0	ditto,
958	73	65		.10	.09	.09	35	60	45		NW	1	2	0	ditto,
1060	70	65		.10	.10	.14	40	60	50			0	1	0	ditto,
1158	72	65		.13	.10	.12	35	60	50			1	2	1	ditto,
1259	72	65	.11	.11	.11	25	50	45		N	1	2	0	ditto,	
1360	72	66	.11	.11	.12	30	50	45		NW	2	1	0	ditto,	
1460	73	67	.12	.11	.13	40	45	45			0	1	0	ditto,	
1558	71	65	.14	.14	.14	35	50	50			1	2	0	ditto,	
1660	70	65	.15	.15	.17	40	55	50			0	2	0	ditto,	
1760	69	65	.17	.13	.10	45	55	50		N	1	1	0	ditto,	
1859	70	65	.10	.10	.06	40	55	50		NW	1	2	0	ditto,	
1960	70	65	.08	.05	.05	40	60	50			0	2	0	ditto,	
2058	71	65	.05	.05	.05	30	55	50			0	1	0	ditto,	
2164	74	67	.02	.00	.07	0	40	30		SW	0	1	0	ditto,	
2260	71	65	.08	.05	.08	40	55	50		W	1	2	0	ditto,	
2359	70	65	.04	.04	.05	40	60	55		SW	1	2	0	ditto,	
2462	70	66	.06	.04	.05	40	55	50		W	0	2	0	ditto,	
2562	75	68	.08	.06	.07	40	55	45			0	1	0	ditto,	
2663	74	69	.07	.01	.03	30	45	30		SW	0	2	0	ditto,	
2768	74	70	29.98	29.97	.03	15	40	30		S	0	2	0	ditto,	
2867	76	69	30.01	.98	.04	10	55	10		SW	1	2	0	ditto,	
2955	77	74	.02	30.01	.05	40	60	50		S	0	3	1	ditto,	
3066	76	71	.00	.01	.03	10	40	0			0	3	1	Cloudy,	
3170	78	74	.02	.03	.05	40	40	10			0	3	2	ditto,	
mean	71½	72½		30.08	30.07	30.09	30	50	40		var.	1½	2	1½	Clear.

A P P E N D I X.

A GENERAL STATE of the WEATHER, for FEBRUARY 1785.

		M.	N.	E.	
THERMOMETER,	Greatest altitude, - - - - -	74	86	76	} 75 Mean temperature.
	Least ditto, - - - - -	68	75	69	
	Mean ditto, - - - - -	71	79½	74	
BAROMETER,	Greatest ditto, - - - - -	30.14	30.17	30.15	} 30.02 Mean state of the atmosphere.
	Least ditto, - - - - -	29.89	29.89	29.96	
	Mean ditto, - - - - -	30.02	30.01	30.04	
	Greatest variation, - - - - -	0.25	0.28	0.19	
	Mean density, - - - - -	.713	.698	.708	
HYGROMETER,	Moisture and drought, - - - - -	0	28 d.	22 d.	} .706
	Clear - - - 17 days.				
	Cloudy, - - - 11 ditto.				
	Rain, - - - 4 ditto.				
	Quantity ditto, 2-9 inches.				

THUNDER five times. Mean heat of the Sun at mid-day, the Thermometer being exposed five minutes, 96°. The beginning of this month the air was very moist, which is generally the case when the wind comes from the S and SE. On the contrary, the NW winds which prevailed, renders it very dry and elastic, and has always a very great effect in raising the mercury in the Barometer. During the whole of this month the mornings were extremely thick and foggy; on the 1st, 8th, and 12th, moderate storms from the NW.

C A L C U T T A, F E B R U A R Y 1785.

Day.	Thermo- meter.			Mean den- sity at each quarter of the Moon.	Barometer.			Hygrometer.				Rain.	Wind and Force.					
	M.	N.	E.		M.	N.	E.	M.	N.	E.	Point.		M.	N.	E.			
1	71	77	74	L. Q. 714	30.00	29.90	29.95	50	0	0	40	0.5	S	1	4	1	Cloudy.	
2	73	76	71		29.89	.89	.96	40	15	20				SE	1	2	1	ditto,
3	69	77	73		.96	.96	30.03	30	25	20				S	0	1	0	Clear,
4	72	78	74		33.08	30.07	.12	30	5	30				S	0	1	1	Cloudy,
5	72	79	75		.08	.04	.04	4	15	25					0	1	1	Clear,
6	74	80	76		29.98	.03	.05	50	30	20					3	2	F	Cloudy,
7	72	80	72		.98	29.99	.04	45	35	0	0			SE	1	1	1	ditto,
8	75	80	73		30.05	30.04	.11	30	15	5	0.8			E	0	1	0	ditto,
9	68	78	74		.07	.03	.03	35	15	5				W	1	1	0	Cloudy,
10	72	80	75		29.97	29.95	29.98	15	40	30				N	2	1	0	Clear,
11	70	80	74		.98	.99	30.03	10	60	55					1	1	0	ditto,
12	73	82	69		30.03	30.03	.12	30	30	40	1.1			NW	0	0	3	Cloudy,
13	69	79	72		.05	.00	.06	25	45	40					1	0	2	ditto,
14	69	81	74	.01	.00	.04	35	55	50				SW	1	1	0	Clear,	
15	70	81	75	.04	.01	.04	30	45	45					0	1	0	ditto,	
16	70	75	73	.07	.06	.08	35	55	50				NW	3	3	0	Cloudy,	
17	69	80	73	.06	.02	.05	40	60	55				SW	0	1	1	Clear,	
18	70	73	69	.02	.02	.04	35	30	5	0.7				0	2	1	Cloudy,	
19	67	75	71	.03	.04	.03	15	15	15					0	2	1	ditto,	
20	69	79	72	.03	.03	.03	10	25	20				NW	0	2	0	Clear,	
21	69	77	73	.04	.04	.04	0	20	25				W	0	2	1	ditto,	
22	70	82	75	29.98	29.97	29.97	10	10	15					0	1	1	ditto,	
23	74	84	76	.99	.96	30.00	20	35	45					1	2	1	ditto,	
24	72	82	75	30.00	.98	29.98	35	55	45					0	1	0	ditto,	
25	72	86	76	29.96	.96	.97	30	60	55				NW	0	1	0	Cloudy,	
26	73	81	76	.96	.96	30.00	50	60	55				NW	1	1	0	Clear,	
27	73	83	74	30.03	30.03	.10	50	60	55					0	1	0	ditto,	
28	70	81	73	.14	.17	.15	50	60	55					0	1	0	ditto,	
mean	71	79½	74		30.02	30.01	30.04	15	15	30	2	28	6	2.9	1	1½	1½	

A P P E N D I X.

A GENERAL STATE of the WEATHER, for MARCH 1785.

		M.	N.	E.	
THERMOMETER,	Greatest altitude, - - - - -	80°	90°	83°	79°
	Least ditto, - - - - -	68	80	73	
	Mean ditto, - - - - -	75	85	78	
BAROMETER,	Greatest ditto, - - - - -	30.12	30.10	30.13	29.95
	Least ditto, - - - - -	29.85	29.84	29.86	
	Mean ditto, - - - - -	29.95	29.92	29.97	
	Greatest variation, - - - - -	.27	.26	.27	
	Mean density, - - - - -	.075	.688	.700	
HYGROMETER,	Moisture and drought, - - - - -	0 .0	36 d.	18 d.	.698
	Clear, - - - - - 20 days.				
	Cloudy, - - - - - 11 ditto.				
	Rain, - - - - - 3 ditto.				
	Quantity ditto, - - - - - 0.5 inches.				

THUNDER five times. Mean heat of the sun 100°.
 THERE were two or three thunder storms this month, but gentle, and attended with very little rain. Several mornings about the beginning, were very foggy and damp, and continued so, but in a lesser degree, nearly throughout the month. Heavy dews from the 15th.
 THE Barometer continued low, which may proceed from the high winds that prevailed, as well as from the extreme rarefaction of the atmosphere at this season of the year. We had often the appearance of rain, as must always be the case while the wind comes from the South quarter, and bringing with it so much vapour.

C A L C U T T A, M A R C H 1785.

Day.	Thermometer.			Barometer.			Hygrometer.			Rain.	Wind and Force.																				
	M.	N.	E.	M.	N.	E.	M.	N.	E.		Point.	M.	N.	E.																	
1	68	84	73	30.12	30.10	30.13	55	60	60		NW	1	2	0	Clear,																
2	68	84	73	.10	.07	.08	50	60	55		SW	0	1	0	ditto,																
3	69	80	74	.05	.04	.07	50	55	50		SW	0	2	1	ditto,																
4	72	82	75	.04	.03	.06	25	50	50		SE	1	2	2	ditto,																
5	73	83	75	.05	.04	.04		5	35	25		SE	0	3	1	ditto,															
6	73	81	76	.03	29.98	.00		5	50	35			0	4	1	ditto,															
7	73	82	77	29.97	.99	.04		0	55	40		S	0	4	1	ditto,															
8	73	82	77	30.02	30.03	.07	20	45	40		SE	0	3	2	Cloudy,																
9	73	87	77	.06	.04	.07	40	55	40		SW	1	2	0	Clear,																
10	74	84	74	.05	.02	.05	25	50	45	0.1	SW	0	3	1	Cloudy,																
11	71	83	76	.02	29.98	.02	45	50	40		SE	0	2	1	Clear,																
12	74	85	77	29.98	.90	29.93	10	40	15			0	2	1	Cloudy,																
13	75	84	75	.90	.84	.89		20	40	0.3		1	3	2	Clear,																
14	71	84	74	.90	.88	.93	35	30	15	some hail.		0	3	1	Cloudy,																
15	75	84	74	.90	.85	.93		40	20			1	4	3	ditto,																
16	73	83	77	.87	.87	.97	10	20	20			3	4	4	ditto,																
17	77	85	80	.90	.89	.97		10	25		S	1	1	1	ditto,																
18	77	86	80	.96	.88	.93		20	21	10	SW	0	2	1	Clear,																
19	77	89	82	.92	.87	.92		25	50		SE	1	2	1	ditto,																
20	78	90	83	.89	.85	.88		35	40	10	SW	0	2	2	ditto,																
21	78	87	81	.86	.84	.87		20	20	10	SE	1	3	1	Cloudy,																
22	79	86	81	.87	.87	.89		30	10	10	S	1	4	2	ditto,																
23	79	85	81	.85	.84	.89		30	10	0.1		1	3	4	Clear,																
24	77	85	80	.87	.85	.89		10	20			1	2	3	ditto,																
25	78	87	81	.89	.92	.98		30	35			0	3	2	ditto,																
26	79	86	81	.96	.91	.91		30	20	10		0	3	3	Cloudy,																
27	79	88	82	.89	.93	.86		20	20			2	3	1	Clear,																
28	79	88	82	.85	.87	.92		35	15	5		1	2	3	ditto,																
29	79	88	83	.90	.87	.92		25	20	5		1	2	2	ditto,																
30	80	84	82	.95	.87	.90		30	20	20		0	0	0	Cloudy,																
31	79	88	82	.90	.85	.90	25	60	40			0	1	0	Clear,																
mean															75	85	78	29.95	29.92	29.97	13	13	36	20	2	0.5	S	1	3	2	Clear.

A P P E N D I X:

GENERAL STATE of the WEATHER, for APRIL 1785.

		M.	N.	E.	
THERMOMETER,	Greatest altitude,	83	91	85	82½
	Least ditto,	69	75	74	
	Mean ditto,	79	86½	82	
BAROMETER,	Greatest ditto,	29.97	29.92	29.97	69.33
	Least ditto,	29.70	29.68	29.74	
	Mean ditto,	29.83	29.81	29.86	
	Greatest variation,	.27	.24	.23	
	Mean density,	.695	.684	.691	
HYGROMETER,	Moisture and drought,	20 m.	20 d.	4 d.	.690
	Clear	-	-	17 days.	
	Cloudy,	-	-	13 ditto.	
	Rain,	-	-	6 ditto.	
	Quantity ditto,	-	-	8 inches.	

THE quantity of rain that fell on the 16th and 17th was very considerable, and the variation that appeared on the mercury before and after the thunder storms was very great, sometimes 00.30 in the space of a few minutes.

THUNDER six times. Mean heat of the sun 108° to 116°.

THE temperature of the air throughout this month was less warm and sultry than it is generally found at this time of the year, as also the storms that came from the NW were fewer in number. The air rather moist, and little or no variation in the winds, they being always directly S and SE.

C A L C U T T A, A P R I L 1785.

Day.	Thermo- meter.			Barometer.			Hygrometer.			Rain.	Wind and Force.											
	M.	N.	E.	M.	N.	E.	M.	N.	E.		Point.	M.	N.	E.								
1	79	84	80	29.90	29.86	29.90	30	55	50		S	0	2	2	Clear,							
2	75	90	80				.89	.82	.85			25	60	30	0	1	2	ditto,				
3	77	90	83				.82	.77	.81			20	60	30	0	1	2	ditto,				
4	77	90	82				.82	.80	.84			10	45	20	0	1	3	ditto,				
5	79	88	83				.83	.80	.83			4	45	30	0	3	1	ditto,				
6	79	90	83				.81	.82	.83			3	35	25	0	3	3	ditto,				
7	78	88	82				.86	.85	.88			2	20	20	1	4	3	ditto,				
8	80	88	81				.88	.83	.84			1	30		0	4	4	Cloudy,				
9	80	87	84				.82	.81	.84			3	20	10	2	3	2	Clear,				
10	80	87	84				.78	.77	.85			3	30	40	1	4	1	Cloudy,				
11	81	88	85	.83	.82	.86	2	50	15	1	2	3	ditto,									
12	81	88	85	.82	.80	.87	3	30	10	1	0	1	ditto,									
13	81	85	84	.82	.86	.89	2	30	35	1	0	0	ditto,									
14	83	84	82	.87	.87	.89	1	40	40	1	4	0	ditto,									
15	81	84	83	.90	.92	.97	2	30		NW	1	0	1	ditto,								
16	78	81	74	.97	.92	.96	4	5	40	0	2.4	3	2	4	ditto,							
17	69	75	75	.86	.79	.83	3	30	20	50	3.6	NE	3	3	2	ditto,						
18	77	82	80	.82	.88	.94	6	0	15	20	0.5	S	0	0	0	Clear,						
19	79	84	82	.92	.84	.90	4	40				0	4	0	Cloudy,							
20	78	85	81	.85	.79	.93	2	20				1	2	2	Clear,							
21	75	84	80	.85	.83	.90	1	10				1	3	2	Cloudy,							
22	74	82	80	.85	.84	.87	2	20	10	10	0.9	SE	1	2	0	Clear,						
23	79	85	83	.83	.80	.83	4	40	10	20		SE	1	2	1	Cloudy,						
24	81	88	85	.80	.75	.78	4	40	10	20		S	1	3	1	Clear,						
25	82	89	85	.77	.76	.84	4	40	20	10		S	1	2	1	ditto,						
26	83	89	81	.76	.77	.87	3	30	10	10	0.3	S	1	4	4	Cloudy,						
27	82	89	82	.72	.68	.83	4	40	20	20	0.3	S	1	4	4	ditto,						
28	79	87	83	.70	.75	.74	4	40	20	30		S	1	3	3	ditto,						
29	82	90	85	.76	.79	.84	5	50	10	15		S	0	3	1	ditto,						
30	82	91	85	.82	.83	.84	4	40	10	15		S	1	3	1	ditto,						
mean	79	86½	82					29.83	19.81	29.86	4	24	24	4	12	8	8.0	S	1	3	2	Cloudy.

A P P E N D I X .

A GENERAL STATE of the WEATHER, for MAY 1785.

		M.	N.	E.	
THERMOMETER,	Greatest altitude,	87	94	89	86
	Least ditto,	79	87	85	
	Mean ditto,	83	89½	85	
BAROMETER,	Greatest ditto,	29.96	29.92	30.03	29.77
	Least ditto,	29.60	29.53	29.53	
	Mean ditto,	29.77	29.74	29.82	
	Greatest variation,	.36	.39	.30	
HYGROMETER,	Mean moisture,	1 m.	30 d.	20 d.	.682
	Mean density,	.685	.676	.685	
Clear,		16 days.			
Cloudy,		13 ditto.			
Rain,		10 times.			
Quantity ditto,		6 inches.			

TRUNDER fourteen times. Mean heat of the sun 110° to 111°.
 The air this month has been drier than that of the preceding, but the winds being more from the SE quarter is the reason of the mercury being so low; much close and sultry weather about the middle. The variation on the Barometer much greater than usual.

C A L C U T T A , M A Y 1 7 8 5 .

Day.	Thermometer.			Mean density at each quarter of the Moon.	Barometer.			Hygrometer.			Rain.	Wind and Force.									
	M.	N.	E.		M.	N.	E.	M.	N.	E.		Point.	M.	N.	E.						
182	92	86		L. Q. .682	29.82	29.80	29.81	40	10	10		S	1	2	1	Clear,					
283	91	85			.77	.74	.75	30	10	10			2	2	2	ditto,					
383	91	87			.75	.68	.75	30	20	20			1	1	2	ditto,					
487	91	86		.76	.78	.83	15	40	20			6	3	1	ditto,						
585	89	86		.71	.83	.87	0	30	20			1	4	4	Cloudy,						
683	90	83		.96	.86	30.03	15	30	20	0.5		2	3	2	Clear,						
781	87	84		.78	.78	29.94	10	35	35		E	1	2	1	Cloudy,						
882	90	87		.95	.92	.97	10	50	30		S	0	2	0	Clear,						
983	90	85		.94	.89	.95	10	50	25			0	2	1	ditto,						
1083	89	85		.92	.85	.89	10	45	20	0.3	SE	0	2	0	ditto,						
1184	90	83		.86	.79	.83	10	50	30			0	2	2	ditto,						
1283	90	83		.80	.77	.85	50	15	15	0.1		1	2	2	ditto,						
1384	89	85		.80	.78	.83	10	45	35			3	3	0	ditto,						
1484	91	85		.83	.77	.82	25	50	30			0	1	0	Cloudy,						
1584	92	86		.84	.77	.80	10	60	55			0	1	0	Clear,						
1686	93	84		.81	.76	.86	40	60	55		SW	0	0	0	ditto,						
1782	92	85		.83	.81	.90	20	56	30			0	1	0	Cloudy,						
1890	88	84		.77	.86	.93	10	40	20	1.4	S	0	1	0	ditto,						
1981	88	86		.89	.81	.83	10	50	40		SW	1	0	0	Clear,						
2083	89	86		.80	.72	.79	10	50	40		S	0	0	0	Cloudy,						
2184	91	83		.75	.67	.79	10	55	40			0	1	1	Clear,						
2282	90	87		.74	.65	.75	30	40	40			0	1	0	Cloudy,						
2383	91	89		.69	.58	.66	10	40	35		SE	0	1	0	Clear,						
2487	94	89		.63	.53	.66	20	20	20	0.2	S	0	0	4	Cloudy,						
2584	92	82		.60	.59	.63	10	60	10	1.3		1	0	0	ditto,						
2679	88	85		.65	.64	.70	10	50	20		SE	1	0	0	ditto,						
2784	90	80		.65	.64	.76	20	40	10	0.5		0	3	1	ditto,						
2882	88	85		.70	.70	.78	20	40	10			0	1	3	Clear,						
2981	83	82		.73	.70	.75	10	40	10	0.4	S	3	3	1	Cloudy,						
3084	90	85		.74	.66	.72	20	0	0	0.1		3	3	2	Clear,						
3181	87	85		.61	.68	.72	40	20	40	1.2	SW	2	1	1	Cloudy,						
mean	83	85					29.77	29.74	29.82	81	91	40	1	23	3	6.0	1	4	2	1	Clear.

A P P E N D I X.

A GENERAL STATE of the WEATHER, for JUNE 1785.

		M.	N.	E.	
THERMOMETER,	Greatest altitude,	84	90	85	} 82½
	Least ditto,	79	50	79	
	Mean ditto,	81½	84½	82	
BAROMETER,	Greatest ditto,	29.70	29.65	29.72	} 29.58
	Least ditto,	29.44	29.40	29.47	
	Mean ditto,	29.59	29.56	29.61	
	Greatest variation,	.26	.23	.25	
	Mean density,	.637	.681	.685	
HYGROMETER,	Mixture and drought,	50 m.	30 m.	40 m.	} .684
	Clear, - - - - -	4 days.			
	Cloudy, - - - - -	26 ditto.			
	Rain, - - - - -	24 times.			
	Thunder, - - - - -	16 ditto.			
	Quantity of rain, - - -	24 inches.			

MEAN heat of the Sun 106°. THE quantity of rain this month has been uncommonly great, and scarce a day passed without some falling; the weather of course disagreeable and unhealthy. THE mercury in the Barometer very low, which seldom fails to be the case, while the winds come from the SE and E quarters.

C A L C U T T A, J U N E 1785.

Day.	Thermometer.			Barometer.			Hygrometer.			Rain.	Wind and Force.				
	M.	N.	E.	M.	N.	E.	M.	N.	E.		Point.	M.	N.	E.	
1	84	90	83	29.61	29.54	29.05	40	10	20	0.2	S	0	0	1	Cloudy,
2	83	85	82	.63	.61	.68	40	20	40		SE	1	1	0	ditto,
3	81	90	83	.68	.67	.70	45	0	20			0	1	0	Clear,
4	81	85	82	.70	.66	.72	40	40	50	0.7		1	0	0	Cloudy,
5	81	86	83	.70	.62	.64	40	30	40		NE	1	0	1	ditto,
6	81	85	83	.62	.55	.61	60	30	40	0.1	E	1	1	1	ditto,
7	82	85	82	.59	.61	.60	50	50	50	0.1		1	1	0	ditto,
8	82	84	80	.64	.60	.68	60	60	60	0.5	SE	1	0	0	ditto,
9	80	80	82	.68	.65	.70	60	60	60	2.7		0	1	1	ditto,
10	80	84	84	.57	.64	.68	60	40	60	1.5	S	0	1	0	Clear,
11	82	84	84	.67	.64	.70	60	20	50	0.1		0	0	1	Cloudy,
12	82	87	84	.70	.68	.70	50	10	30			0	1	0	Clear,
13	84	87	85	.62	.68	.58	30	30	30			0	1	0	ditto,
14	83	87	81	.56	.46	.50	50	30	30	0.2		0	1	0	Cloudy,
15	84	84	82	.44	.40	.47	50	50	40	2.9	SE	0	0	2	ditto,
16	81	84	80	.48	.47	.57	60	50	50	1.7		0	1	0	ditto,
17	82	83	80	.54	.58	.65	60	60	50	1.4	E	0	1	0	ditto,
18	79	82	79	.63	.62	.66	60	60	60	2.9	SE	0	1	0	ditto,
19	80	82	80	.58	.56	.60	60	40	60	1.3		1	2	1	ditto,
20	80	82	81	.57	.54	.62	60	40	50	0.2		2	1	1	ditto,
21	79	83	82	.57	.54	.60	50	40	40	0.3		0	1	0	ditto,
22	81	84	82	.57	.55	.57	40	40	50		N	0	1	1	ditto,
23	81	82	80	.55	.55	.59	50	30	60	5.9		0	0	0	ditto,
24	80	84	82	.56	.52	.58	50	30	40	0.1		1	1	0	ditto,
25	82	85	83	.53	.52	.57	50	30	40		N	1	1	2	ditto,
26	82	85	83	.52	.52	.55	50	30	40	0.1		1	0	0	ditto,
27	83	85	84	.47	.48	.54	50	30	40	0.1		0	0	1	ditto,
28	82	84	83	.30	.45	.50	50	30	40	0.6		1	0	0	ditto,
29	82	85	84	.46	.44	.48	50	30	40			0	0	0	ditto,
30	82	85	84	.46	.45	.49	50	30	40	0.8	NE	0	1	0	ditto,
mean	81½	84½	82				29.59	29.56	29.61			1½	1½	1½	Cloudy.

A P P E N D I X.

A GENERAL STATE of the WEATHER, for JULY 1785.

		M.	N.	E.	
THERMOMETER,	Greatest altitude	84°	89	87	82½
	Least ditto	79½	80	80	
	Mean ditto	81½	84½	82½	
BAROMETER,	Greatest ditto	29.73	29.67	29.73	29.59
	Least ditto	29.44	29.48	29.47	
	Mean ditto	29.59	29.56	29.62	
	Greatest variation	.29	.22	.26	
	Mean density	.686	.682	.689	
HYGROMETER,	Mean moisture	50 m.	35 m.	45 m.	.684
	Clear	4 days.			
	Cloudy	27 ditto.			
	Rain	24 times.			
	Quantity of ditto	12-8 inches.			
	Thunder	11 times.			

MEAN heat of exposed air 100°. THE weather this, as the preceding month, very relaxing and disagreeable, although the quantity of rain only about one half. The low state of the mercury is undoubtedly affected by the Easterly winds, as is no less the animal spirits.

C A L C U T T A, J U L Y 1 7 8 5.

Day.	Thermometer.			Mean density at each quarter of the Moon.	Barometer.			Hygrometer.			Rain.	Wind and Force.					
	M.	N.	E.		M.	N.	E.	M.	N.	E.		Point.	M.	N.	E.		
1	82	86	85	N. M. 684	29.47	29.46	29.52	40	20	40	0.1	SE	0	0	0	Cloudy,	
2	80	80	83		.51	.50	.58	40	30	40	0.3	NE	1	1	2	ditto,	
3	79	83	81		.52	.53	.57	50	30	50	0.2		1	0	3	ditto,	
4	80	84	81		.56	.54	.60	60	40	60	0.2	S	0	1	0	ditto,	
5	82	82	81		.58	.54	.59	60	50	60	0.3	S	0	0	0	ditto,	
6	81	80	80		.54	.45	.47	60	60	60	2.6	SE	0	0	3	ditto,	
7	79	83	81		.44	.47	.57	60	60	60	0.1	SW	0	2	2	ditto,	
8	80	82	80		.54	.57	.63	60	60	60	0.4	SE	0	1	1	ditto,	
9	80	84	81		.60	.59	.66	60	60	60		S	1	1	1	ditto,	
10	80	85	83		.66	.63	.70	60	20	40			0	1	1	ditto,	
11	82	84	82	.68	.66	.70	60	30	40	R		0	0	1	ditto,		
12	81	85	83	F. Q. 686	.66	.57	.58	50	30	40	1.3	SE	0	1	2	ditto,	
13	83	83	82		.55	.48	.54	50	40	50	1.7		0	1	0	ditto,	
14	81	83	81		.52	.51	.62	50	40	50	0.1	SE	1	1	3	ditto,	
15	80	84	83		.63	.63	.68	50	20	30		SW	2	2	2	ditto,	
16	82	85	83		.67	.60	.64	50	30	40	0.3	S	2	1	2	ditto,	
17	82	86	84		.62	.57	.57	50	20	30	0.2	S	1	1	4	Clear,	
18	82	83	81		.52	.49	.50	50	30	40	0.5	SW	1	2	3	Cloudy,	
19	80	84	80		.47	.50	.57	50	20	40	0.6	SE	1	1	0	ditto,	
20	80	83	82		.55	.54	.60	50	30	40	0.6	SW	0	0	1	ditto,	
21	81	84	82		.57	.55	.63	50	30	40		S	0	1	1	ditto,	
22	81	83	81	F. M. 687	.60	.62	.66	50	40	40	0.1	SE	0	0	0	ditto,	
23	80	84	81		.66	.64	.72	50	40	30	0.1		1	1	0	ditto,	
24	80	85	83		.72	.67	.73	50	40	20	R		1	2	0	ditto,	
25	83	87	85		.73	.67	.69	25	30	10		S	1	1	0	Clear,	
26	84	87	84		.72	.67	.72	30	30	10	0.1	SE	0	0	1	ditto,	
27	84	86	84		.70	.63	.67	10	10	20		S	0	0	0	Cloudy,	
28	84	85	84		L. Q. 688	.67	.60	.64	30	0	0	0.3	SE	0	2	1	ditto,
29	84	89	87			.64	.58	.66	40	0	20			0	1	0	Clear,
30	84	87	85			.60	.56	.60	40	20	20	0.1		0	1	0	Cloudy,
31	82	86	84			.57	.46	.65	40	10	20	0.1		1	0	1	ditto,
mean	81½	84½	82½		29.59	29.56	29.62	50	35	45	12.8		½	1	1	Cloudy.	

A P P E N D I X.

A GENERAL STATE of the WEATHER, for AUGUST 1785.

		M.	N.	E.	
THERMOMETER,	Greatest altitude,	84	89	86	82½
	Least ditto,	79	80	80	
	Mean ditto,	81½	84½	82½	
BAROMETER,	Greatest ditto,	29.78	29.72	29.78	29.62
	Least ditto,	29.50	29.49	29.57	
	Mean ditto,	29.62	29.59	29.64	
	Greatest variation,	.28	.23	.21	
	Mean density,	.687	.682	.686	
HYGROMETER,	Moisture,	50 m	30 m	40 m	.685
	Clear,	- - - 3 days.			
	Cloudy,	- - - 28 ditto.			
	Thunder,	- - - 16 times.			
	Rain,	- - - 20 ditto.			
	Quantity ditto,	- 9-3 inches.			

The heat of the sun at mid-day 100°. Much cloudy weather, but seldom any very heavy falls of rain, and the quantity altogether but moderate. The river very full, and accounts of heavy rains up the country. The Barometer remarkably low the whole month; a proof of there being still much water in the Clouds.

C A L C U T T A, A U G U S T 1785.

Day.	Thermometer.			Barometer.			Hygrometer.			Rain.	Wind and Force.					
	M.	N.	E.	M.	N.	E.	M.	N.	E.		Point.	M.	N.	E.		
1	80	84	82	22.53	29.50	29.58	50	40	40	0.3	SE	0	1	1	Cloudy,	
2	81	86	83	.56	.53	.60	50	30	20			0	1	0	Clear,	
3	83	84	83	.59	.56	.63	50	20	30			0	1	0	Cloudy,	
4	83	87	85	.60	.55	.60	40	20	20	0.1		1	1	0	ditto,	
5	81	83	81	.59	.58	.61	40	40	40	1.3		1	1	0	ditto,	
6	80	83	81	.56	.54	.60	50	40	50	0.9		1	1	1	ditto,	
7	81	84	81	.58	.56	.65	60	40	50	0.2		0	1	0	ditto,	
8	80	82	81	.63	.62	.74	60	50	50	1.2		0	1	1	ditto,	
9	70	80	80	.74	.74	.76	60	60	50	0.1		0	0	1	ditto,	
10	79	84	82	.74	.68	.70	60	50	50			0	1	1	ditto,	
11	82	87	85	.65	.59	.62	60	30	50			0	0	1	Clear,	
12	82	85	83	.60	.61	.64	50	30	40			0	1	1	Cloudy,	
13	81	83	82	.63	.60	.64	50	40	30			0	0	0	ditto,	
14	81	85	84	.58	.50	.57	50	30	40	0.3		0	1	1	ditto,	
15	83	86	84	.53	.49	.57	50	40	30	0.4		0	1	0	ditto,	
16	82	83	82	.54	.53	.57	50	30	20	0.5	NE	1	1	2	ditto,	
17	82	84	82	.50	.54	.62	50	20	30	0.2	SE	1	1	1	ditto,	
18	83	84	83	.62	.58	.64	50	30	40	1.3		1	1	1	ditto,	
19	84	87	85	.60	.58	.63	50	20	30			0	1	2	ditto,	
20	80	89	86	.58	.60	.66	40	0	0		NE	0	1	1	Clear,	
21	84	85	85	.62	.60	.67	20	20	20		SE	0	1	0	Cloudy,	
22	83	87	84	.62	.57	.64	30	10	20	0.2		4	1	1	ditto,	
23	83	85	83	.61	.60	.60	40	30	30	0.1		1	1	1	ditto,	
24	81	85	82	.63	.63	.70	40	30	30	0.3	NE	1	1	1	ditto,	
25	82	85	84	.68	.67	.72	40	30	40			1	1	0	ditto,	
26	81	84	81	.70	.66	.71	40	30	40	0.3		0	0	2	ditto,	
27	80	84	81	.73	.70	.78	40	30	30	0.1		0	0	1	ditto,	
28	81	85	83	.78	.72	.78	40	20	30	0.1		0	0	1	ditto,	
29	81	85	83	.74	.67	.76	50	20	30		SE	0	0	1	ditto,	
30	82	84	83	.70	.67	.73	40	20	30	0.1		0	0	0	ditto,	
31	82	83	82	.67	.62	.69	30	30	30	1.4		1	1	1	ditto,	
mean	81½	84½	82½		29.62	29.59	29.64	150	30	40	9.3	SE	½	1	1	Cloudy.

A P P E N D I X.

A GENERAL STATE of the WEATHER, for SEPTEMBER 1785.

		M.	N.	E.	
THERMOMETER,	Greatest altitude,	84°	89°	85	} 52½
	Least ditto,	80	81	80	
	Mean ditto,	81	85	82½	
BAROMETER,	Greatest ditto,	29.83	29.82	29.87	} 29.71
	Least ditto,	29.62	29.59	29.66	
	Mean ditto,	29.71	29.68	29.75	
	Greatest variation,	.21	.83	.21	
HYGROMETER,	Moisture,	45 m	20 m	25 m	} .686
	Density,	.637	.632	.688	
	Clear,	8 days.			
	Cloudy,	22 ditto.			
	Rain,	16 times.			
	Thunder,	13 ditto.			
	Quantity of rain,	11-7 inches.			

MEAN heat of the sun at mid-day 110°.

THE Barometer higher than the former month; about the middle and end, great quantities of rain. By accounts from Eerhampore, the quantity of rain there must have been very considerable, and many parts above, the whole country being under water, and the river swelling prodigiously. This month very unhealthy and many people dying.

C A L C U T T A, S E P T E M B E R 1785.

Day.	Thermometer.			Barometer.			Hygrometer.			Rain.	Wind and Force.					
	M.	N.	E.	M.	N.	E.	M.	N.	E.		Point.	M.	N.	E.		
1	80	84	82	29.65	29.64	29.74	40	20	20		NE	2	2	2	Cloudy.	
2	80	83	81	.70	.69	.77	30	20	30	0.2		1	1	1	ditto.	
3	80	85	83	.75	.74	.82	50	20	20			1	1	1	Clear.	
4	81	87	85	.77	.73	.80	40	10	20		SE	0	1	0	ditto.	
5	82	88	85	.78	.76	.84	30	10	10			0	1	0	ditto.	
6	83	89	85	.80	.74	.80	30	20	0	0		0	1	0	ditto.	
7	84	88	85	.76	.73	.77	20	20	10			1	1	0	ditto.	
8	82	89	85	.77	.73	.80	30	10	10			1	1	0	ditto.	
9	84	87	85	.80	.76	.85	20	10	0	0		0	1	0	Cloudy.	
10	83	85	83	.83	.82	.87	20	10	0	0		0	1	0	ditto.	
11	83	84	82	.82	.77	.80	40	20	30	0.5	E	0	1	0	ditto.	
12	82	86	83	.97	.68	.73	40	20	20	0.3		1	0	1	ditto.	
13	82	88	83	.68	.63	.70	40	20	20	0.6		0	0	1	ditto.	
14	82	84	82	.66	.62	.69	40	20	20		NE	0	1	0	Clear.	
15	81	87	83	.64	.60	.68	40	30	20			0	1	0	Cloudy.	
16	81	85	83	.66	.64	.72	40	30	20	0.4	E	2	1	0	Clear.	
17	81	84	81	.67	.66	.73	50	40	20	0.8	NE	2	1	1	Cloudy.	
18	80	83	82	.68	.64	.70	50	40	40	0.3		2	1	2	ditto.	
19	81	84	81	.62	.59	.66	50	40	50	0.3	SE	2	1	1	ditto.	
20	80	84	80	.62	.60	.70	50	40	50	1.4		1	0	1	ditto.	
21	80	82	81	.68	.72	.78	50	40	50	0.5		1	2	2	ditto.	
22	80	82	81	.78	.77	.80	50	30	0	0.1		3	2	2	ditto.	
23	81	87	85	.78	.72	.74	40	40	20		E	1	1	0	ditto.	
24	84	87	85	.72	.66	.70	20	10	10			0	0	0	Clear.	
25	83	86	82	.66	.62	.70	20	0	10			0	0	0	Cloudy.	
26	81	83	80	.66	.64	.72	20	20	10	1.3	SE	1	2	2	ditto.	
27	80	83	81	.66	.63	.68	30	20	20	1.7		1	1	2	ditto.	
28	80	81	80	.62	.60	.67	50	50	30	0.6		1	2	2	ditto.	
29	80	84	81	.66	.66	.72	50	50	50	3.5		2	2	3	ditto.	
30	80	85	83	.70	.73	.78	50	20	20	0.2		0	1	1	ditto.	
mean	81	85	82½	29.71	29.68	29.75	45	20	1	25	11.7	SE	1	1	1	

A P P E N D I X.

A GENERAL STATE of the WEATHER, for OCTOBER 1785.

		M.	N.	E.	
THERMOMETER,	Greatest altitude	84	88	85	.83
	Least ditto,	77	82	79	
	Mean ditto,	81	85½	82½	
BAROMETER,	Greatest ditto,	29.98	29.96	29.98	29.91
	Least ditto,	22.83	29.81	29.85	
	Mean ditto,	29.90	29.87	29.96	
	Greatest variation,	.15	.15	.13	
HYGROMETER,	Mean density,	5 d.	24 d.	7 d.	.698
		.694	.684	.692	
	Clear,	-	-	21 days.	
	Cloudy,	-	-	10 ditto.	
	Thunder,	-	-	4 times.	
	Rain,	-	-	7 times.	
	Quantity of ditto,	-	-	1-4 inches.	

THE mean heat of the sun at mid-day 110°.
THE wind began to set in from the NW about the 12th and 13th.

C A L C U T T A, O C T O B E R 1785.

Day.	Thermometer.			Barometer.			Hygrometer.						Rain.	Wind and Force.				
	M.	N.	E.	M.	N.	E.	M.		N.		E.			Point.	M.	N.	E.	
							d.	m.	d.	m.	d.	m.						
1	83	85	84	29.84	29.80	29.85	30	20						NE	0	0	0	Clear,
2	81	85	83	.83	.82	.85	10	40							0	0	0	ditto,
3	83	87	85	.83	.81	.86	10	30							0	0	0	ditto,
4	82	87	84	.85	.85	.90	10	40							0	0	0	ditto,
5	82	87	84	.88	.86	.93	0	30							0	0	0	ditto,
6	84	88	85	.95	.88	.92	10	10							0	0	0	ditto,
7	83	87	85	.90	.82	.90	0	10							0	0	0	ditto,
8	82	85	81	.88	.82	.90	0	10				0.1			1	1	1	Cloudy,
9	81	82	80	.88	.85	.91	10	0				0.6			10	0	0	ditto,
10	78	84	81	.91	.88	.96	10	30				10			1	1	1	ditto,
11	81	85	83	.96	.90	.94	10	20				0.1			0	1	0	Clear,
12	83	87	82	.94	.90	.96	0	30					NW		0	1	0	ditto,
13	82	87	85	.95	.90	.96	0	40							0	1	0	ditto,
14	83	88	85	.95	.89	.93	10	40							0	1	1	ditto,
15	84	88	84	.93	.91	.98	0	40							0	1	0	ditto,
16	83	85	85	.98	.93	.96	0	10							0	1	1	ditto,
17	83	87	84	.97	.92	.93	10	40							1	1	0	ditto,
18	81	88	85	.93	.89	.93	0	30							1	1	0	ditto,
19	82	88	83	.92	.96	.94	0	30							0	1	1	ditto,
20	81	85	83	.90	.84	.96	10	50							1	1	1	ditto,
21	81	86	83	.90	.88	.91	20	50							0	1	0	ditto,
22	79	87	82	.92	.84	.89	10	50							0	1	1	ditto,
23	79	86	82	.91	.87	.93	10	50							0	1	0	ditto,
24	86	85	83	.92	.90	.95	20	40							1	0	0	ditto,
25	79	86	84	.94	.90	.94	0	30							0	1	0	ditto,
26	79	83	79	.90	.88	.90	0	20				10	0.2	SW	0	2	2	Cloudy,
27	79	82	80	.86	.82	.88	30		10			20	R	NE	0	2	1	ditto,
28	78	84	79	.87	.84	.88	30		0			20			0	2	1	ditto,
29	77	82	79	.85	.82	.92	30		10			10			0	2	2	ditto,
30	78	82	79	.90	.86	.92	30		10			10	0.3	NW	0	1	0	ditto,
31	87	82	80	.92	.90	.95	30					10	0.1	NE	0	0	0	ditto,
mean	81	85½	82½	29.90	29.87	29.96	3	8	25	1	10	3	1.4	NW	1	1	1	Clear.

A P P E N D I X.

A GENERAL STATE of the WEATHER, for NOVEMBER 1785.

		M.	N.	E.	
THERMOMETER,	Greatest altitude,	80	85	82	75
	Least ditto,	67	74	71	
	Mean ditto,	73	78½	75	
BAROMETER,	Greatest ditto,	30.10	30.08	30.12	29.98
	Least ditto,	29.90	29.82	29.80	
	Mean ditto,	29.99	29.98	30.00	
	Greatest variation,	.20	.26	.32	
HYGROMETER,	Mean density,	15 d	25 d	20 d	.705
		.709	.700	.706	

Clear - - - 26 days.
 Cloudy, - - 4 ditto.
 Rain, - - - 4 times.
 Quantity ditto, 0.5 inches.

MEAN heat of the sun at mid-day 100°.

C A L C U T T A, N O V E M B E R 1785.

Day.	Thermo- meter.			Mean den- sity at each quarter of the Moon.	Barometer.			Hygrometer.						Rain.	Wind and Force.				
	M.	N.	E.		M.	N.	E.	M.		N.		E.			Point.	M.	N.	E.	
								d.	m.	d.	m.	d.	m.						
1	79	85	82	N. M. 596	29.93	29.90	29.96	20	10				10	R	NW	0	2	0	Clear,
2	80	85	82		.95	.93	30.00	20	10				10		NE	0	2	0	ditto,
3	80	84	80		.93	.97	29.96	20	20				10		NE	0	2	0	ditto,
4	79	81	79		.94	.87	.92	20					10			1	1	2	ditto,
5	77	81	79		.90	.82	.87	20					20		R	2	2	1	ditto,
6	79	82	79		.88	.85	.80	30					10			0	2	0	ditto,
7	78	81	80		.93	.90	.97	30	30				10		0.4	0	1	1	Cloudy,
8	77	77	75		.93	.90	.93	30	30				30			1	2	3	ditto,
9	73	76	74		.90	.92	.97	10					30		NW	1	1	0	Clear,
10	73	79	77		.94	.94	0.03	30	20	10			10			0	1	0	ditto,
11	73	80	77	F. Q. 706	30.04	30.00	.10	30	30	20					0	1	0	ditto,	
12	75	80	76		.10	.04	.07			0	20				0	1	0	ditto,	
13	74	79	75		.08	.08	.12	10	40	30					0	1	0	ditto,	
14	74	77	75		.08	.03	.09	20	40	30					0	1	0	ditto,	
15	72	77	75		.00	29.96	29.98	30	50	30					0	1	0	ditto,	
16	72	77	75		F. M. 710	29.90	.93	.93	40	50	30					0	1	0	ditto,
17	73	79	76			.96	.96	30.00	40	50	40					0	1	0	ditto,
18	74	79	76			30.02	30.02	.06	30	40	30					0	1	0	ditto,
19	73	78	74			.06	.03	.07	30	40	30					2	0	1	ditto,
20	71	77	75			.10	.04	.11	30	40	30					1	1	1	ditto,
21	71	77	73	.07		.04	.10	10	20	10				0.1	1	2	1	Cloudy,	
22	69	79	74	.05		.02	.04	10	20	10					2	2	0	Clear,	
23	71	77	75	L. Q. 712		.01	29.94	29.97	10	20	10					0	1	1	ditto,
24	73	77	74			29.98	.93	.94	20	40	20					1	1	1	ditto,
25	71	77	74			.93	.90	.96	40	50	40					2	1	1	ditto,
26	71	77	72		.94	.92	.98	40	50	40					1	1	1	ditto,	
27	70	75	72		30.02	30.02	30.06	40	50	40					1	1	1	ditto,	
28	68	74	71		.01	.00	.05	40	50	40					1	1	1	ditto,	
29	67	74	71		.05	29.97	.02	40	50	40					0	2	1	ditto,	
30	67	74	72		.02	.94	.00	40	50	40					0	1	0	ditto,	

mean 73 | 78½ | 75 | | 29.99 | 29.98 | 30.00 | 20 | 7 | 25 | 1 | 20 | 3 | 0.5 | WW | ½ | ½ | ½ | Clear.

A P P E N D I X.

A GENERAL STATE of the WEATHER, for DECEMBER 1785.

		M.	N.	E.	
THERMOMETER,	Greatest altitude	70	76	73	.69
	Least ditto,	63	71	66	
	Mean ditto,	65½	73½	69	
BAROMETER,	Greatest ditto,	30.09	30.06	30.10	30.01
	Least ditto,	29.97	29.90	29.99	
	Mean ditto,	30.02	29.98	30.03	
HYGROMETER,	Greatest variation,	.12	.16	.11	.716
	Mean density,	30 d.	50 d.	40 d.	
Clear, - - - - - 31 days.		.721	.709	.719	

THE weather throughout the month remarkably clear and pleasant, and much milder than it is usually at this season of the year.
 MEAN heat of the sun at mid-day about 96°.

C A L C U T T A, D E C E M B E R 1 7 8 5.

Day.	Thermometer.			Mean density at each quarter of the Moon.	Barometer.			Hygrometer.						Rain.	Wind and Force.			
	M.	N.	E.		M.	N.	E.	M.		N.		E.			Point.	M.	N.	E.
								d.	m.	d.	m.	d.	m.					
1	68	76	78	N. M. 714	30.00	29.97	29.99	30	50	40	NW	WW	I	I	0	0	0	Clear,
2	70	75	72		29.99	.95	30.00	30	50	40				0	1	0	0	ditto,
3	70	75	72		30.03	.98	.02	30	50	40				0	0	2	0	ditto,
4	69	75	72		.04	.98	.03	30	50	40				0	0	0	0	ditto,
5	68	75	71		.01	.96	.00	30	50	40				I	I	I	0	ditto,
6	67	75	71		29.98	.95	29.99	25	45	45				0	I	0	0	ditto,
7	67	74	71		.99	.96	.99	25	45	35				I	I	I	0	ditto,
8	67	74	69		.99	.99	30.04	30	45	35				0	I	I	0	ditto,
9	67	74	69		30.06	.99	.05	30	40	35				0	I	I	0	ditto,
10	67	74	69		720	.05	.97	.04	35	45	40			0	I	0	0	ditto,
11	67	75	70	.05	.94	.10	30	50	40				I	I	0	0	ditto,	
12	68	75	70	.08	.99	.08	30	55	40				0	I	I	0	ditto,	
13	66	75	70	.09	30.05	.08	30	55	40				0	2	1	0	ditto,	
14	64	74	68	.06	.04	.09	30	55	45				0	I	0	0	ditto,	
15	63	71	66	.07	.03	.09	30	60	45				I	I	I	0	ditto,	
16	63	71	67	.08	.02	.05	30	55	40				I	I	0	0	ditto,	
17	63	72	67	.04	.02	.04	25	35	40				0	I	I	0	ditto,	
18	66	73	67	.03	.00	.02	25	35	40				0	I	I	0	ditto,	
19	64	73	68	.00	.00	.01	25	40	30				I	I	I	0	ditto,	
20	63	73	69	29.97	29.97	.05	30	40	40				I	I	I	0	ditto,	
21	65	73	69	30.02	.98	.02	30	50	45				0	I	I	0	ditto,	
22	65	74	69	.00	.98	.03	35	40	30				0	I	0	0	ditto,	
23	66	73	69	.05	.97	.03	35	40	30				0	I	0	0	ditto,	
24	67	74	68	.03	.91	.06	35	45	35				0	I	I	0	ditto,	
25	65	73	67	.04	.90	.02	30	45	40				0	I	I	0	ditto,	
26	64	73	67	.00	.96	.00	30	50	40				I	I	0	0	ditto,	
27	63	72	68	29.99	.95	.00	30	55	45				0	I	I	0	ditto,	
28	64	73	68	.98	.97	.01	30	55	50				I	I	I	0	ditto,	
29	64	73	57	.99	.97	.04	30	55	45				0	I	0	0	ditto,	
30	64	73	68	30.06	30.04	.07	30	50	40				0	I	I	0	ditto,	
31	63	74	67	728	.07	.06	.09	30	50	40				0	I	0	0	ditto,
mean	65½	73½	69		30.02	29.98	30.03	30	50	40				½	1	½		

FROM the foregoing DIARY of the Weather, it may be remarked, in regard to the variation of the Barometer, that, during the cold season, from November to March, the mercury is at its greatest height, and at the lowest during the rainy months May, June, July, August, and September. The variation of the Thermometer, or the difference between the temperature of mid-day and that of the morning and evening is very trifling, seldom exceeding 3 or 4° during the rains; whereas, during the cold season, the difference is 8 or 10°.

II.

A Synopsis of the different cases that may happen in deducing the Longitude of one place from another by means of ARNOLD'S Chronometers, and of finding the rates when the difference of Longitude is given. — By Mr. REUBEN BURROW.

IT was formerly the custom to give rules for calculation, without any investigation of their principles; but the contrary method has so much taken place of late, that those who are not acquainted with the theory of a subject are seldom in a capacity of calculating at all; and those who are acquainted with it, must either lose time by recurring thereto continually, or run the hazard of often making mistakes. Indeed the use of practical Rules is so obvious, that NEWTON has often given them when he has omitted their demonstrations; and the want of them has been noted by BACON among the deficiencies of learning; the Hindoos were so particularly attentive in that respect, that they usually gave two rules for the same operation; one couched in the shortest terms possible, and often in verse, for the ease of the memory; and the other more at length as an explanation. It therefore is much to be wished that authors would revert to the ancient custom so far, as to pay some attention to the reduction of their knowledge to practice; that people may not be under the necessity of investigating rules, at the time that they want to use them.

THE following is one rule out of a great number, that I drew up for my own use, in determining the situations of places in India, and I insert it here on account of its utility and easiness of application.

Let E = Error of the Watch from mean time at the first place;

e = Error from mean time at the second place.

T = Time by the Watch at the second place, when the error was e ;

D = Difference of Longitude between the places;

N = Interval of mean time between the observations at the two places (found by taking the interval by the Watch, and correcting it according to the estimated rate, &c.)

r = Rate of the Watch, or what it gains or loses in a day of mean time.

Then,

A P P E N D I X.

If the Watch be too	}	Fast for mean time at both places, and the Watch be	}	Gaining,	}	then	$T - E - nr$	Is the mean time at the first place when the Watch was T at the second, or when the mean time at the second place was	$T - e$	Then if the second place be from the first to the	E	$(D - E + e) : n$	Is the rate of the Watch, and	$E - e + nr$	Is the difference of Longitude.					
		Losing,		$T - E + nr$		$T - e$	W		$(e - E - D) : n$		$e - E - nr$									
		Slow for mean time at both places, and the Watch be	}	}	Gaining,	}	then		$T + E - nr$		$T + e$	E		$(E - D - e) : n$		$E - e - nr$				
		Losing,			$T + E + nr$		$T + e$		W		$(D + E - e) : n$	$e + E + nr$								
		Slow for mean time at first place and fast at second place, and the watch be	}	}	}	Gaining,	}		then		$T + E - nr$	$T + e$		E		$(D + E - e) : n$	$e - E - nr$			
		Losing,				$T + E + nr$			$T + e$		W	$(E - D - e) : n$		$e + E + nr$						
		Fast for mean time at first place and slow for mean time at second place, and the Watch be	}	}	}	}	Gaining,		then		$T - E - nr$	$T + e$		E		$(D - E - e) : n$	$E - e + nr$			
		Losing,					$T - E + nr$		$T + e$		W	$(D - E - e) : n$		$E + e + nr$						
			}	}	}	}	}		}		}	}		}		}	E	$(E - D + e) : n$	$E + e - nr$	}
																	W	$(D + E + e) : n$	$nr - E - e$	

III.

MEMORANDUMS *concerning* AN OLD BUILDING, *in the*
Hadjipore District, *near the* Gunduck River, &c.

By Mr. REUBEN BURROW.

THE pyramids of *Egypt*, as well as those lately discovered in *Ireland* (and probably too the *Tower of BABEL*), seem to have been intended for nothing more than images of MAHADEO.

Two of the *Sakkara* pyramids, described by NORDEN, are like many of the small ones usually built of mud, in the villages of *Bengal*: one of the pyramids of *Dashour* drawn by POCOCK, is nearly similar to that I am going to mention, except in the acuteness of the angle: most of the *Pagodas* of the *Carnatic* are either complete or truncated pyramids; and an old Stone Building without any cavity, which I saw in *Yambeah*, near the *Catabeda* river on the *Aracan Coast*, differed so little from a pyramid, that I did not suspect it was meant for the image of SEEVA, till I was told it by the natives.

THE largest building of the kind which I have yet seen in *India*, is about two days journey up the *Gunduck* river, near a place called *Kessereah*: it goes by the name of "BHEEM SAIN'S DEWRY," but seems evidently intended for the well known image of MAHADEO; having originally been a cylinder placed upon the frustrum of a cone for the purpose of being seen at a distance. It is at present very much decayed, and it is not easy to tell whether the upper part of the cylinder has been globular or conical; a considerable quantity of the outside is fallen down, but it still may be seen a good distance up and down the river.

THE day I went from the river to view it was so uncommonly hot that the walk and a fever together obliged me to trust to the measurements of a servant: for want of a better instrument, he took the circumference of the cylindrical part in lengths of a spear, and from that as a scale, and a sketch of the building taken at a distance, I deduced the following dimensions: what

F f f

dependance

dependance there may be on his measures I cannot determine, but probably they are not very erroneous.

Diameter of the Cylindrical part, - - - - -	64 feet.
Height of the Cylinder, - - - - -	65
Height of the Conic frustum on which the Cylinder is placed,	93
Diameter of the Cone at the base, - - - - -	563

BOTH the Cone and the Cylinder were of bricks; those of the last were of different sizes, many of them two spans long and one broad; others were of the common size, but thinner; and they were well burnt, though bedded in mortar little better than mud; there did not appear any signs of the Cylinder being hollow: the Conical part was overgrown with jungle, but I broke through it in several places and found it every where brick.

I DO not recollect whether it be visible from the site of the ancient city where the famous pillar of *Singeah* stands, or not; but have a faint idea that it is. What the intention of these extraordinary columns may have been originally, is perhaps not so easy to tell; at first sight it would seem that they were for holding inscriptions, because those of *Bettiah*, *Dehli*, and *Illahabad*, have inscriptions, (though in a character that has not been yet decyphered); but the pillar of *Singeah* seems to have none whatever, for some *Bramins* told me they attended at the time it was dug to the foundation, near twenty feet underground, by a gentleman of *Putna*, who had hopes to have found some treasures; and that there was not the least vestige of any inscription upon it. Probably those pillars, *CLEOPATRA'S* needle, and the *Devil's bolts* at *Borough-bridge*, may all have the same religious origin.

PERHAPS the connection of time and place may apologize for the diversity of the subject, in mentioning, that while I sat under the shade of a large tree near the pyramid, on account of the sultry heat, some of the people of the adjacent village came and played there with *Cowries*, on a diagram that was formed by placing five points in a circular order, and joining every pair of alternate points by a line, which formed a kind of pentagon; this brought to my recollection a circumstance told me by a gentleman in *England*, that an old piece of silver plate had been dug out of the earth with such a figure upon it; the use of it was totally unknown, as well as the age; and I was desired to find what geometrical properties the figure possessed; one I remember was, that if any number of points whatever were placed in a circular order, and each

each two alternate points joined, then the sum of all the salient angles of the figure would be equal to two right angles when the number of points was odd; but equal to four right angles when the number was even. EUCLID's properties of the angles of the triangle and trapezium are particular cases of these; but I had no suspicion of the real intention of the figure till I saw the use here made of it. It seems, however, an argument in favour of the identity of the *Druids* and *Bramins*, as well as another well known diagram usually called the "*Walls of Troy*," which was used originally in the *Hindoo* astrology: these figures however appear to have flowed from a much higher source, and to have relation to what LEIBNITZ had a distant idea of, in his analysis of situation; EUCLID in his *Porisms*, and GIRARD perhaps in his restitution of them; in fact, as the modern Algebraists have the advantage of transferring a great part of their labour from the head to the hands, so there is reason to believe that the *Hindoos* had *mechanical methods of reasoning geometrically*, much more extensive than the elementary methods made use of at present, and that even their games were deduced from, and intended perhaps to be examples of them: but this deserves to be treated more at length elsewhere.

THE same apology may perhaps excuse my mentioning here, that the idea of the *Nile's* deriving its floods from the melted snows, as well as the *Ganges*, appears to be rather imaginary: they seem to be caused principally by the rains; for the high hills beyond the *Herdwar* apparently retain their snow all the year, and therefore the quantity melted could never produce the enormous swell of the *Ganges*; not to mention that the effect of a thaw seems different from what would arise from the mere difference of heat, and therefore might partly take place in winter and the dry season. That the rains are sufficient for the purpose without recurring to the hypothesis of melted snows, appears from the following fact: A little before I observed the aforesaid pyramid, I had been a considerable distance up the *Gunduck*; the river was low for the time of the year, and the hills that skirt the borders of *Nepaul* were clear, and apparently not above fifteen coss distant; soon after a heavy shower fell upon them for some hours, and the river soon after was filled to the very banks, and continued so for many days, and large trees were torn up by the roots, and came driving down with such force by the torrent, that my boat was often endangered. Now on these hills there was actually no snow whatever; and as the rise was obviously caused by the rains, it may reasonably be concluded that the same effect has the same cause in other places.

IV.

OBSERVATIONS of *some of the* Eclipses of JUPITER'S
Satellites.

By Mr. REUBEN BURROW.

The following in the Ganges and Burrampooter Rivers.

Apparent time, 1787.		Satellite.	Weather.	Im. or Em.	Place of Observation.
d.	b.				
Sept.	23 11 41 9	2	Moderate,	Imm.	Bankipore Granary,
	24 15 41 22	3	Ditto,	Imm.	Ditto,
Oct.	11 12 45 14	1	Ditto,	Imm.	Colgong; Cleveland's Bungalow,
	23 10 26 20	3	Ditto,	Emer.	Mouth of Jellingy,
	25 11 47 39	2	Ditto,	Imm.	Shore of Ganges, South of Pubna,
	25 16 42 40	1	Ditto,	Imm.	Ditto,
	27 11 13 59	1	Ditto,	Imm.	Coffundah; Nullah,
Nov.	30 14 35 16	3	Ditto,	Emer.	Dacca; Nabob's House,
	19 8 56 32	2	Ditto,	Imm.	Tealcopee, Burrampooter.
Dec.	26 11 33 45	2	Ditto,	Imm.	Bakkamar Chorr,
	26 13 13 57	1	Ditto,	Imm.	Ditto,
	28 7 42 52	1	Ditto,	Imm.	Cazycotta,
	3 14 10 54	2	Hazy,	Imm.	Goalparah,
	3 15 8 1	1	Moderate,	Imm.	Ditto,
	5 7 51 59	3	Ditto,	Imm.	Ditto,
	5 9 35 26	1	Ditto,	Imm.	Ditto,
	10 16 41 54	2	Very Hazy,	Imm.	Budjrapore,
	10 16 56 17	1	Moderate,	Imm.	Ditto,
	12 11 26 9:	1	Hazy,	Imm.	Tingarchor;
12 11 48 40:	3	Ditto,	Imm.	Ditto,	
19 15 28 59	1	Ditto,	Emer.	Luckipore,	

The following on the Arracan Coast.

Apparent time, 1788.		Satellite.	Weather.	Im. or Em.	Place of Observation.
d.	b.				
Feb.	5 10 18 12:	1	Moderate,	Emer.	Cheduba, Flag Staff point,
	12 12 13 54	1	A little hazy,	Emer.	Ditto, Maykawoody Fort,
	21 8 39 29	1	Moderate,	Emer.	Yambeah Ty Fort,
	23 10 57 53	2	Ditto,	Emer.	Ditto, Kyaonemo,
	28 10 35 13	1	Ditto,	Emer.	Cheduba; Cedar point.

*The following were observed at Colonel WATSON'S Docks, at Kidderpore,
near the mouth of the Nullah.*

Apparent time, 1788.		Satellite.	Weather.	Im. or Em.	Place of Observation.
d.	b.				
March,	15 8 36 36	1	Moderate,	Emer.	
	19 7 54 2	2	Ditto,	Emer.	
	22 10 34 41	1	Ditto,	Emer.	
	31 7 1 24	1	Ditto,	Emer.	

The following in the Ganges and Rohilcund, &c.

Apparent time, 1788.		Satellite.	Weather.	Im. or Em.	Place of Observation.	
d.	h. m.					
Oct.	8 14 35 30	3	Moderate.	Emer.	Bankipore,	
	29 14 3 4	1	Ditto,	Imm.	Benares, Observatory,	
Nov.	1 15 42 36	2	Ditto,	Imm.	Chunar Camp,	
	12 17 44 23	1	Hazy,	Imm.	Illahabad Fort,	
	14 12 11 29	1	Ditto,	Imm.	Corrahcotta,	
	20 10 48 28	3	Moderate,	Imm.	In the Ganges, 3 m. below Nudjiff	
	20 14 9 52::	3	Ditto,	Emer.	Ghur,	
	21 13 58 32	1	Ditto,	Imm.	Jaujemow,	
	27 14 44 29	3	Ditto,	Imm.	Cawnpore; Magazine Gaut,	
	28 15 49 22	1	Ditto,	Imm.	Ditto,	
	30 10 17 2	1	Ditto,	Imm.	Ditto,	
	Dec.	3 15 2 23	2	Ditto,	Imm.	Joognagpore Gaut,
7 12 6 5		1	Ditto,	Imm.	East of Canouge, 0° 2' 29",	
14 13 54 57		1	Ditto,	Imm.	Futtygur, Magazine,	
21 9 20 53		2	Ditto,	Imm.	Ditto Dr. Cook's Gaut,	
21 15 44 51		1	Ditto,	Imm.	Ditto,	
23 10 12 34		1	Ditto,	Imm.	Ditto,	
28 17 35 22::		1	Hazy,	Imm.	Cutterah,	
30 12 2 48		1	Moderate,	Imm.	Fereedpore,	
1789.						
Jan.		4 14 26 28	2	Ditto,	Imm.	Nabobgunge,
	6 13 53 41	1	Ditto,	Imm.	Pillibeat; Eed Gab,	
	8 8 20 16:	1	Ditto,	Imm.	Shairgurr,	
	9 14 10 39	3	Ditto,	Imm.	Bowerkah.	
	22 14 15 50	1	Ditto,	Emer.	Bhyrah,	
	24 8 44 1	1	Ditto,	Emer.	Takoordwar,	
	29 14 15 36	2	Ditto,	Emer.	Nidjibabad,	
	29 16 7 14	1	Hazy,	Emer.	Ditto,	
	Feb.	14 13 22 49	3	Moderate,	Emer.	Amrooah,
		14 14 23 40	1	Ditto,	Emer.	Ditto,
16 8 48 8		2	Ditto,	Emer.	Huffenpore,	
16 8 51 53		1	Hazy,	Emer.	Ditto,	
17 6 53 11:		4	Ditto,	Imm.	Seerlah,	
17 11 6 44:		4	Ditto,	Emer.	Ditto,	
23 10 50 1		1	Ditto,	Emer.	Chandowfy,	
March,	2 12 48 13	1	Moderate,	Emer.	Futtyghur, Dr. Cook's Gaut,	
	2 14 11 10	2	Ditto,	Emer.	Ditto,	
	11 9 22 21	1	Ditto,	Emer.	Mobarickpore Gaut,	
	18 11 23 56	1	Ditto,	Emer.	Chunar Fort,	
	20 9 4 40	2	Ditto,	Emer.	Benares, Observatory,	
	27 7 59 16	1	Ditto,	Emer.	Bankypore, Granary,	
	27 11 53 1	2	Ditto,	Emer.	Ditto,	
	29 10 31 10	3	Ditto,	Imm.	Ditto,	
	April	3 9 56 45:	1	Ditto,	Emer.	Patna; Chehelfattoon,
		10 11 59 48:	1	Very Hazy,	Emer.	Mongeer, Rocky Point,
19 8 30 56		1	Hazy,	Emer.	Rajmahal,	
26 10 31 22		1	Moderate,	Emer.	Teacally Dumdumma,	

The following were observed at Ruffahpugly, near Calcutta.

<i>Apparent time, 1789.</i>		<i>Satellite.</i>	<i>Weather.</i>	<i>Im. or Em.</i>	<i>Place of Observation.</i>
<i>d.</i>	<i>b.</i>				
May	12 8 48 50	1	Moderate,	Emer.	
Dec.	19 11 59 15	1	Hazy,	Imm.	
	19 14 5 33	3	Ditto,	Imm.	
	22 11 23 4	2	Moderate,	Imm.	
	26 13 49 38	1	Ditto,	Imm.	
1790.					
Jan.	2 15 39 32	1	Ditto,	Imm.	
	18 13 49 51	1	Mist & wind	Imm.	
	23 10 44 48	2	Ditto,	Imm.	
	24 9 40 57	3	Hazy,	Imm.	
	27 10 8 19	1	Moderate,	Imm.	
	31 13 36 35	3	Very Hazy,	Imm.	
Feb.	1 17 32 48	1	Hazy,	Imm.	
	3 12 1 30	1	Moderate,	Imm.	
	17 10 38 18	2	Ditto,	Emer.	
	19 12 33 56	1	Ditto,	Emer.	
	26 14 28 38	1	Hazy,	Emer.	
	28 8 57 22	1	Moderate,	Emer.	
March	1 9 0 52	3	Ditto,	Emer.	
	5 16 24 13	1	Hazy,	Emer.	
	16 7 18 14	1	Moderate,	Emer.	
	23 9 14 25	1	Ditto,	Emer.	
	26 7 36 11	4	Ditto,	Imm.	

The two following were at Jowgatta, near Krishnagur.

<i>Apparent time, 1790.</i>		<i>Satellite.</i>	<i>Weather.</i>	<i>Im. or Em.</i>	<i>Place of Observation.</i>
<i>d.</i>	<i>b.</i>				
April,	22 10 27 50	2	Moderate,	Emer.	
	22 11 31 10	1	Ditto,	Emer.	

Those to the 31st of March, 1788 were observed with a glass made by WATKINS that magnified about 110 times; those from thence to the 12th of May, 1790, were observed with one of RAMSDEN'S telescopes of the sort lately made for the Navy, and the remainder with a glass made by DOLLAND that magnifies about eighty times.

I shall conclude these observations with a remark that highly concerns both the buyers and makers of telescopes; namely, that the parts which compose the object glass of an Achromatic, are generally put together in such a manner that they cannot be taken asunder; and the brass part that they are bedded in, shoots a number of chymical ramifications between the glasses, that in the course of a year renders a telescope of little or no service. This defect the maker may easily remove by making the compound object glass capable of being taken to pieces, or the parts in some other substance not liable to this defect.

III.

A Proof that the Hindoos had the BINOMIAL THEOREM.

By Mr. REUBEN BURROW.

THE *Islands* in the bay of *Bengal* are many of them covered with shells and marine productions to a great height, and there are beds of large smooth pebbles near the *Herdwar* some hundreds of feet above the present level of the *Ganges*; the sea has therefore gradually been retiring, and consequently the position of the Equator was formerly farther north than it is at present in this part of the earth: and if a few similar observations were made in other countries, it is evident that the ancient situation of the pole upon the surface of the earth might be determined sufficiently near for explaining many difficulties and paradoxes in Geographical antiquities; for this purpose also, it would be adviseable to have permanent meridian lines drawn in high northern latitudes, to be compared in succeeding ages, and also to have marks cut upon rocks in the sea, to shew the proper level of the water.

IN the aforesaid position of the Equator, the sands of *Tartary* were inhabitable and the Siberian climates temperate; the deserts of the lesser *Buckharia* were then part of the seat of the *Paradise of Moses*; and the four sacred rivers of *Eden* went through *India, China, Siberia*, and into the *Caspian Sea*, respectively; this appears from a *Bramin* map of the world in the *Sanscrit language*, which I met with about two years ago in the higher parts of *India*, together with a valuable Treatise of Geography upon the system of *Boodh*; both of which I communicated, with my idea on the subject, to Mr. WILFORD, of the *Bengal Engineers*; and from him the world may expect shortly to be favoured with the first true representation of Scriptural and *Hindoo* Geography.

FROM the aforesaid country the *Hindoo* religion probably spread over the whole earth: there are signs of it in every northern country, and in almost every system of worship: in *England* it is obvious; Stonehenge is evidently one of the Temples of *Boodh*; and the Arithmetic, the Astronomy, Astrology, the Holidays, Games, names of the Stars and figures of the Constellations; the ancient Monuments, Laws, and even the languages of the different nations, have the strongest marks of the same original. The worship of the sun and fire; human and

animal sacrifices, &c. have apparently once been universal: the religious ceremonies of the papists seem in many parts to be a mere servile copy of those of the *Gosigns* and *Fakers*; the Christian Ascetics were very little different from their filthy original the *Byraggys*, &c.; even the hell of the northern nations is not at all like the hell of the scripture, except in some few particulars; but it is so striking a likeness of the hell of the *Hindoos*, that I should not at all be surpris'd if the story of the soldier that saw it in SAINT PATRICK'S purgatory, described in MATTHEW PARIS'S history, should hereafter turn out to be merely a translation from the *Sanscrit* with the names changed. The different tenets of *Poperly* and *Deism* have a great similitude to the two doctrines of *Brahma* and *Boodh*; and as the *Bramins* were the authors of the Ptolemaic system, so the *Boodhists* appear to have been the inventors of the ancient *Philolaic* or *Copernican*, as well as of the doctrine of attraction; and probably too, the established religion of the *Greeks* and the *Eleusinian* mysteries may only be varieties of the two different sects. That the *Druids* of *Britain* were *Bramins* is beyond the least shadow of a doubt; but that they were all murdered and their sciences lost, is out of the bounds of probability; it is much more likely that they turned Schoolmasters and Freemasons and Fortune-tellers, and in this way part of their sciences might easily descend to posterity, as we find they have done: an old paper, said to have been found by *Locke*, bears a considerable degree of internal evidence both of its own antiquity and of this idea; and on this hypothesis it will be easy to account for many difficult matters that perhaps cannot so clearly be done on any other, and particularly of the great similitude between the *Hindoo* sciences and ours: a comparison between our eldest scientific writers and those of the *Hindoos*, will set the matter beyond dispute; and fortunately the works of *Bede* carry us twelve hundred years back, which is near enough to the times of the *Druids* to give hopes of finding their remains: I should have made the comparison myself, but *Bede* is not an author to be met with in this country; however, I compared an Astrolabe in the *Nagry* character (brought by Dr. MACKINNON from *Jynagur*) with CHAUCER'S description, and found them to agree most minutely; even the center pin, which CHAUCER calls "the horse," has a horse's head upon it in the instrument; therefore if CHAUCER'S description should happen to be a translation from *Bede*, it will be a strong argument in favour of the hypothesis; for we then could have nothing from the *Arabians*. What *Bungey* and *Swiffet* may contain, will also deserve enquiry; and that the
comparison

comparison may be the readier made, where the books are procurable, I mean very shortly to publish translations of the *Leelavotty* and *Beej Ganeta*, or the Arithmetic and Algebra of the *Hindoos*.

It is much to be feared, however, that many of the best treatises of the *Hindoos* are lost, and that many of those that remain are imperfect; by the help of a *Pundit*, I translated part of the *Beej Ganeta* near six years ago, when no *European* but myself, I believe, even suspected that the *Hindoos* had any Algebra; but finding that my copy was imperfect, I deferred completing the translation in hopes of procuring the remainder; I have since found a small part more, and have seen many copies; but from the plan of the work (which in my opinion is the best way of judging) they still seem all to be imperfect, though the copier generally takes care to put at the end of them that they are complete. I have the same opinion of the *Leelavotty*, and for the same reason; indeed, it is obvious that there must have been treatises existing where Algebra was carried much farther; because many of their rules in Astronomy are approximations deduced from infinite series; or, at least, have every appearance of it; such for instance as finding the sine from the arc, and the contrary; and finding the angles of a right angled triangle from the hypotenuse and sides, independant of tables of sines; and several others of a similar nature much more complicated. I have been informed by one of their *Pundits*, that some time ago, there were other treatises of Algebra besides that just mentioned, and much more difficult, though he had not seen them; and therefore as it is possible they may still be existing, and yet be in danger of perishing very soon, it is much to be wished that people would collect as many of the books of science as possible, (their poetry is in no danger), and particularly those of the doctrine of *BOODH*, which perhaps may be met with towards *Thibet*. That many of their best books are depraved and lost is evident, because there is not now a single book of geometrical elements to be met with; and yet that they had elements not long ago, and apparently more extensive than those of *EUCLID*, is obvious from some of their works of no great antiquity: the same remarks are applicable to their Cosmographical remains, in some of which there are indications of an Astronomy superior to that of the *SOORYA SIDDHANT*, and such popular treatises.

TILL we can therefore find some of their more superior works, it must be rather from the form and construction of their astronomical tables and rules, and the properties implied in their accidental solutions of questions, &c. that we can judge what they formerly knew, than otherwise; that they were acquainted

quainted with a differential method similar to NEWTON's, I shall give many reasons for believing, in a treatise on the principles of the *Hindoo* Astronomy, which I began more than three years ago, but was prevented from finishing, by a troublesome and laborious employment that for two years gave me no leisure whatever; and which (though the small time I had to spare since has been employed in writing a comment on the works of NEWTON, and explaining them to a very ingenious native who is translating them into *Arabic*) I hope ere long to have an opportunity of completing: at present I shall only give an extract of a paper explaining the construction of some tables, which first led me to the idea of their having a differential method; it is part of one out of a number of papers that were written in the latter part of the year 1783, and the beginning of 1784, and of which several copies were taken by different people, and some of them sent to *England*: this particular extract, was to investigate the rules at pages 253, 254, and 255, of *Monf. GENTIL's Voyage*, of which the Author says, "Je n'ai pu savoir sur quels principes cette table est fondée, &c." and is as follows:

"Now, by proceeding in the manner explained in the aforesaid paper to calculate the right ascension and ascensional difference for *Tirvalour*, and afterwards taking the differences Algebraically, and reducing them to puls of a *Gurry*, as in the following table, the principles of the method will be evident.

S.	Obl. Ascens.				First diff. of Obl. Ascension.				Ditto reduced to Puls of a Gurry.	Do. farther reduced.	
	R. A.		Asc. diff.								
	o	'	o	'	o	'	o	'			
0	0	0	0	0							
1	27	54	—2	19	27	54	—2	19	279	—23	256
2	57	49	—4	13	29	55	—1	54	299	—19	280
3	90	0	—4	59	32	11	—0	46	322	—8	314
4	122	11	—4	13	32	11	+0	46	322	+8	330
5	152	6	—2	19	29	55	+1	54	299	+19	318
6	180	0	+0	0	27	54	+2	19	279	+23	302
7	200	54	+2	19	27	54	+2	19	279	+23	302
8	237	49	+4	13	29	57	+1	54	299	+19	318
9	270	0	+4	59	32	11	+0	46	322	+8	330
10	302	11	+4	13	32	11	—0	46	322	—8	314
11	332	6	+2	19	29	55	—1	54	299	—19	280
12	360	0	+0	0	27	54	—2	19	279	—23	256

"The

“ The fifth and sixth columns sufficiently explain the tables in page 253 and
 “ 254 of *M. Gentil*; but there remains a part more difficult, namely, why in
 “ calculating the *Bauja*,” or the doubles of the first differences of the ascensional
 “ difference “ $\frac{2}{3}$ of the length of the shadow is taken for the first; $\frac{1}{3}$ of the
 “ first term for the second, and $\frac{1}{3}$ of the first term for the third?” “ The pri-
 “ mary reason of taking differences here, seems to be, that the chords may be
 “ nearly equal to the arcs, and that, by adding of the differences, the arcs
 “ themselves may be found nearly; the reason will appear from the following
 “ investigation. Let N be the equatorial shadow of the *Bramins* in *Bingles*,
 “ then 720 the length of the *Gnomon*, or twelve *Ongles*, will be to N the sha-
 “ dow, as radius to the tangent of the latitude; and radius to the tangent of the
 “ latitude as the tangent of the declination to the sine of the ascensional dif-
 “ ference; consequently, 720 is to N as the tangent of declination to the sine
 “ of the ascensional difference. Now, if the declinations for one, two, and
 “ three sines be substituted in the last proportion, we get the sines of the three
 “ ascensional differences in terms of N and known quantities; and, if these
 “ values be substituted in the Newtonian form for finding the arc from the sine,
 “ we get the arcs in parts of the radius; and if each of these be multiplied by
 “ 3600 and divided by 6,28318, the values comes out in puls of a *Gurry* if N
 “ be in *Bingles*, but in parts of a *Gurry* if N be in *Ongles*; and by taking the
 “ doubles, we get the values nearly as follow:

Values.	Difference		
0,00000 N		}	
0,33056 N	0,33056 N = 1-3 N nearly,		the values used by the <i>Bramins</i> ,
0,59928 N	0,26872 N = 4-5 of 1-3 N nearly,		
0,70860 N	0,10932 N = 1-3 N nearly,		

“ Now, because the values in the first column are doubles of the ascensional
 “ differences for one, two, and three sines, their halves are the ascensional dif-
 “ ferences in parts of a *Gurry*, supposing N to be in *Ongles*; and if each of
 “ these halves be multiplied by sixty, the products, namely, 9,9168 N,
 “ 17,9784 N, and 21,2580 N will be the same in puls of a *Gurry*; and if to
 “ get each of these nearly in round numbers, the whole be multiplied by
 “ three, and afterwards divided by three, the three products will be 29,75 N.
 “ 53,94 N, and 63,77 N, which are nearly equal to thirty N; fifty-four N,
 “ and sixty-four N respectively; and hence the foundation of the *Bramin* rule
 “ is evident, which directs to multiply the equatorial shadow by thirty, fifty-
 “ four,

“ four, and sixty-four respectively; and to divide the products by three for the
 “ *Chorardo* in puls: and these parts answer to one, two, and three signs of lon-
 “ gitude from the true equinox; and therefore the *Ayanongsh*, or *Bramin* pre-
 “ cession of the equinox, must be added to find the intermediate *Chorardo* by
 “ proportion.”

Though the agreement of this investigation with the *Bramin* results, is no proof that the *Hindus* had either the differential method, or Algebra, it gave me at the time a strong suspicion of both; and yet, for want of knowing the name that Algebra went by in *Sanscrit*, I was near two years before I found a treatise on it, and even then I should not have known what to enquire for, if it had not come into my mind to ask how they investigated their rules. Of the differential method, I have yet met with no regular treatise; but have no doubt whatever that there were such, for the reasons I have before hinted; and I hope others will be more fortunate in their enquiries after it than myself.

With respect to the *Binomial Theorem*, the application of it to fractional indices will perhaps remain for ever the exclusive property of *Newton*; but the following question and its solution evidently shew that the *Hindus* understood it in whole numbers to the full as well as *Briggs*, and much better than *Pascal*. *Dr. Hutton*, in a valuable edition of *Sherwin's* tables, has lately done justice to *Briggs*; but *Mr. Whitchell*, who some years before pointed out *Briggs* as the undoubted inventor of the differential method, said he had found some indications of the *Binomial Theorem* in much older authors. The method, however, by which that great man investigated the powers independant of each other, is exactly the same as that in the following translation from the *Sanscrit*.

“ A RAJA's palace had eight doors; now these doors may either be opened
 “ by one at a time; or by two at a time; or by three at a time; and so on
 “ through the whole, till at last all are opened together: it is required to tell
 “ the numbers of times that this can be done?”

“ Set down the number of the doors, and proceed in order gradually decreas-
 “ ing by one to unity, and then in a contrary order, as follows:

8	7	6	5	4	3	2	1
1	2	3	4	5	6	7	8

“ DIVIDE the first number eight by the unit beneath it, and the quotient
 “ eight shews the number of times that the doors can be opened by one at a
 “ time:

“ time: multiply this last eight by the next term seven, and divide the product
 “ by the two beneath it, and the result twenty-eight is the number of times
 “ that two different doors may be opened: multiply the last found twenty-
 “ eight by the next figure six, and divide the product by the three beneath it,
 “ and the quotient fifty-six, shews the number of times that three different
 “ doors may be opened: again, this fifty-six multiplied by the next five, and di-
 “ vided by the four beneath it, is seventy, the number of times that four differ-
 “ ent doors may be opened: in the same manner fifty-six is the number of fives
 “ that can be opened; twenty-eight the number of times that six can be
 “ opened: eight the number of times that seven can be opened; and lastly,
 “ one is the number of times the whole may be opened together, and the sum
 “ of all the different times is 255.”

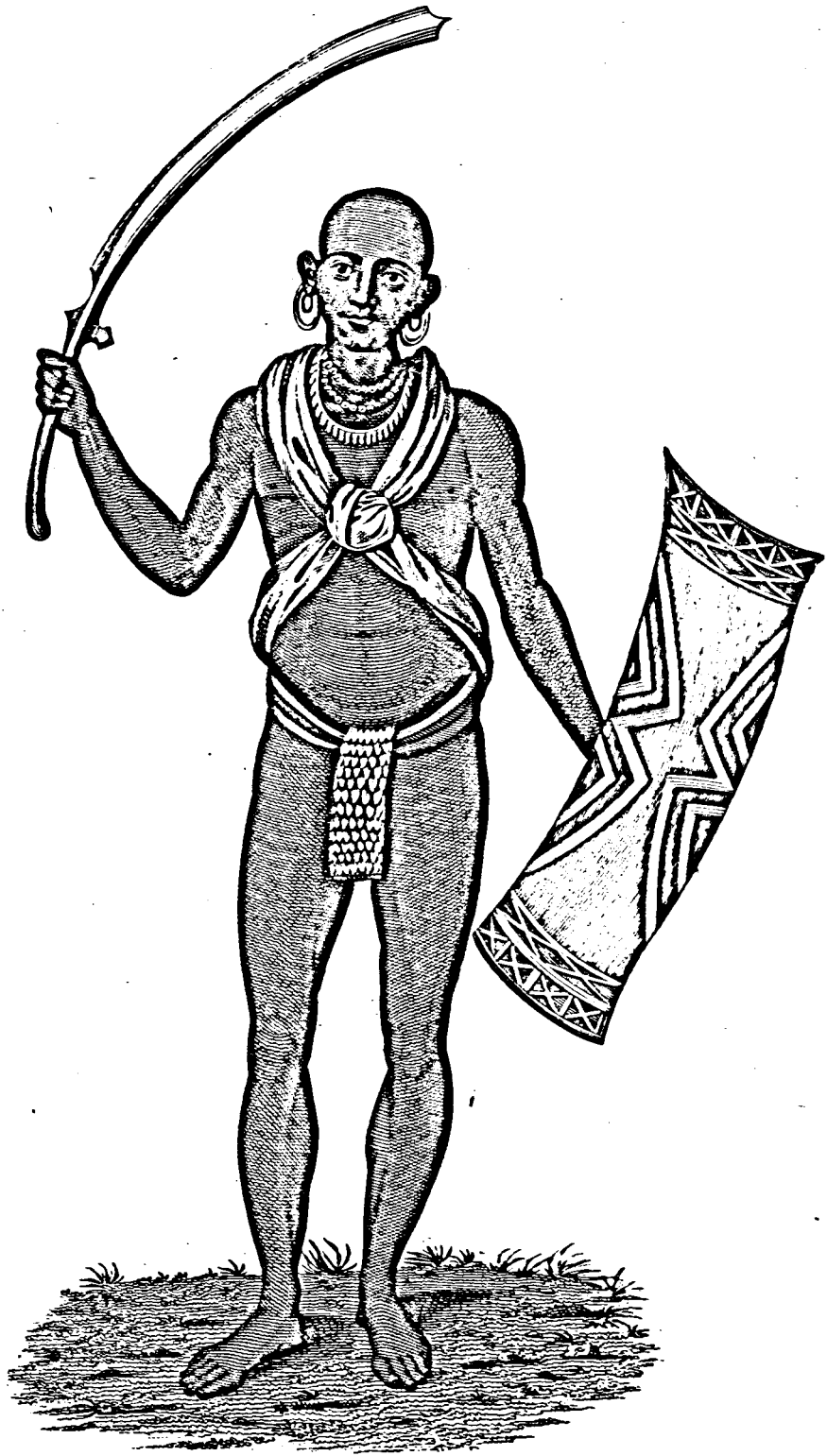
THE demonstration is evident to mathematicians; for as the second term's coefficient in a general equation shews the sum of the roots, therefore in the n power of $1 + 1$, where every root is unity, the coefficient shews the different *Ones* that can be taken in n things: also because the third term's coefficient is the sum of the products of all the different twos of the roots, therefore when each root is unity, the product of each two roots will be unity, and therefore the number of units, or the coefficient itself, shews the number of different *twos* that can be taken in n things. Again, because the fourth term is the sum of the products of the different threes that can be taken among the roots, therefore when each root is unity, the product of each three will be unity, and therefore every unit in the fourth will shew a product of three different roots, and consequently the coefficient itself shews all the different *threes* that can be taken in n things; and so for the rest. I should not have added this, but that I do not know well where to refer to it.

P. S. THERE is an observation perhaps worth remarking, with respect to the change of the *POLES*; namely, that the small rock Oysters are generally all dead within about a foot above high water mark; now, possibly, naturalists may be able to tell the age of such shells nearly by their appearance; and if so, a pretty good estimate may be formed of the rate of alteration of the level of the sea in such places where they are; for I made some astronomical observations on a rock in the sea, near an island about seven miles to the south of the island of *Cheduba*, on the *Aracan Coast*, whose top was eighteen feet above high water

mark, and the whole rock covered with those shells fast grown to it, but all of them dead, except those which were a foot above the high water mark of that day, which was February 2, 1788: the shells were evidently altered a little in proportion to their height above the water, but by no means so much as to induce one to believe that the rock had been many years out of it: all the adjacent islands and the coast shewed similar appearances, and therefore it was evidently no partial elevation by subterranean fires, or any thing of that sort: this is also apparent from the island of *Cheduba* itself, in which there is a regular succession of sea beaches and shells more and more decayed to a great height. By a kind of vague estimation from the trees and the coasts and shells, &c. (on which, however, there is not the least dependance) I supposed that the sea might be subsiding at the rate of about three inches in a year.

ASIATICK RESEARCHES:
OR,
TRANSACTIONS
OF THE
SOCIETY INSTITUTED IN BENGAL,
FOR INQUIRING INTO THE
HISTORY AND ANTIQUITIES, THE ARTS, SCIENCES, AND LITERATURE
OF
A S I A.

VOLUME THE THIRD.



A Garroiw. Man in his War Dress.

I.

THE EIGHTH ANNIVERSARY DISCOURSE.—*See the Works of Sir William Jones, Vol. I. p. 113.*

II.

OBSERVATIONS ON THE INHABITANTS OF THE GARROW HILLS,
MADE DURING A PUBLIC DEPUTATION IN THE YEARS 1788 AND 1789.

By JOHN ELIOT, Esq.

IN the month of *September* 1788, I was deputed by Government to investigate the duties collected on the *Garrow* hills, which bound the north-eastern parts of *Bengal*; and, to conciliate the good-will of the people, who had hitherto known no intercourse with *Europeans*, some scarlet cloth was given me by Government to be distributed to them.

The mountaineers, who inhabit different parts of *India*, have been generally considered savages, equally unrestrained by law and morality, and watchful to take every opportunity of committing depredations on the low country, pillaging the inhabitants, and destroying their villages, whenever they could do so with impunity. At *Boglepore*, however, it has been proved, that the hill-people, by good treatment and encouragement, may be in a great degree civilized, and rendered at least peaceable and inoffensive, if not serviceable: my observation of the character and the conduct of the *Garrows* has induced me to believe the same good consequences may be expected from encouraging them; but I propose to relate in plain language what I experienced on my visit to them, and leave others to form their own judgment; and, as I am the first *European* who has travelled among them, I shall also add a few observations on the country, and on what attracted my notice as being in any respect peculiar.

On drawing near the hills you have a beautiful sight of three ranges of mountains, rising one above another; but on nearer approach they vanish, except the

Gonassers

Gonassers, the lower range, in appearance, insignificantly small. The verdure and rich land, however, fully recompense the loss; and, turn your eye which way you will, you see something to cheer the mind, and raise the fancy, in the numerous small villages round about, protected from the heat by a variety of trees interspersed.

The first pass I went to, was *Gbofegong*, situated on the west side of the *Natie* river. Here a great number of *Garrows* reside at the foot of the pass in three villages, *Gbofegong*, *Gbonie*, and *Borack*. The head people of the villages are called *Boneabs*, a name used by the head *Rajás* in *Bengal*, when the king resided at *Gour*. Whence they derived this name, I could not learn; and many other things, which might lead to discoveries, escaped my knowledge from the want of a good interpreter.

OODASSEY BOONEAH is looked on as the head man of this pass at present, having most influence with his sect; but the rightful chief is *MOMEE*, a woman, and her power being, by established usage, transferrable by marriage to her husband, he ought in consequence to preside; but, from his being a young and silly man, the chiefship is usurped by *OODASSEY*, and his usurpation is submitted to by *MOMEE* and her husband. *OODASSEY* however is by no means a violent or artful man. He is far from possessing a bad disposition, is a mild man, and by all accounts takes great pains to do justice, and keep up unanimity with his people.

The village *Gbofegong* is surrounded by a little jungle. On passing it, the village is opened to your sight, consisting of *Cbaungs* or Houses from about thirty to 150 feet long, and twenty or forty broad.

These *Garrows* are called by the villagers and upper hill people *Council Garrows*, though they themselves, if you ask them of what cast they are, will answer *Garrows*, and not give themselves any appellation of cast, though there are many casts of *Garrows*, but with what differences I had not time to ascertain.

The soil is of a fine black earth, here and there intermixed with spots of red earth: its richness is plainly seen from the quickness of vegetation. The rice is in many places equal to the *Benares* long rice. The mustard seed is twice as big as any produced in the *pergunnahs* of *Bengal*, where I have been, and the oil it produces, is as superior to, as the size of its grain is greater than, any other. The hemp is equally good, but, as to its superiority to what may be produced in other *pergunnahs*, I am unable to speak with certainty: as far as I can judge from my own observation, the sort brought to the *Calcutta* market is not equal to what is produced on the borders of the hills. The pasture for cattle may be classed next in
quality

quality to that of *Plassy* plain; and this I infer from its being generally known, the *Sbeerpour* and *Sufung* ghee is nearly as good as that made at *Plassy*.

There are rivers at the several passes. Those of note are the *Natie*, *Mabareefee*, *Summasserry*, and *Mabadeo*. On the west side of the *Natie* is *Gbofegong*, and on the east the *Suffoor* pass. *Abramabad* or *Bygombarry* is on the east side of the *Mabareefee*; *Augbur*, on the east of *Summasserry*; and *Burradowarrab*, on the west of *Mabadeo*. These rivers are all of a sandy and gravelly bottom, with much limestone and iron. The *Mabadeo* has abundance of coals, the oil of which is esteemed in the hills as a medicine for the cure of cutaneous disorders, and is reputed to have been first discovered to the hill people and villagers by a *Fakeer*. The mode of extracting the oil is simple. A quantity of coals are put into an earthen pot, the mouth of which is stopped with long grass by way of strainer. This pot is put into a large deep pan, perforated at the bottom, so as to admit of the neck of the pot being put through it; the pan is supported upon bricks to prevent the neck of the pot from touching the ground, and also that a vessel may be placed under the strainer as a reservoir for receiving the oil as it drops. The pan is filled with dry cow dung, which is used as fuel, and extracts the oil in the course of an hour.

There are but few sorts of fish in these rivers: turtle are to be had in great numbers, and are always consecrated by sacrifice before they are eaten. The hill people are however fully recompensed for the loss of fish in the rivers, by the great abundance they get from the neighbouring lakes.

A *Garrow* is a stout well-shaped man, hardy and able to do much work; of a furlly look, flat *Cáfri* like nose, small eyes, generally blue, or brown, forehead wrinkled, and overhanging eye-brow, with large mouth, thick lips, and face round and short; their colour is of a light or deep brown; their dress consists of a brown girdle, about three inches broad; having in the centre a blue stripe; it goes round the waist, is passed between the thighs, and is fastened behind, leaving one end or flap hanging down before, about eight inches; sometimes it is ornamented with brass-plates; with rows of ivory or a white stone shaped like bits of tobacco-pipes, about half an inch long; the brass plate is made to resemble a button, or an apothecary's weight, but more indented: some have it ornamented with little bits of brass, shaped like a bell: some wear an ornament on their head about three or five inches broad, decorated in the same manner as the flap, serving to keep their hair off the face, which gives them a wild fierce appearance. Some tie their hair on the crown, in a loose careless manner, while others crop it close. The *Booneahs* or chiefs

chiefs wear a silk turban; to the girdle they affix a bag containing their money and *païons*, and also a net for holding the utensils with which they light their pipe hung near to it by a chain.

The women are the ugliest creatures I ever beheld, short and squat in their stature, with masculine faces, in the features of which they differ little from the men. Their dress consists of a dirty red cloth, striped with blue or white, about sixteen inches broad, which encircles the waist, and covers about three-fourths of the thigh. It never reaches to the knee, and being but just long enough to tie above on the left side, part of the left thigh, when they walk, is exposed. On their necks they have a string of the ornaments above described resembling tobacco-pipes, twisted thirty or forty times round, but negligently, without any attention to regularity; their breasts are exposed to view, their only clothing being the girdle abovementioned; to their ears are affixed numbers of brass rings, increasing in diameter from three to six inches: I have seen thirty of those rings in each ear; a slit is made in the lobes of the ear, which increase from the weight of the rings and in time will admit the large number stated. This weight is however partly supported by a string, which passes over their heads; a tape three inches broad ties their hair, so as to keep it back from their foreheads, though generally it is tied with a string on the crown of the head. The wives of the *Booneabs* cover their heads with a piece of coarse cloth, thirteen or fourteen inches broad, and two feet long, the end of which with their hair, hangs down behind, flowing loose on their backs. The women work, as well as the men, and I have seen them carry as great burthens. Their hands, even those of the wives of the *Booneabs*, bear evident marks of their laborious occupations.

These people eat all manner of food, even dogs, frogs, snakes, and the blood of all animals. The last is baked over a slow fire in hollow green bamboos, till it becomes of a nasty dirty green colour. They are fond of drinking to an excess. Liquor is put into the mouth of infants, almost as soon as they are able to swallow: they have various sorts of spirits, but that mostly drunk is extracted from rice, soaked in water for three or four days before use. Their cookery is short, as they only just heat their provisions; excepting rice and guts, the first of which is well boiled, and the other stewed till they are black. Indeed, excepting these, their animal food is eaten almost raw.

In times of scarcity many of the hill people subsist on the *Kebul*, which in growth is said to be like the *Palmira*; and the interior part of the *trunk*, when pounded
and

and steeped in water, is an article of food, in so much as to be the common means of sustenance during a scarcity of grain. When boiled it is of a gelatinous substance, and tastes, when fresh, like a sugar cane: those, who can afford it, mix rice with it. They also subsist on the *Kutchu*, a sort of *Yam*, found in great plenty about the hills. I saw three forts, though I could not learn they had any separate name. One has a number of buds on it, is said to be a cooling medicine, and is eaten boiled or baked. Some of them I brought with me from the hills, and being bruised in the basket used in bringing them from the hills, I cut off the rotten part, which I found to be of no detriment to their growth, although out of the ground. At *Dacca* I gave them to Mr. RICHARD JOHNSON, who, I understand, delivered them to Colonel KYD, the superintendant of the Company's botanical garden, where, I hear, they have produced a very handsome flower. This plant was cultivated by the *Garrows*, nearly in the same manner as we do potatoes in *England*; a bud being broken off to be sown for a plant. The *Garrows* say it yields, after it is dug out of the ground, and laid by for the ensuing season of cultivation (commencing immediately on the breaking up of the rains) from three to ten buds. Another sort of *Kutchu* grows at the tops of the hills, and is found by its sprout, which twists itself round the trunk and branches of trees. I have seen the sprout from ten to twenty feet high, the leaves have three segments like a vine leaf, but more pointed: of deep green, and very small. The root is found from a foot to two feet and a half below the ground, is in shape tapering, of a reddish colour, and in length from five inches to a foot and half: it is eaten roasted. The other species grows in the same manner, but is of a dirty yellow colour.

The houses of these *Garrows*, called *Chaungs*, are raised on piles, about three or four feet from the ground, from thirty to 150 feet in length; and in breadth from ten to forty, and are roofed with thatch. The props of the *Chaung* consist of large *saul* timbers: in the centre there are eight, and on the sides from eight to thirty: over these are placed horizontally large timbers, for a support to the roof, and tied fast, sometimes with strings; but string is rarely used for this purpose; the tying work being mostly done with slips of grass or cane. The roof is neatly executed, and with as much regularity as any of our Bungalow thatches. When I say this, however, I speak of the *Chaungs* of the *Booneabs*: I went into few of the *Chaungs* of the lower class. The roof consists of mats and strong grass. The sides of the house are made from the small hollow bamboos cut open, flatted, and woven as the common mats are. The floor is made in the same manner; but of a stronger bamboo.

bamboo. The *Cbaung* consists of two apartments, one floored and raised on piles as described, and the other without a floor, at one end, for their cattle: at the other end is an open platform, where the women sit and work. On one side also is a small raised platform, usually about six feet square, inclosed at the sides and open above: here the children play: in the centre of the *Cbaung* they cook their victuals, a space of about five feet square being covered with earth; on one side a little trap door is made in the floor, for the convenience of the women on certain occasions, which creates much filth under their *Cbaungs*. Indeed a great part of their dirt is thrown under the *Cbaung*, and the only scavengers I saw, were their hogs; but luckily for them, they have plenty of those animals.

Bugs cover their wearing apparel, of the same sort, as those which infest beds in England: during my journey along the hills I suffered very much from them.

The disposition of a *Garrow* could not be accurately known in the short time I had to observe it; yet my intercourse with them, which was of the most open nature, will, I think, allow me to say something of it.

Their surly looks seem to indicate ill temper, but this is far from being the case, as they are of a mild disposition. They are, moreover, honest in their dealings, and sure to perform what they promise. When in liquor they are merry to the highest pitch: then men, women, and children will dance, till they can scarce stand. Their manner of dancing is as follows: twenty or thirty men of a row standing behind one another, hold each other by the sides of their belts, and then go round in a circle hopping on one foot, then on the other, singing and keeping time with their music, which is animating, though harsh and inharmonious, consisting chiefly of tomtoms, and brass pans, the first generally beaten by the old people, and the last by the children. The women dance in rows and hop in the same manner, but hold their hands out, lowering one hand and raising the other at the same time, as the music beats, and occasionally turning round with great rapidity. The men also exhibit military exercises with the sword and shield, which they use with grace and great activity. Their dancing at their festivals lasts two or three days, during which time they drink and feast to an excess, infomuch that it requires a day or two afterwards to make them perfectly sober again, yet during this fit of festivity and drunkenness they never quarrel.

Marriage is in general settled amongst the parties themselves, though sometimes by their parents: if it has been settled by the parties themselves, and the parents of either refuse their assent, the friends of the opposite party, and even others unconnected,

nected, go and by force compel the dissenters to comply; it being a rule among the *Garrows* to assist those that want their help, on these occasions, let the disparity of age or rank be ever so great. If the parents do not accede to the wish of their child, they are well beaten till they acquiesce in the marriage, which being done, a day is fixed for the settlement of the contract, or rather for a complimentary visit from the bride to the bridegroom, to settle the day of marriage, and the articles, of which the feast shall consist, as well as the company to be invited; and they then make merry for the night. The invitations on these occasions are made by the head man of a *Cbaung* sending a *paun* to the inhabitants of another *Cbaung*, as they cannot invite one out of a *Cbaung* without the rest: the man who carries the *paun*, states the purpose for which it is sent, and the next day an answer is made, if the invitation be accepted, but not otherwise, as they never wish to give a verbal refusal; and, therefore, if no body returns the next day, the invitation is understood to be refused.

On the nuptial day, the parties invited go to the bride's house; it being the custom among the *Garrows* for the bride to fetch the bridegroom: when the wine, &c. are ready, and all the company arrived, they begin singing and dancing, and now and then take a merry cup; while a party of the women carry the bride to the river, wash her, and on their return home, dress her out in her best ornaments; this completed, it is notified to the company, and the music ceases: then a party take up the wine, provisions, drums, pans, and a cock and hen, and carry them to the bridegroom's house in procession; the cock and hen being carried by the priest, after which, the bride follows, with a party of women, walking in the centre, till she arrives at the bridegroom's house, where she and her party seat themselves in one corner of the *Cbaung* near the door; the remaining visitors then proceed to the bridegroom's house, and the men sit at the further end of the room, opposite to the women; the men then again begin singing and dancing; the bridegroom is called for; but, as he retires to another *Cbaung*, some search is made for him, as if he were missing, and, as soon as they find him, they give a shout; they then carry him to the river, wash him, return, and dress him in his war dress; which done, the women carry the bride to her own *Cbaung*, where she is put in the centre; and, notice of this being brought to the visitors at the bridegroom's house, they take up the wine, &c. and prepare to go with the bridegroom, when his father, mother, and family, cry and howl in the most lamentable manner, and some force is used to separate him from them. At last they depart, the bride's

father leading the way, and the company following one by one, the bridegroom in the centre. On entering the bride's *Cbaung*, they make a general shout, and place the bridegroom on the bride's right-hand, and then sing and dance for a time, till the priest proclaiming silence, all is quiet; and he goes before the bride and bridegroom, who are seated, and asks some questions, to which the whole party answer *Nummab*, or *good**; this continues a few minutes, after which, the cock and hen being brought, the priest takes hold of them by the wings, and holds them up to the company, asking them some questions, to which they again reply *Nummab*; some grain is then brought, and thrown before the cock and hen, who being employed in picking it, the priest takes this opportunity to strike them on the head with a stick, to appearance dead, and the whole company, after observing them a few seconds, calls out as before; a knife being then brought, the priest cuts the anus of the cock, and draws out the guts, and the company repeat *Nummab*, after which he performs the same operation on the hen, and the company give a shout, and again call out *Nummab*. They look on this part of the ceremony as very ominous; for should any blood be spilt by the first blow, or the guts break, or any blood come out with the guts, it would be considered as an unlucky marriage. The ceremony being over, the bride and bridegroom, drinking, present the bowl to the company, and then they all feast and make merry.

I discovered these circumstances of the marriage ceremony of the *Garrows*, from being present at the marriage of LUNGREE, youngest daughter of the chief OODASSY, seven years of age, and BUGLUN, twenty-three years old, the son of a common *Garrow*; and I may here observe, that this marriage, disproportionate as to age and rank, is a very happy one for BUGLUN, as he will succeed to the *Booneahship* and estate; for among all the *Garrows*, the youngest daughter is always heiress, and, if there be any other children, who were born before her, they would get nothing on the death of the *Booneah*: what is more strange, if BUGLUN were to die, LUNGREE would marry one of his brothers; and, if all his brothers were dead, she would then marry the father: and, if the father afterwards should prove too old, she would put him aside, and take any one else, whom she might chuse.

The dead are kept four days, burnt on a pile of wood in a *Dingy* or small boat, placed on the top of the pile, and the ashes are put into a hole dug exactly where the fire was, covered with a small thatch building, and surrounded with a railing:

* I suspect the word to be *Namab* or *salutation* and *reverence*. J.

a lamp is burnt within the building every night, for the space of a month or more; the wearing apparel of the deceased is hung on poles fixed at each corner of the railing, which, after a certain time (from six weeks to two months) are broken, and then allowed to hang downwards till they fall to pieces: they burn their dead within six or eight yards of their *Cbaungs*, and the ceremony is performed exactly at twelve o'clock at night; the pile is lighted by the nearest relation: after this they feast, make merry, dance and sing, and get drunk. This is, however, the ceremony to a common *Garrow*. If it be a person of rank, the pile is decorated with cloth and flowers, and a bullock sacrificed on the occasion, and the head of the bullock is also burnt with the corpse: if it be an upper hill *Booneab*, of common rank, the head of one of his slaves would be cut off, and burnt with him; and if it happen to be one of the first rank *Booneabs*, a large body of his slaves rally out of the hills, and seize a *Hindu*, whose head they cut off, and burn with their chief. The railed graves of *Booneabs* are decorated with images of animals placed near the graves, and the railing is often ornamented with fresh flowers.

Their religion appears to approximate to that of the *Hindus*: they worship MAHADEVĀ; and at *Baurjaun*, a pass in the hills, they worship the sun and moon. To ascertain which of the two they are to worship upon any particular occasion, their priest takes a cup of water and some wheat: first calling the name of the sun, he drops a grain into the water; if it sinks, they are then to worship the sun; should it not sink, they then would drop another grain in the name of the moon, and so on till one of the grains sink. All religious ceremonies are preceded by a sacrifice to their god of a bull, goat, hog, cock, or dog; in cases of illness, they offer up a sacrifice in proportion to the supposed fatality of the distemper, with which they are afflicted; as they imagine medicine will have no effect, unless the Deity interfere in their favour, and that a sacrifice is requisite to procure such interposition.

The sacrifice is made before an altar constructed as follows: two bamboos are erected, stripped of all their branches and leaves, except at the extremity of the main stem, which is left: a stick is fixed near the top of each, to which is tied, at each end, a double string, reaching to two side bamboos, about two feet out of the ground, with the tops split, so as to make a kind of crown; between the strings are placed bits of sticks of about a foot in height, at the distance of a foot from each other, or more, in proportion to the height of the bamboos. The cross sticks thus form a square, with the perpendicular strings, and in every other square, cross strings are tied, beginning with the top square: round the bamboos a space of six
or

or eight feet square is cleared, and covered with red earth; and in front, at the distance of about six or more feet, a square of two feet is cleared, in the centre of which a small pit is dug, and spread over with red earth; at some distance from the altar, on the side nearest the hills, two split bamboos are bent into an arch, with the ends in the ground, so as to form a covering; under this a small mound is raised, and a little thatched building erected over it, open at the sides, under which some boiled rice is placed. When thus much is prepared, the priest approaches the little pit, and the people assembled stand behind him. He then mutters something to himself; when the animal, intended to be sacrificed, is brought, and the head cut off by the priest over the pit, some holding the head by a rope, and others the body: if the head is not taken off at one blow, it is reckoned unlucky. The blood is collected in a pan, carried to the covered arch, with the head of the animal, and put by the side of the mound. A lighted lamp is then brought, and put near the animal's head, when the whole company bow to the ground, and a white cloth is drawn over the arch, it being supposed their god will then come, and take what he wants; a fire is also kept burning during the ceremony between the altar and arch. An hour after, the covering is taken off, the provisions therein placed, with the animal, are dressed for the company, and they make merry.

When a large animal is to be sacrificed, two staves are put by the side of the pit, so as to place the animal's neck between them: a bamboo is tied under his neck to the staves, to prevent his head from falling to the ground: he is then stretched out by ropes, fixed to his legs, and his head is severed by the strongest man among them.

Their mode of swearing at *Gbofegong* is very solemn: the oath is taken upon a stone, which they first salute, then with their hands joined and uplifted, their eyes stedfastly fixed to the hills, they call on MAHADEVVA in the most solemn manner, telling him to witness what they declare, and that he knows whether they speak true or false. They then again touch the stone with all the appearance of the utmost fear, and bow their heads to it, calling again upon MAHADEVVA. They also, during their relation, look stedfastly to the hills, and keep their right hand on the stone. When the first person swore before me, the awe and reverence with which the man swore, forcibly struck me; my *Moberrir* could hardly write, so much was he affected by the solemnity. In some of the hills they put a tiger's bone between their teeth, before they relate the subject to be deposed; others take earth in their hand; and, on some occasions, they swear with their weapons in their hands. I understand

stand their general belief to be, that their God resides in the hills; and, though this belief may seem inconsistent with an awful idea of the divinity, these people appeared to stand in the utmost awe of their deity, from their fear of his punishing them for any misconduct in their frequent excursions to the hills.

Their punishments consist mostly in fines. The *Booneabs* decide on all complaints, except adultery, murder, and robbery, which are tried by a general assembly of the neighbouring chiefs, and are punished with instant death. As the money collected by fines was appropriated to feasting and drunkenness, I wished to see if I could induce them to give over this mode of punishing; but they told me plainly, they would not allow me to interfere; yet, as I had been very kind to them, when a man was to be punished with death, they would let me know.

When any thing particular is to be settled, they all assemble in their war-dress, which consists of a blue cloth (covering part of the back and tied at the breast, where the four corners are made to meet), a shield, and a sword; they sit in a circle, the sword fixed in the ground before them. Their resolutions are put into immediate execution, if they relate to war; if to other matters, they feast, sing, dance, and get drunk.

Their chiefs debate the subject of deliberation, and their wives on these occasions have as much authority as the chiefs. This I had an opportunity of seeing, when I settled the revenue they had to pay, having told them they would be well protected from any oppression while under me; and that no more should be taken from them, than was finally settled: some of the chiefs wished to pay an inadequate sum, when MOMEE, wife to the principal chief, rose, and spoke for some minutes, after which she asked me if I declared the truth to them, and on my replying in the affirmative, they agreed to the revenue I demanded: SUJANI, wife of another chief, then came to me, and told me I had heard what she suffered from the oppression of the *Zemindars*, and begged, with tears in her eyes, that I would get justice done to her. I made a particular inquiry into her complaint, and made the *Darogah* of the pass restore her cattle; and so much confidence had they at last in me, that they requested I would make a fair division of their lands, which they would never suffer the *Zemindar* or his people to do.

Their mode of settling their proportions of payments, &c. is by sticks: each of the inferior *Garrows* places as many sticks in a pan, as he can give of the article required: the whole are then counted, and the deficiencies made up by the *Booneabs*: all their accounts also are kept by sticks, as well as their agreements.

I have

I have before said, on occasions of illness, a sacrifice is made to the deity: I endeavoured to find out what medicines they use, but I cannot say I have been successful in this material point: I imagine, however, they must have some valuable plants, from the many great cures that appear to have been effected in wounds. The *neem* leaf seems to be much used in inflammations, and blue vitriol is applied to fresh wounds: this last medicine appears to have been introduced by the natives of *Bengal*; charms and spells are common among the *Garrows*. The tiger's nose strung round a woman's neck, is considered as a great preservative in child-birth: they aver, it keeps off giddiness and other disorders consequent on this event. A woman, for nearly a month before her time, is not permitted to stir out of her *Cbaung*: six days after delivery she and her child are carried to the river and bathed.

The skin of the snake, called the *Burrawar*, is esteemed a cure for external pains, when applied to the parts affected.

Inoculation is common among the *Garrows*, but this appears to have been only of late years, and was introduced among them by JOYNARAIN *Zemindár* of *Sheer-pour*, through the interference and recommendation of some of the hill traders, who, having been in the hills at a time when the *Garrows* were afflicted with this fatal disorder, and dying without being able to assist themselves, persuaded the chiefs to send a deputation to the *Zemindár*, and he sent them his family doctor, who is represented to have been very capable, and, by his skill, introduced inoculation among the *Garrows*; and this induced them to provide themselves yearly with an inoculator, whom they reward in the most liberal manner, and take as much care of, while he resides among them, as if he were their father. The inoculator is obliged to obtain from the *Zemindár* a *sunnud*, permitting him to go into the hills, and for which he pays a very handsome fee; but the *Zemindár* is very cautious whom he permits to go into the hills to officiate on these occasions.

Among the *Garrows* a madness exists, which they call transformation into a tiger, from the person who is afflicted with this malady walking about like that animal, shunning all society. It is said, that on their being first seized with this complaint, they tear their hair and the rings from their ears, with such force as to break the lobe. It is supposed to be occasioned by medicine applied to the forehead; but I endeavoured to procure some of the medicine, thus used, without effect: I imagine it rather to be created by frequent intoxications, as the malady goes off in the course of a week or a fortnight; during the time the person is in this state, it is with the utmost difficulty he is made to eat or drink. I questioned a man, who had thus been
afflicted,

afflicted, as to the manner of his being seized, and he told me he only felt a giddiness without any pain, and that afterwards he did not know what happened to him.

The language of the *Garrows* is a little mixed with the *Bengáli*: a few words of it I annex; I had made a tolerable collection for a vocabulary, but unfortunately I lost it, by one of my boats sinking in the *Berbampooter*.

To drink,	ring,bo.
eat,	cha,fuch.
bathe,	ha,boo,ah.
wash,	fu,fuck.
fight,	den,juck.
wound,	ma,juck.
come,	ra,ba,fuck.
go,	ree.
call,	gum,ma.
sleep,	fee,fuck.
run,	ca,tan,juck.
bring,	rap,pa.
fit,	a,jen,juck.
a man,	mun,die.
a woman,	mee,che,da,rung.
a child,	dooë.
head,	fee,kook.
face,	moo,kam.
nose,	ging.
mouth,	chu,chul.
eye,	mok,roon.
ear,	ner,chil.
hair,	ke,nil.
hand,	jauck.
finger,	jauck,fee.
back,	bick,ma.
foot,	ja,chuck.
fire,	waul.

water,

water,	chee.
house,	nuck.
tree,	ber.
rice,	my,run.
cotton,	caule.
hog,	wauck.
cow,	ma,shu.
wine,	pa,t,ka.
salt,	foom.
cloth,	ba,ra.
dog,	aa,chuck.
plenty,	gun,mauck.
good,	num,mah.
sword,	dig,ree.
shield,	too,pee.
grass,	cau,pun.

At the foot of the hills reside a cast of people called *Hajins*; their customs nearly resemble the *Garrows*; in religious matters they partake more of the *Hindus*, as they will not kill a cow: their habitations are built like the houses of the ryotts in general, but are better made, enclosed with a court-yard, kept remarkably neat and clean, the railing made of bamboos split, flatted, and joined together; the streets of their villages equal the neatness of their houses. The men are of a dark complexion, well made and stout; their face nearly resembles the *Garrow*, though rather of a milder look; their dress is the same as that of the head peasants in *Bengal*, consisting of a *Dootee*, *Egfautab*, and *Pugree*, or waist-cloth, mantle, and turband.

The women are remarkably neat and clean: their dress consists of one cloth, made to go near twice round the body, and to hang in folds, down to the ankle, covers their breasts, and passes under their arms, and the ends are tucked in as the waist-cloth of the natives of *Bengal*: their hair is tied on the crown, and they have ear-rings in the same manner as the *Garrow* women, but no neck ornament.

This is the sum of the observations, which my short stay with the inhabitants of the *Garrow* hills enabled me to make on their manners and customs. I have written separately an account of my journey at the foot of the hills to the different passes,

passes, where their trade is carried on, from which some further information may be derived of their conduct and character; but I am conscious that my remarks describe them but imperfectly, and found my only hope of their proving acceptable on the people, to whom they relate, having hitherto been wholly unnoticed: they may also perhaps lead to more accurate inquiries hereafter.

TO THE PRESIDENT.

DEAR SIR,

I NOW have the pleasure to inclose a copy, written with a stylus on five palmyra-leaves, of the engraving on copper-plates preserved in the great pagoda of *Conjeveram*; the language is the *Dévaráni*, and the character *Dévanágarí*. Two persons only at this place can read and expound them: they contain an account of the division of lands, &c. in this country. Thus have I taken the liberty to trouble you with matters which may, or may not, prove of consequence; they who are able to judge of them must determine. Should any good arise from these communications, my merit will be only that of the slave, who digs from a mine the rough diamond, which others, of superior skill and capacity, cut and polish into its full lustre and value.

I am, dear Sir,

Your most obedient humble servant,

ALEXANDER MACLEOD.

Conjeveram, April 7, 1791.

III.

A ROYAL GRANT OF LAND IN CARNATA.

Communicated by ALEXANDER MACLEOD, Esq. and translated from the Sanscrit by the President.

Prosperity attend you!
Adoration to GANE'SA!

STANZAS.

ADORED be the God SAMBHU, on whom the city of the three worlds rested in the beginning as on its main pillar, and whose lofty head is adorned with a crescent that kisses it, resembling the point of a waving *Châmarâ*!

NOTE.

The comparison is taken from the image of an *Indian* prince, fanned by an officer, who stands behind him, with the tail of a *Chayara*, or wild cow, the hairs of which are exquisitely fine, and of a pale yellow tint. (SAMBHU IS MAHADEVA.)

2. May the tusk of that boar, whose form was assumed in sport by HERI, when the raised earth was his gorgeous umbrella with *Hémâdri* (or the golden mountain) for the ornament of its top, be a staff to keep you secure!

NOTE.

VISHNU, in his *boar* incarnation, is allegorically represented as a boar, the symbol of strength, supporting our globe on his tusk, which is here compared to the staff of a *Châtra*, or *Indian* umbrella. The *Châtras* of rich men have an ornament of gold on their summits, called a *Calasa*, to which the royal bard, who wrote the grant, compares the mountain *Sumêru*, or the North-pole.

3. May the luminous body of that God, who, though formed like an elephant, was born of PARVATI, and is revered even by HERI, propitiously dispel the gloom of misfortune!

NOTE.

The bodies of the *Hindu* gods are supposed to be an *ethereal substance* resembling light; and GANE'SA, or the Divine Wisdom personified, is represented with the head of an *elephant*: his mother was the daughter of the mountain *Himâlaya*. This couplet is in the style called *yamaca*, where some of the words have different meanings, but are applicable, in all of them, to the rest of the sentence: thus *Agajā*, or *mountain-born*, may signify the goddess PARVATI, but it also means *not a female elephant*; and HERI, or VISHNU, may be translated a *lion*, of which elephants are the natural prey.

4. There

मेरा लावा हल ताते राका हर रातीः रातेः। वतुः सता द्वै
नहु वतानेः रा हल जालैः। अमल वलनेऽप्रजन सो जन स कठे। फ
कपनेन गो वाने। र रा। छा। व। छा। ता। पे। न। रु। वे। व। वा। रा। सा। र। म। स
ठा। पे। व। रु। ता। य। रे। त। म। न। म। प। गा। ता। रे।। आ। वै। त्रु। पा। रु। स।। द्वै। गो।। त। पा
ता। र्क। फ। पा। प। व। जा। स।। स्या। ता। त। ग। छा। स्व। ने।। त। फु। छा। सा। य। पे। ता।।
ता। रे। अ। त्। न्। स। फ। पा। स। ता।।। सु। ग। स्या। ल। य। त्। पे। पो। प। स्या। रा। सा
व। आ। दु। आ।। स्या। ता।। क। ले।। ५। मे। ना। म। दु। ते। म। म। प। ता। नु। पे।। त। स्व। कु
हु। र्क। ता। वः। सा। न्ने। लु। पः। सा। च। ना। म। फु। र्। त। म्। छा। न। य। स्या।। ५। ता। म। छा।
रु।। स्या। स्यु। टः। तु। गाः।। त। छे। व। ते। प। फा। तै। वा। स। गा। तु। ना। रे। रा। पे। न।। फु। वा
फु। स्या। म्। पा। ५। तु। नै। ता। ना। फु। लु। प। छे। स्या।।

4. There is a luminary, which rose, like fresh butter, from the ocean of milk churned by the gods, and scattered the gloom from around it.

NOTE.

After the usual stanzas, called *mangala*, or *auspicious*, we are presented with the pedigree of the donor, beginning with the Moon, who, in the *second* incarnation of VISHNU, was produced from the sea of milk. A comparison of the moon to *butter* must seem ridiculous to *Europeans*; but they should consider, that every thing, which the *cow* produces, is held sacred by the *Hindus*; and the simile is consistent with the allegory of a *milky* ocean churned by the deities.

5. The offspring of that luminary was BUDHA, or the Wise, with reason so named from his unequalled acts of devotion and eminent virtues: the son of BUDHA was PURURAVAS, by the force of whose arm the lives of his foes were destroyed: his son was AYUS; his, NAHUSHA; his, the hero YAYA'TI, famed through the world in battle; and from him, by his happy consort DEVAYANI, came TURVASU, equal to a God.

NOTE.

This pedigree is conformable to the *Purānas*. BUDHA was probably an old philosopher and legislator, highly revered, while he lived, and supposed after his death to preside over the planet MERCURY; while his father (if that be not an astronomical fable) was conceived to be regent of the Moon: he gives his name, like the WODEN of the north, to the *fourth* day of the week. The original epithet of the last king, named in this verse, is *Vasunibha*, or equal to a *Vasu*; but the jingle of syllables, which the *Indian* poet meant as a beauty, is avoided in the translation. A *Vasu* is one of the *eight* divinities, who form a *gana*, or assemblage, of Gods; and there are *nine* of those *ganas*.

6. In his family was born DEVACIJANI; and in his, TIMMA, a sovereign celebrated among those of equal descent, like VRISHNI among the children of YADU.

NOTE.

If *Tulavinda* be the true reading in the second hemistich, it must be the name of a kingdom: but we must beware of geographical errors, lest the names of countries, which never existed, should find their way into maps. YADU was another son of YAYA'TI; and CRISHNA descended from him through VRISHNI, whence the Shepherd God is named *Yādava*, and *Vārshnéya*.

7. From him sprang BHUCCAMAJANI, a ruler, who cherished the world; a gem on the head of kings, not spreading terror around, but gleaming with undiminished brightness.

8. He lived with delight; and DEVACINANDANA, the king who gave felicity to mankind, sprang from him, like the God of Love from the son of DEVACI.

NOTE.

CA'MADEVA, or the God of Love, was born in one of his incarnations as the son of CRISHNA, whose real parents were DEVACI and VASUDEVA: in that birth CA'MA took the name of PRADYUMNA, and was father

father of ANIRUDDHA, whose adventures with USHA' are the subject of a beautiful tale and a very interesting drama.

9. In many places, of which *Ráméswara* was the first, renowned for various exertions of virtue, he distributed, as the law ordains, with a joyful heart again and again, a variety of gifts around the shrines of the deities; attaining such fame on earth, that the inhabitants of the three worlds expanded it in triumphant songs.

NOTE.

Ráméswara near the southern extremity of the Indian continent, received its name and sanctity from the seventh incarnation of VISHNU in the form of RA'MA. This *nimb* couplet is written in a singular metre, with rhimes in the middle of each division:

Vividha sucritód *dámé vámé* swara pramuc'hé muhṛ,
Muditahridaya *ś'báné ś'báné* vyadhatta yat'há vidhi
Vibudhaperitó *náná dáná* niyah bhuví shodásá,
Tribhuvanajanód *gítam ś'bitam* yafah punaruddhayan.

If *śnáné* be the correct reading, it means a sacred bathing-place; and if *śódása* be properly written at the end of the third line, it may imply, that the royal donations were made to sixteen temples; or that the principal donations were sixteen.

10. He shone forth conspicuously, having rapidly bound the *Cávéri*, by raising a bridge over that receptacle of tumultuous waters; and having, by the strength of his arm, made JÍVAGRA'HA captive in battle, he appointed that kingdom, of which the name begins with *Sriranga*, as the feudal territory of his prisoner, but subject to his own dominion paramount: he was praised, even to the end of his career, by the three peopled worlds, who heard the whole extent of his fame.

NOTE.

JÍVAGRAHA seems to be the proper name of a prince, whose dominions lay beyond the *Cávéri*: the word means the *Seizer of Life*. Among the many epithets of the god SIVA we find RANGA; and *Sriranga pattan*, or a city dedicated to him, is the capital of *Makéswar*, so called from another name of the deity. Those appellations are in some measure preserved to this day; but the ancient name of *Travancore* was *Mal-lára*.

11. Having conquered the regions of *Cbéra*, *Cbóla*, and *Pánjya*, subdued the king MADHURIVALLABHA, whose chief ornament was his loftiness of mind, taken VÍRYO'DAGRA prisoner, vanquished the king GAJAPETI, or Lord of Elephants, and other sovereigns, he became universally celebrated from the northern banks of *Gangà* to *Lancà* (the equinoctial point) from the verge of the first, or eastern, to that of the last, or western, mountain, and placed his awful behest, like a chaplet of flowers, over the heads of the mightiest potentates.

NOTE.

NOTE.

Two *Bráhmens*, who perused this couplet, proposed to read *Pándya*, of which they had before heard, instead of *Pánjya*, which appears in the transcript. Had *Madburá* been written instead of *Madburí*, there could have been little doubt, that it meant one of the southern kingdoms: one of my *Pandits* thinks, that it means *Madura*.

12. From that chief of lion-like men, by two queens TIPWA'JI' and NAGARA', as from DASARAT'HA by the divine CAUSALYA and SUMITRA',

13. Sprang two valiant, yet modest, heroes, like the two princes RAMA and LACSHMANA, named VIRANRISINHENDRA and CRISHNARAYA, both lords of the earth.

14. The famed VIRANRISINHA, having taken his seat in *Vijayanagar*, on a throne blazing with gems, far surpassed in glory and policy the ancient kings NRIGA, NALA, NAHUSHA, and, consequently, all other monarchs on earth: from the southern bridge to *Suméru*, the mountain beautifully extended on this globe, and from the eastern, to the farthest extremity of the western, hills, he dwelled in the hearts of mankind, and governed his realms with mild sway.

NOTE.

All the kings, named in the three preceding stanzas, are celebrated in the heroic poems of *India*; and *Vijayanagar*, or the *City of Conquest*, is very generally known. The epithet *avanisūtanūtab*, which, if it be the *fifth* case, agrees with *Sumeru*, may agree, in the *first* case, with the hero, and signify *applauded by the son of the earth*, that is by MANGALA, or the planet MARS, who gives his name to the *third* day of the *Indian* and *Gothick* weeks. TRIVEDI SERV'RU contends, that it means, *praised by the sons of the earth, or by all men born on it*.

15. He offered many presents in the Golden Court, in the temple of the three-eyed God, in the city of him, whom CALAHASTI' owns as her lord, on the mountain *Vencata*, in *Cánchi*, on the two mountains of *Sri* and *Sóna*, in the great shrine of HERIHERA, at *Ságarasangama*, *Sriranga*, *Cumbbacóna*, *Niverti*, and *Mabánandi*, that place of pilgrimage, by which the gloom of sin is dispelled.

16. At *Gócarna*, at RAMA's bridge, and in numberless places famed in this world for their virtue, the waters of the sea were dried by the dust scattered from the hoofs of his galloping steeds, and the earth herself was oppressed and disturbed by the God, who grasps the thunder bolt, and who felt pain from the obstruction of the ocean, until multiplied force was restored to the world by the abundant streams of his immense liberality.

NOTE.

The holy places, enumerated in these two stanzas, are all well known to the *Pándit*, except *Niverti*: the correctness of the reading may, therefore, be suspected. *Hábala*, which my *Nágarí* writer pronounces to

be

be the name of a river, and which one of my three *Pandits* knows to be a place of pilgrimage, appears on the palm-leaf; but *Ságara* is written above it. If two distinct places are intended, we find *sixteen* in all, agreeably to the *ninth* stanza. The first meridian of the *Hindus* passes through the city of *Ujjayini*, of which we know the position; but, as *Lancá*, therefore, falls to the west of *Silán*, which *RA'MA*'s bridge seems to mark as the kingdom of *RA'VAN*, the *Indians* believe that the island had formerly a much larger extent; and it has been asserted, that appearances between *Silán* and the *Maldives* in some degree justify that belief. *Maldive* is, most probably, a corruption of *Malayadwípa*, from the promontory of *Malaya* on the continent of *India*:

In the following verses, which I received from a venerable astronomer, *Cánchi* also appears in the first meridian, and *Ujjayini* seems distinct from *Abanti*, though some authors insist, that they are one and the same city.

Bhúmedhya réc'há canacádrilancá
medhyaast'hadéfáh cila vatlagulmau,
Cánchí, farah fannihitam, curúnám
chétram tat'há pajjanicápyabanti,
Sitáchalafschójjayini che déva
canyá che róhítaca gargarátau.

"The places in the meridian line between the golden mount and *Lancá*, are *Vaisa*, *Gulma*, *Cánchi*, *Sannibitasarab*, *Curusbétra*, *Pajjanicá*, *Abanti*, *Sitáchala*, *Ujjayini*, *Dévacanyá*, *Róhítaca*, *Gargarát*."

17. The gifts, which he spread around were; 1. A *Brabmánda*, or Mundane Egg; 2. A Circle of the Universe; 3. A Vase representing the five Elements; 4. A Cow formed of Gems; 5. A Figure of the seven Seas; 6. Two Sprigs from the Tree of Ages; 7. A golden *CA'MADHENU*, or celestial Cow; 8. A Terrestrial Sphere made of Gold; 9. A Chariot and Horses of the precious Metals; 10. A Man's Weight of Gold; 11. A thousand Images of Cows; 12. A golden Horse; 13. An Image of *BRAHMA*; 14. A golden Car; 15. A Plough of Gold, complete in its five Parts; 16. A Car drawn by Elephants of the same Metal.

N O T E.

If all this be not a wild poetical exaggeration, and if such presents were often made by the *Hindu* princes, the *Mogols*, who soon after conquered most of the southern provinces, must have plundered the *Hindu* temples of immense treasures.

18. He was eminently wise, and ruled with undiminished magnificence; and, when he ascended, with the cordial acquiescence of *INDRA*, to a celestial mansion, leaving behind him the reputation of a king, who resembled in his great qualities that ruler of the firmament.

19. Then the king *CRISHNARA'YA*, with irresistible power, bore the round earth on his arm like a bracelet of gems.

N O T E.

NOTE.

This prince, the donor of the land, was probably the younger brother of VĪRANRISINHA, who died, it seems, without male issue.

20. The Gods had apprehensions, in the beginning of time, that the glory of so great a monarch would rapidly diffuse one vast blaze over the universe, and leave them without marks of distinction: thence it was, that PURA'RĪ assumed a third eye in his forehead; PEDMA'CSHA, four arms; ATMABHU', four faces; that CALĪ' held a cimeter in her hand; RAMA', a lotos-flower; and VA'NĪ', a lyre.

NOTE.

The six names in the text are appellations of the Gods MAHA'DĒVA, VISHNU, BRAHMA', and the Goddesses DURGA', LACSHMI', SERESWATI': they signify, in order as they occur, the foe of *Pura* or *Tripura*, the Lotus-eyed, the Self-existing, Female Time, the Delightful, and Speech.

21. In the midst of his assembled foes, he darts a consuming fire kindled by his wrath. Oh! what said I? He dries up the series of seven oceans with the dust and sand of the whole earth trampled on by the cavalry of his numerous armies, and presently forms a new range of seas, blazing with his measureless glory, by the unbounded streams of those noble gifts, among which the first were a Mundane Egg and a golden figure of *Meru*.

22. "May you long enjoy entire here below the felicity and wealth bestowed on you by me!" Thus blessing mankind, and well knowing the general obstacles to an ascent in the car of the sun towards the mansion of the gods, he distributed in all regions of the world those obelisks, which confer celebrity, and on which encomiastick verses are engraven by the Goddess of Abundance herself, that they might become the lashes of whips to quicken the horses of the mountains.

NOTE.

The extravagant imagery in this couplet is connected with the old *Indian* custom of raising pillars to perpetuate the memory of great events, and with the belief of the *Hindus*, that the souls of good men pass through the sun to their seat of happiness. Although the *Columns of Victory*, as they are called, were monuments of kingly pride or of courtly adulation, yet the poet insinuates, that the donor intended to facilitate a passage to heaven for those whom he had enriched on earth; and the mountains are animated, to become the horses of the sun's car, and to be lashed by the royal obelisks.

Other columns were erected, perhaps, as *Gnomons*, and others, possibly, to represent the phallus of *Is-wara*; but those called *Jayastambas*, or *Pillars of Victory*, some of which remain to this day with metrical inscriptions, are most frequently mentioned by the ancient poets of *India*.

23. He proceeded continually, as the law prescribes, for the attainment of greatness and prosperity, to all the terrestrial seats of the Gods and places of pilgrimage, the first of which were *Cānchi*, *Srīśaila*, mount *Sōnā*, *Canacāṣabbā*, or the Golden Court,

Court, and *Vēncatādri*; where he dispensed many offerings, as a man's weight of gold; and the like, together with all the smaller oblations, which are specified in the *Agama*.

NOTE.

The *Agama* is a mysterious book, or set of books, part of which has been communicated to me by a *Sannyāsī* of *Maṭhurā*; it is so named, because it is believed to have come from the mouth of *SIVA*, as the *Vedas* proceeded severally from the four mouths of *BRAHMA*. The same word means also the *Vīda*.

24. When he is enraged, he becomes a rod to punish guilty sovereigns: when he assumes the arm of *SESHA*, he acts as the chief preserver of this globe: he smiles with a placid cheek, when just princes address him; but rages in battle, when he relieves oppressed nations who ask his protection.

NOTE.

SESHA is the king of Serpents, the couch of *VISHNU*, and the symbol of Eternity. The measure of this rhimed couplet is dactylic, and each of its four divisions begins and ends with a similar sound; as,

Rēṣhā critah prētipārt'hivā danda
Tēṣha cridārt'hishu yō rana chanda.

25. Justly is he styled *Rājādbirāja*, since he is the supreme ruler of rulers, offering a mild cheek to the princes of *Mūru*, but filling other kings with terror.

NOTE.

The phrase *rāyaraganda* occurs both in this and in the preceding stanza. *Rāya* means a king, not in *Sanscrit*, but in a popular idiom; and the whole phrase may be a title in the vulgar dialect of *Carnāta*. It is here preceded by *Mūru*, which we shall find again towards the end of the grant, and which may, or may not, be the name of a country. Not one of the three *Pandits*, who were consulted on the meaning of the words *Mūru* and *Raganda*, could throw any light on them; except that *Mūru* is a territory, of which the derivative is *Maurava*.

26. He is a deliverer of those *Hindu* princes, who act like beneficent genii, but a destroyer of those who rage like fierce tigers: thence he receives due praises, with the title *Virapratāpa*, or the glory of heroes, and other splendid epithets.

NOTE.

The word *Hindu* is applied likewise in a verse of *CA'LIDA*'s to the original inhabitants of this country; but the *Pandits* insist, that it is not *Sanscrit*. Since the first letter of it appears to be radical, it cannot be derived from *Indu*, or the moon; but, since a sibilant is often changed into an aspirate, it has been thought a variation of *Sindhu* or *Indus*. To that etymology, however, we may object, that the last consonant also must be changed, and that *Sindhu* is the name of a river, not of a people.

27. He is revered by the kings of *Anga*, *Bēnga*, *Calīnga*, and others, who exclaim, "Look on us, mighty potentate! Live, and conquer!"

NOTE.

NOTE.

Anga was the ancient kingdom of *Carna*, including the district of *Bhāgalapura*. To the east of *Gaura*, or the *Land of Sugar*, to which we give the name of *Bengal*, lies *Benga*, properly so named, *Calinga*, a word known to the *Greeks*, is the country watered by the *Gōdāverī*.

28. Exalted with praises by the wife, the king CRISHNARA'YA sits on a throne of gems in *Vijayanagar*, surpassing in the practice of moral virtue NRIGA and other monarchs: from the centre of the eastern, to that of the western, mountain, and from *Hémādri* to the southern bridge, he shines with transcendent glory, dispensing riches and felicity through the world;

29. One thousand four hundred and forty-eight years of the *Sacābda*, or era established in memory of SA'LI'VA'HANA, being elapsed;

30. In the year *Vyaya*, in the month of *Pushya*, when the sun was entering *Macara*, in the dark fortnight, on the day of BHRIGU, and on that venerable *tit'bi*, the tenth of the moon;

31. Under the constellation *Vīśāc'bhā*, at a time productive of good fortune, on the banks of the river *Tungabhadra*, near the temple of the God with three eyes.

NOTE.

The date of the grant follows the genealogy of the donor, and precedes that of the donee; after which comes a description of the land granted, and the religious tenure by which it was to be held. The *Sacābda* began in Y. C. 78, and the grant was made in Y. C. 1526, the very year in which BABUR took possession of *Dehli*; or 264 years ago: for, by the almanack of *Navadwipa*, the first of *Vaiśāc'h* 1712 Y. S. answers to 11th April 1790 Y. C. The cycle of sixty is divided into sets of twenty years, each set being sacred to one of the three divine attributes; and *Vyaya* is the 20th year of the cycle, or the last in the part allotted to BRAHMA. *Macar* is the sign of *Capricorn*, and *Pushya*, the 8th lunar mansion. BHRIGU was the father of SUCRA, who presides over the planet *Venus*, and is properly named BHA'RGAVA; but the day of BHRIGU means Friday.

32. That temple, where priests, who have aimed at piety towards ISWARA as their only grandeur, and who shine only with the fame of eminent holiness, fix their heart on the godhead alone;

33. Him, who is an ornament of AGASTYA's race, and whose peculiar studies are the *Sāc'bhās*, or branches, of the *Yajurveda*; whose father was distinguished on earth in this age of *Oali*, or contention, by the surname of RA'YA;

34. Born in the family of TAMVA, SRI' AILLAPA BHATTA, surnamed *Sānc'-byanāyaca*, or chief teacher of the *Sānc'hya* philosophy (thus men openly declare his name, his race, and his virtue);

35. Him the king has appointed the dispenser of nectareous food even here below, to those pious students, and, in like manner, his sons and sons' sons to an age without end.

NOTE.

AGASTYA was an ancient sage, now believed to preside over the star *Canopus*.

36. The land called *Srijayacunda* by the inhabitants of the district of *Chôla*; that named *Méyiccôta* in the principality of *Cbandragiri*; that known in *Ambinâri* by the name of *Malacà*.

NOTE.

The couplets, containing a description of the land, are so indistinctly written, that the grammatical construction of them can hardly be traced. The first letter of *Méyiccôta* may belong to the preceding word; and an entire hemistich seems in this place to be omitted.

It may here be remarked, that this whole grant is conformable to the rules of *YA'GYAWALCYA*, in whose work we find the following verses:

Datwâ bbûmin nibandhan vâ eritwâ léc'hyantu cārayet,
âgâmbhadranripati perijnyânâya pâra' hîwab;
Patêvâ tâmrâpâtê vâ swamudrôperichibhîtan
abhîlêc'hyâtmând vânsânâtmânâncemahîpetih.
Pretigrâhaperimânân dânach' hêdôpaswernanan,
swabâstacâlasampânnan sâsanânc' cārayêst' hîran.

“ Let a king, having given land, or assigned revenue, cause his gift to be written, for the information of good princes, who will succeed him, either on prepared cloth, or on a plate of copper, sealed above with his own signet: having described his ancestors and himself, the dimensions or quantity of the gift, with its metes and bounds, if it be land, and set his own hand to it, and specified the time, let him render his donation firm.”

37. Land, situated to the east of *Tirumâpêru*, *Câjômaca*, and so forth, and the two villages *Cônâru* and *Côbila*;

38. Placed to the south of *Palapûrusha* and *Hulli*, and to the west of the town called *Parundar*;

39. To the north of *Bêrupû* and *Purapâcà*, including the town which has the name of *Sivabhaçapura*, or that of SIVA's adorers;

40. With another propitious name derived from the four sacred hearths (*Cbaturoédi*) of the delightful *Chôla*; together with the charming town of *Gôvinda-pâri*;

41. Where

41. Where eleven *Bráhmens* are to water one *Amra* tree, and to worship the God *RUDRA* by day and by night after the prescribed acts of devotion;

42. And the smaller town, called *Chattupáca*, ever abundant in grain; inhabited by men eminently learned, in the great principality of *Paraviru*.

43. A place to be honoured by all; marked on all sides by four distinct boundaries; surrounded with rivulets formed by good genii, the pebbles of which are like gems carefully deposited.

44. Viewed with delight by the distant eye, fit to be enjoyed by deities; graced with trees exquisitely beautiful; having the advantage also of ponds, wells, and pools of water with raised banks;

45. Frequented by officiating priests and attendants, with subdued passions and benevolent hearts; by deities of different classes, and by travellers, who know the *Veda*, and converse with copiousness:

46. All the land before mentioned has the great prince *CRISHNADEVA*, worthy of reverence from the wise, given with serene joy, having first diffused a stream of gold, silver, and gems.

47. Such was the decree of *CRISHNARA'YA*, to whom belongs the whole earth, celebrated by the royal bards; that bountiful king, who is the source of all the wealth possessed by the bards of *Múru*.

48. By the command of the great *Ráya* *CRISHNADEVA*, the president of his council proclaimed this donation to *MRIRA*, or *ISWARA*; and his command is here engraved on plates of copper.

49. The artist *Sri* *VIRANA'CHARYA*, the son of *MALLANA*, wrote on copper this grant of the great prince *CRISHNADEVA*.

50. As between a gift of land and the confirmation of it by the successors of the donor, the confirmation is more meritorious than the gift; by the gift, a king attains a seat in heaven; by the confirmation, a seat from which he never can fall.

51. The confirmation of a gift by another prince has twice the merit of a gift by himself; but the resumption of land granted by another makes even his own gift fruitless.

52. He who resumes land given either by himself or by another, becomes a worm in ordure for successive births through a period of sixty thousand years.

53. Land, granted for virtuous purposes, is in this world the only sister of kings; and consequently must not be enjoyed by them, nor taken by them in marriage.

54. "This

54 This is the universal bridge of virtue for princes, and must be repaired by you from time to time: thus doth RAMACHANDRA exhort again and again the sovereigns of the earth: both those who now live, and those who are to reign hereafter.

SRI VIRUPACSHA!

OR,

THE GOD WITH THREE EYES!

IV.

ON THE MUSICAL MODES OF THE HINDUS: — See the Works of Sir William Jones, Vol. I. p. 413.

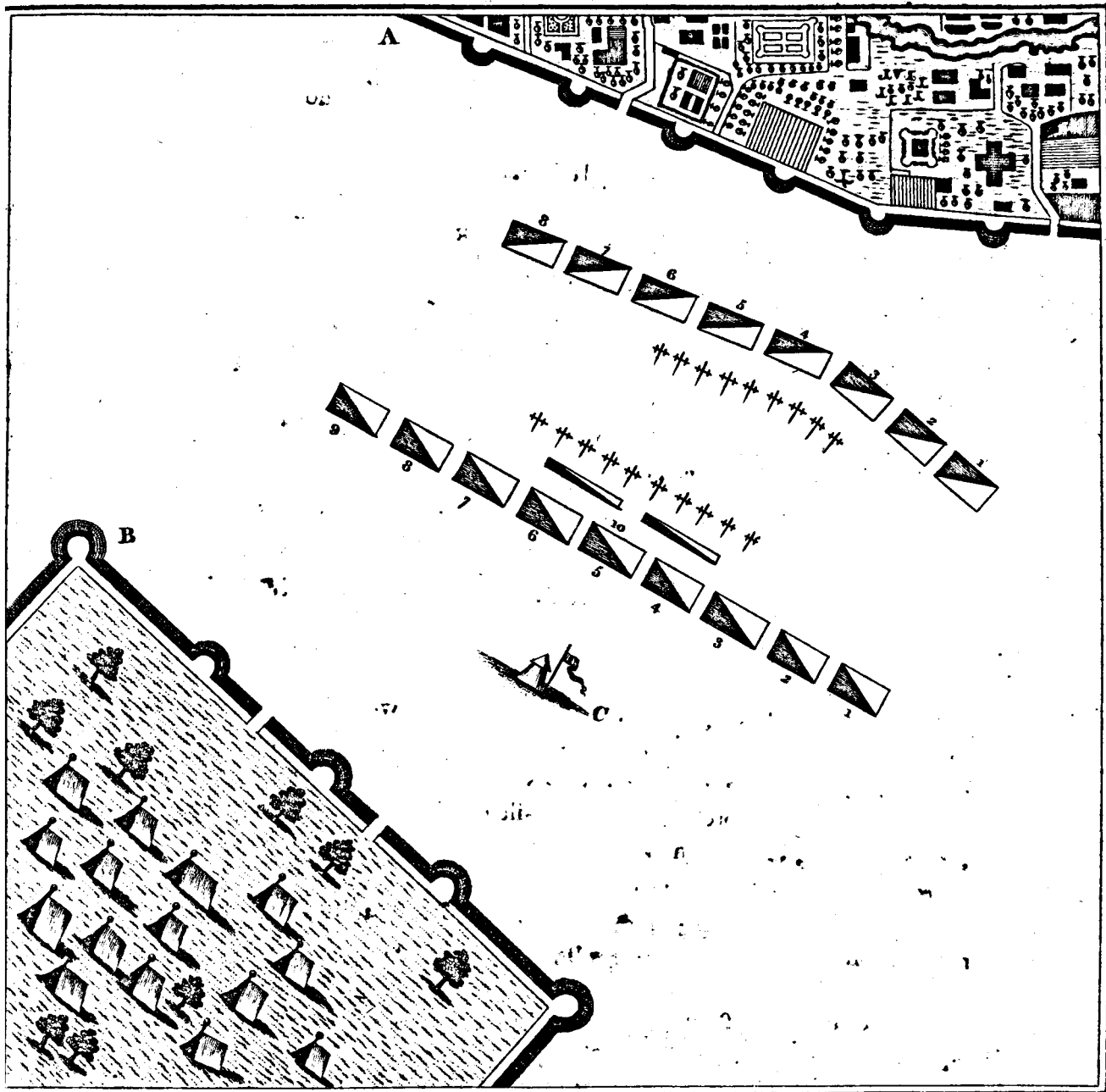
A LETTER FROM LIEUTENANT BROWNE TO THE PRESIDENT.

DEAR SIR,

IN the course of reading history, it is a reflection, which must, I think, have occurred to every one, that, if the actors in the most material events could have foreseen the importance, which those events would have in the eyes of posterity, they would certainly have preserved such detailed and circumstantial relations of them, as would have prevented the general darkness and uncertainty, which we now experience and lament: but it has probably seldom happened, that their genius, or leisure from more important concerns, has admitted of this; and thus we are from necessity often compelled to rest satisfied with imperfect traditions, repeated (or, which is worse, arbitrarily amended) by subsequent historians.

With what avidity should we now peruse an account written by any of the principal persons present at the battle of *Hastings*, of *Lincoln*, of *Lewes*, of *Evesham*, of *Creffy*, of *Agincourt*, of *Townton*, or of *Bosworth*! but in those days, a general or statesman was as unskilful with his pen, as he was expert with his sword; and the monks, who were almost the only writers, were seldom participators of such active scenes.

Considering



Mallow, sculp.

Plan of the Battle of Panipat.

Considering this, as well as the importance, which the wars and politicians of *Hindustan* have now acquired in the opinions of *European* historians, I cannot avoid believing, that the great events of this country will hereafter be fought for with as much diligence as those of the early part of *European* history are at present: if I am not mistaken in this, the battle of *Paniput* will be among those events, which will claim the greatest attention, both as a military action, and as an era, from which the reduction of the *Mabratta* power may be fixed, who otherwise would probably have long ago reduced the whole of *Hindustan* to their obedience.

It appeared to me in this light at a time, when a very particular and authentick narrative of that action came into my possession: and, as the plainness of the original led me to believe myself competent to the task, I was induced to undertake the translating it into *English*, that the difficulty in reading it in the *Persian* might not prevent its being as generally known as its historical importance merits.

It is almost superfluous to tell you, dear Sir, who are so well versed in *Afiatick* history, that this battle was fought in the month of *January* 1761, between the united forces of all the *Mabratta* chiefs on one side, commanded by SEDASHEO, (commonly called the BHOW) and the combined armies of the *Durrannies*, *Robillas*, and *Hindustany Mussulmans*, on the other, under the command of AHMED SHAH DURANNY:—few battles have been more bloody, or decisive of greater events; for, had the *Mabrattas* been conquerors, they would have put a final period to the *Mussulman* dominion in *Hindustan*, and established their own in its place; but, as it happened, the power of the *Mabrattas* received a shock, from which it has never entirely recovered; and the DURANNY SHAH, having returned precipitately to his own dominions, left the disunited *Robillas*, and *Hindustany Mussulmans* to carry on, as they could, their distracted government, under a wretched pageant of royalty, and a divided and unprincipled nobility.

The writer of this narrative, CASI RAJ PUNDIT, was a *Muttasuddy* in the service of the late Vizier, SHUJA-UL-DOWLAH; and, being by birth a native of the *Deccan*, acquainted with the *Mabratta* language, and having some friends in the service of the BHOW, he became the channel of several overtures for peace, which the BHOW endeavoured to negotiate through SHUJA-UL-DOWLAH: this, together with the accuracy and clearness of his narrative, makes it much more interesting than any other which I have seen. The translation is however far from literal, as I endeavoured to make the style as plain and unadorned as possible.

Such as it is, permit me, dear Sir, to offer it to you, and to leave it to your disposal.

posal: if I am so happy as to know, that it receives your approbation, as likely to prove useful in elucidating the history of this country, I shall think myself sufficiently rewarded for the time it has taken up. Believe me to be, with the greatest esteem and respect,

Dear Sir,

Your very faithful
and obedient servant,

JAMES BROWNE

Dinapore, February 1, 1791.

V.

AN ACCOUNT OF THE BATTLE OF PANIPUT,

AND OF THE EVENTS LEADING TO IT.

Written in Persian by CA'SI RAJA PUNDIT, who was present at the Battle.

BALA ROW, *Pundit pradhán*, who sat on the *Musnud* of government in the *Decan*, was considered by the chiefs and inhabitants of *Hindostan* as a man of wisdom, circumspection, and good fortune: but he naturally loved his ease and pleasure, which did not however lose him the respect and attachment of his people.

As long as harmony prevailed in his family, he left the entire management of all the affairs of government to **SEDASHEO** * **ROW BHOW**, and gave himself up to pleasure.

SEDASHEO, from his earliest years, had studied every branch of the art of government, the regulation of the finances and the army, and the conduct of all public affairs, under the instruction of **RAMCHUNDRA BABA Sindbvi**, the greatest statesman of the age; and from the first watch of the day till the middle of the night, applied to the public business. By his great experience, address, and ability, he brought men over to his opinion, to a co-operation in his measures, and a perfect reliance upon his wisdom and ability. Several important affairs both in the *Decan* and the provinces had been brought to a conclusion by his means; and at length an expedition was fitted out for completing the conquest of *Hindostan*, under

* Properly, *Sadivva*.

the

the supreme command of RAGHUNAUT ROW. MULHAR ROW HULKAR, JUN-
 KOOGEE SINDIA, and several other chiefs, were ordered to act under him with very
 powerful forces. They accordingly marched into *Hindoostan*, and with little diffi-
 culty reduced every place to their obedience, until they came to the neighbourhood
 of *Labore* and *Sabbdowla*: here they were opposed by JEHAN KHAN and the other
 commanders left in those districts by AHMED SHAH DURRANNY, whom they de-
 feated and compelled to repass the *Attack*. They kept possession of that country for
 some time, but the army beginning to fall considerably in arrears, RAGHUNAUT
 ROW thought it advisable to return to the *Decan*.

Upon the return of RAGHUNAUT ROW, the accounts of his expedition being
 inspected by the BHOW, it was found that a debt of eighty-eight lacs of rupees was
 due to the army, so much had the expences been allowed to exceed all the collec-
 tions of tribute, *pisheush*, &c. The BHOW, who was in every respect superior to
 RAGHUNAUT, reproached him severely for this, and asked him if that was his
 good management, to bring home debts instead of an increase of wealth to the
 treasury of the state: which RAGHUNAUT ROW replied to, by advising him to
 try his own skill next time, and see what advantage he could make of it. BALLA
 ROW however interfered, and reconciled them in some degree, by excusing RAG-
 HUNAUT ROW on account of his youth and inexperience.

Next year the scheme of reducing *Hindoostan* being renewed, and the command
 again offered to RAGHUNAUT ROW, he declined it, saying, "Let those have the
 command who are well-wishers to the state, and who will consult the public ad-
 vantage." This speech gave great offence to the BHOW, and, on many conside-
 rations, he offered himself to take the command of the expedition; taking with him
 BISWAS ROW, the eldest son of BALA ROW, then seventeen years of age, as the
 nominal commander in chief, according to the ancient custom of the *Mabrattas*.
 The army under his command was very numerous, and they set out on their expe-
 dition without delay; but, as soon as they had passed the *Nerbudda* †, the BHOW
 began to exercise his authority in a new and offensive manner, and both in settling
 the accounts of the army and revenue, and in all publick business, he showed a capri-
 cious and self-conceited conduct. He totally excluded from his council MULHAR
 ROW, and all the other chiefs, who were experienced in the affairs of *Hindoostan*,
 and who had credit and influence with the principal people in that country, and
 carried on every thing by his own opinion alone.

* Properly *Maharashtra*.

† Properly *Narmada*.

When he came to *Seronga*, he dispatched *Vakeels* with presents to all the principal chiefs in *Hindoſtan*, inviting them to an alliance and co-operation with him, for the purpoſe of ſettling the affairs of *Hindoſtan*. Among the reſt a *Vakeel* came with the above propoſal to the *Navab* SHUJAH-UL-DOWLAH, bringing with him a preſent of fine cloths and jewels, to a conſiderable amount; and informing him, at the ſame time, that whenever the *BHOW* ſhould arrive near him, he would diſpatch NAROO SHUNKER to conduct SHUJAH-UL-DOWLAH to him. SHUJAH-UL-DOWLAH answered him in the language of profeſſion, but determined in his own mind to keep himſelf diſengaged from both parties; and to be a ſpectator of the expected conteſt till his future conduct ſhould be determined by the event, when he deſigned to join the victors.

AHMED SHAH DURRANY, after the defeat of DATTEA JEE PUTUL SINDIA, cantoned his army in the diſtrict of *Anuſſhair*, upon the banks of the *Ganges*; and DATTEA JEE PUTUL himſelf having been killed in an action with NUJIB-UL-DOWLAH, the latter was apprehenſive of the conſequences of the reſentment of the *Mabrattas*, and therefore united himſelf cloſely with the DURANNY SHAH, who was himſelf excited to invade *Hindoſtan* by a wiſh to revenge the defeat of his General JEHAN KHAN the preceding year, but ſtill by the ſolicitations of NUJIB-UL-DOWLAH, who agreed to bear the extra charges of the SHAH's army, and, being himſelf a man of great military reputation, as well as an able politician, had perſuaded all the *Robilla* chiefs and the *Patans* of *Ferokhabad* to join the DURANNY SHAH.

The *BHOW*, beſides his own *Decany* troops, had brought with him all the auxiliaries that he could collect in *Malwa*, *Janſye*, &c. under the command of the ſeveral *Aumils*, ſuch as NAROO SHUNKER and others; and, as ſoon as he arrived at the river *Cbumbul*, he ſent a confidential perſon to *Raja* SURJA MUL, chief of the *Jauts*, propoſing a conference, and that SURJA MUL ſhould enter into alliance with him. SURJA MUL ſent him word in reply, that his negotiations with the *Mabrattas* had always been conducted through the mediation of MULHAR ROW and the SINDEAS, and that, if they choſe to interfere on the preſent occaſion, he was ready to wait on the *BHOW*. The *BHOW* from neceſſity aſked thoſe chiefs to aſſiſt him in this matter, which they having conſented to, as ſoon as the army of the *Mabrattas* approached to *Agra*, SURJA MUL paid his reſpects to the *BHOW*; and the converſation turning on the moſt adviſable mode of conducting the war, SURJA MUL ſaid, "You are the maſter of *Hindoſtan*, poſſeſſed of all things; I am
" but

“but a *Zemindar*, yet will give my advice according to the extent of my comprehension and knowledge. In the first place, the families of the chiefs and soldiers, the large train of baggage, and the heavy artillery, will be great impediments to carrying on the kind of war which you have now in hand. Your troops are more light and expeditious than those of *Hindostan*; but the *Durrannies* are still more expeditious than you. It is therefore advisable to take the field against them quite unincumbered, and to leave the superfluous baggage and followers on the other side of the *Chumbul*, under the protection of *Jansya* or *Gualiar*; which places are under your authority.

“Or, I will put you in possession of one of the large forts in my country, *Dieg*, or *Combeir*, or *Burtpoor*, in which you may lodge the baggage and followers; and I will join you with all my forces. In this arrangement you will have the advantage of a free communication with a friendly country behind you, and need be under no apprehensions respecting supplies to your army: and there is reason to believe, that the enemy will not be able to advance so far, but will by this plan of operations be obliged to disperse, without effecting any thing.”

MULHAR ROW and the other chiefs approved of this advice, and observed, that trains of artillery were suitable to the royal armies, but that the *Mabratta* mode of war was predatory; and their best way was to follow the method to which they had been accustomed; that *Hindostan* was not their hereditary possession, and, if they could not succeed in reducing it, it would be no disgrace to them to retreat again. That the advice of SURJA MUL was excellent; and that the plan which he proposed would certainly compel the enemy to retreat, as they had no fixed possession in the country. That their object for the present, therefore, should be to gain time till the breaking up of the rains, when the *Durrannies* would certainly return to their own country.”

Notwithstanding that all the *Mabratta* chiefs were unanimous in recommending this plan, the BHOW, relying on the strength of his army, and his own courage and ability, would not listen to it, but said, “that his inferiors had acquired military reputation by their actions in that country, and he never should be reproached to him, that he, who was the superior, had gained nothing but the disgrace of acting defensively.” And he reproached MULHAR ROW with having outlived his activity and his understanding: at the same time saying “that SURJA MUL was only a *Zemindar*; that his advice was suitable enough to his rank and capacity, but not worth the consideration of men so much his superiors.”

Men of wisdom and experience were surprized at this arrogance and obstinacy in a man who always formerly had shown so much good sense and circumspection as the BHOW had done till this expedition: and concluded, that fate had ordained the miscarriage of their enterprize. Every one became disgusted by his harsh and offensive speeches; and they said among themselves, "It is better that this *Brabmin* should once meet with a defeat, or else what weight and consideration shall we be allowed?"

The BHOW posted a body of troops to prevent SURJA MUL from leaving the camp: this alarmed him very much, but, as all the chiefs were of one opinion, MULHAR ROW and the rest advised him not to be hasty, but to act as circumstances should direct; and, for the present, to remain for the satisfaction of the BHOW.

After this the BHOW marched from *Agra* to *Debly*, and at once laid siege to the royal castle, where YACOOB ALY KHAN (who was nephew to the *Durrany Vizier*, SHAH VULLI KHAN) commanded, and summoned him to surrender the castle, after the batteries had played some days. YACOOB ALY KHAN finding that resistance was vain, by the advice of SHAH VULLI KHAN, capitulated through the other *Mabratta* chiefs' mediation, and delivered the castle up to the BHOW, who entered it with BISWAS ROW, and seized upon a great part of the royal effects that he found there: especially the ceiling of the great hall of audience, which was of silver, and made at an immense expence, was pulled down and coined into seventeen lacks of rupees. Many other actions of the same kind were done, and it was generally reported to be the BHOW's design to get rid of such of the principal *Hindoostany* chiefs as stood in his way; and, after the DURRANY SHAH should return to his own country, to place BISWAS ROW upon the throne of *Debly*. This intelligence was brought to the *Navab* SHUJAH-UL-DOWLAH, and it is on his authority that I relate it.

In the mean time the rains set in, and the BHOW cantoned his army in *Debly*, and for twelve coss round it, residing himself in the castle; while AHMED SHAH DURRANNY remained in cantonments near *Anuffhair*. NUJEIB-UL-DOWLAH gave him exact information of every thing that passed; upon which intelligence the SHAH told him, "that as SHUJAH-UL-DOWLAH was a chief of great weight and power, and vizièr of *Hindoostan*, it was of the greatest importance to secure him to their interest, and to persuade him to join them; for that, should he be gained by the *Mabrattas*, the worst consequences must arise from it. That it was not
" necessary

“ necessary that he should bring a large army with him : his coming even with a few would very considerably strengthen their cause. That on a former occasion, when he (AHMED SHAH) invaded *Hindoostan*, SHUJA-UL-DOWLAH’s father, SUDAR JUNG, had opposed him, and been the principal means of his failure. That no doubt this would make SHUJA-UL-DOWLAH apprehensive and suspicious of him, and therefore NUJEIB-UL-DOWLAH must endeavour by every means to get the better of that obstacle, lest SHUJA-UL-DOWLAH should join the opposite party. That this was a negotiation too nice and important to be conducted by *Vakeels*, or by letters, and that therefore NUJEIB-UL-DOWLAH must go himself with a small escort, and in person prevail on SHUJA-UL-DOWLAH to join them.”

AHMED SHAH DURRANY and his vizier, SHAH VULLI KHAN, sent written treaties of alliance, and the *Khoran* sealed with their seals, by NUJEIB-UL-DOWLAH, who, taking his leave of the DURRANY SHAH, set out with an escort of two thousand horse, and in three days got to *Mindy Gaut*, on the *Ganges*.

SHUJA-UL-DOWLAH, some time before this, had been encamped on his frontier near the *Ganges*, for the protection of his country, and, receiving information of NUJEIB-UL-DOWLAH’s sudden arrival, he found himself under the necessity of giving him a meeting, and showing him all the honours which hospitality and politeness demanded. NUJEIB-UL-DOWLAH showed him the treaties proposed by the DURRANY SHAH, and gave him every assurance and encouragement possible, both from the DURRANY SHAH and from himself; and explained to him also the perils of their own situation. “ For my own part,” said he, “ I give over every hope of safety, when I reflect that the BHOW is my declared enemy; but it behoves you also to take care of yourself, and to secure an ally in one of the parties: and, as you know the BHOW bears a mortal hatred to all *Mussulmans*, whenever he has the power to show his enmity, neither you nor I, nor any other *Mussulman*, will escape. Though, after all, the destiny of God will be fulfilled, yet we ought also to exercise our own faculties to their utmost. From my friendship to you, I have come this distance to explain things to you, though averse from all unnecessary trouble. Now consider and determine. The *Begum* your mother is capable of advising us both: consult her upon the occasion, as well as the rest of your family, and determine on what you shall think best.”

After considering the matter for two or three days, SHUJA-UL-DOWLAH concluded, that it would be very unsafe and improper to join the *Mabrattas*: and to decline

decline the proffered friendship of the other party, would be impolitic, especially after their deputed a man of NUJEIB-UL-DOWLAH's rank to him; and would never be forgiven, either by the SHAH or the *Robilla* chiefs. Yet the danger appeared very great, whether the victory should fall to the *Mabrattas* or to the *Durranyes*. He at length however determined to follow the advice of NUJEIB-UL-DOWLAH, and to join the DURRANY SHAH. He accordingly dispatched his women to *Lucknow*, appointed *Raja BENI BEHADER Naib Subah* during his absence, and, setting out with NUJEIB-UL-DOWLAH, and arriving at the *Durrany* camp near *Anuffbair*, was presented to AHMED SHAH DURRANY, who treated him with the greatest consideration and honour, told him that he considered him as one of his *own children*; that he had waited for his arrival, and now would shew him the punishment of the *Mabrattas*, with many proofs of his friendship. He at the same time proclaimed it through his own camp, that no *Durrany* should presume to commit any violence or irregularity in SHUJA-UL-DOWLAH's camp: that any one who did, should be put to immediate death; adding, that SHUJA-UL-DOWLAH was the son of SUDDER JUNG, the guest of AHMED SHAH's family; and that he considered him as dear as his own child. The grand vizier SHAH VULLI KHAN, who was a man in the highest esteem and respect with all ranks, called SHUJA-UL-DOWLAH his son also, and treated him with the highest distinction.

As the common soldiers among *Durranyes* are stubborn and disobedient, notwithstanding the SHAH's proclamation, they committed some irregularities in SHUJA-UL-DOWLAH's camp: the SHAH hearing of this, had two hundred of them seized upon, and, having had their noses bored through with arrows, and strings passed through the holes, they were led in this condition, like camels, to SHUJA-UL-DOWLAH, to be put to death or pardoned, as he should think proper. He accordingly had them released; and from that time none of the *Durrany* soldiers made the least disturbance in SHUJA-UL-DOWLAH's camp.

Soon after this, though the rains were still at their height, the SHAH marched from *Anuffbair*, and cantoned his army at *Shabdera*, on the bank of the *Jumna*, opposite to the city of *Debly*. Many posts of the *Mabratta* army were within sight; but the river was too deep and rapid to be passed.

The BHOW sent BOWANY SHUNKER, PUNDIT, a native of *Aurungabad*, and a man of good sense and experience, with some overtures to SHUJA-UL-DOWLAH; telling him that there was no ground for enmity between the *Mabrattas* and his Excellency's family; on the contrary, they had formerly given great support and assist-

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ance to SUFDER JUNG, SHUJA-UL-DOWLAH's father. Why then did the *Navab* join their enemies? That their not having long since desired him to join them in person, was solely owing to their unwillingness to give him inconvenience. That now it was by all means necessary for him to join them, or at least to separate himself from the other party, and to send some person of character and rank, on his part, to reside within the camp.

Accordingly the *Navab* sent RAJA DEBYDUT, a native of *Debly*, who was in his service; a man of great eloquence (whose father had been the royal treasurer during the administration of the *Syeds*; and he himself had been one of the household during the reign of MOHAMMED SHAH) to accompany BOWANNY SHUNKER. The *Navab* also sent ROW CASY RAJ (the writer of this narrative), who had been in the service of SUFDER JUNG, and much favoured by him. His excellency told BOWANNY SHUNKER that I (CASY RAJ) was also a *Decany*, and introduced me to him in his own presence; where we soon recognized our being of the same cast and country. BOWANNY SHUNKER wrote the BHOW word of my being employed in this affair; upon which the BHOW caused a letter to be written to me in the *Decan* language; but as there was some deficiency in the form of address, I did not reply to it. The BHOW enquired of BOWANNY SHUNKER why I neglected to answer his letter; which being explained, he was very angry with his *Munshy*.

When *Raja DEBYDUT* got to the BHOW's camp, the negotiation began; but the BHOW being dissatisfied with this agent, he sent BOWANNY SHUNKER back to tell SHUJA-UL-DOWLAH that *Raja DEBYDUT* was too unguarded a man to be entrusted with secrets of such importance: he therefore desired the *Navab* would send a trusty man entirely to be relied on, and send word by him precisely what steps were to be pursued.

At the same time other overtures came from MULHAR ROW and *Raja SURJA MUL*, to know what part they should act. All these proposals the *Navab* communicated exactly to NUJEIB-UL-DOWLAH and the grand vizier; and negotiated with the *Mabrattas* by their advice.

NUJEIB-UL-DOWLAH threw every obstacle that he could in the way of peace; but the grand vizier told SHUJA-UL-DOWLAH, that, if a peace could be brought about through his means, it would be better; that he was very willing to forward it, and would engage to obtain the SHAH's concurrence. In fact, he was at this time on but indifferent terms with NUJEIB-UL-DOWLAH.

At length it was resolved to send the eunuch MOHAMMED YACCOB KHAN with their

their proposals to the *Mabrattas*, and to tell them from SHUJA-UL-DOWLAH, that he acknowledged the friendship which had always subsisted between them and him; that however it was neither proper nor practicable for him to join them, but that on every proper occasion he was ready to manifest his friendship, by giving them the best intelligence and advice; and, since they asked his opinion in the present instance, he would advise them to avoid attempting any other mode of carrying on the war, than the predatory and defultory one, to which they were accustomed: or that, if they preferred peace, means should be devised for obtaining it.

They at the same time wrote to *Raja SURJA MUL*, advising him to quit the *Mabrattas*, and return to his own country; which advice coinciding with his own opinion, he promised to follow it.

The BHOW, in answer to SHUJA-UL-DOWLAH, acknowledged the kindness of his advice and conduct, and promised to pay attention to what he had said. That as to peace, he had no cause of quarrel with the DURRANY SHAH, who might march back to his own country, whenever he pleased; that all the country on the other side of the *Attock* should remain in the possession of the SHAH, and all on this side of it should belong to the chiefs of *Hindoostan*, who might divide and settle it as they could agree among themselves. Or, if this should not satisfy the SHAH, he should possess as far as *Labore*. Lastly, he said, that, if the SHAH insisted on still more, he should have as far as *Sirhind*, leaving the remainder to the chiefs of *Hindoostan*, as was said before. With this answer, YACOOB KHAN returned.

Two days after this, SURJA MUL, who was encamped at *Bidderpoor*, six coss from *Debly*, by the advice of MULHAR ROW, and the other disaffected chiefs, under pretence of changing the ground of his encampment, sent off all his baggage and camp-followers towards his own country, and, when he received intelligence that they had got ten coss off their way, he followed them with his divisions of troops, and had got a great distance, before the BHOW heard of his departure. In a day and two nights he marched fifty coss, and reached the strong holds, of his own country.

The BHOW made no account of his defection, only saying, that such conduct was to be expected from mere *Zemindars*; that his going was of no importance, but rather to be rejoiced at, since he did not quit them at any time, when they might have relied on him for material service.

MAHOMMED YACOOB KHAN, returning to camp, reported all the BHOW's overtures;

tures; but, as neither party were sincerely in earnest, the negotiation went on but slowly.

Meantime, the rains drawing near to an end, the BHOW determined to reduce the strong post of *Kunjpoora*, which is situated on the banks of the *Jumna*, about fifty cofs above *Dehly*, at that time occupied by about 10,000 *Robillas*, as the possession of that place would secure his passing the river to attack the SHAH. He accordingly marched from *Dehly*, and, arriving at *Kunjpoora*, assaulted it with fifteen thousand chosen men; and after an obstinate resistance made himself master of the place, taking the governor DULEIL KHAN, and all the garrison, prisoners, and delivering up the place to plunder. The DURRANY SHAH had exact intelligence of all this proceeding, and was very desirous of relieving *Kunjpoora*; but the *Jumna* was yet impassable.

Soon after the rains broke up, and the *Duffura* arrived: the SHAH gave orders, that the day before the *Duffura*, all the army should be assembled for muster; which being done, he reviewed them himself from an eminence in front of the camp.

The *Durrany* army consisted of twenty-four *Dustas* (or regiments), each containing twelve hundred horsemen. The principal chiefs in command under the SHAH, were the grand vizier SHAH VULLI KHAN,—JEHAN KHAN,—SHAH PUSSUND KHAN,—NUSSIR KHAN BELOCHE,—BERKHORDAR KHAN,—Vizier ULLA KHAN *Kizelbashi*,—MORAD KHAN, a *Persian Moghol*.—Besides these principal chiefs, there were many others of inferior rank; and of the twenty-four *Dustas* above-mentioned, six were of the SHAH's slaves, called *Koleran*.

There were also two thousand camels, on each of which were mounted two musketeers, armed with pieces of a very large bore, called *Zamburucks*; forty pieces of cannon, and a great number of *sbuternals*, or swivels, mounted on camels: this was the strength of the *Durrany* army.

With the *Navab* SHUJA-UL-DOWLAH there were two thousand horse, two thousand foot, and twenty pieces of cannon of different sizes:

With NUJEIB-UL-DOWLAH, six thousand horse, and twenty thousand *Robilla* foot, with great numbers of rockets:

With DOONDY KHAN and HAFIZ RAHMUT KHAN, fifteen thousand *Robilla* foot and four thousand horse, with some pieces of cannon:

And with AHMED KHAN BUNGASH, one thousand horse, one thousand foot, with some pieces of cannon, making altogether forty-one thousand eight hundred horse,

horse, and thirty-eight thousand foot, with between seventy and eighty pieces of cannon.

This I know to have been precisely the state of the *Mussulman* army, having made repeated and particular inquiries before I set it down, both from the dufter (or office) of musters, and from those by whom the daily provisions were distributed. But the numbers of irregulars who accompanied these troops, were four times that number; and their horses and arms were very little inferior to those of the regular *Durrannies*. In action, it was their custom immediately after the regulars had charged and broken the enemy, to fall upon them sword in hand, and complete the rout. All the *Durrannies* were men of great bodily strength, and their horses of the *Turki* breed; naturally very hardy, and rendered still more so by continual exercise.

AHMED SHAH DURRANY issued orders to his army to be ready to march two days after the muster.

On the other side, the BHOW, having reduced *Kunjpoora*, returned to *Debly*, and ordered a muster of his army; when the strength of it appeared to be as follows:

Under IBRAHIM KHAN GARDEE, two thousand horse, and nine thousand sepoy with firelocks, disciplined after the *European* manner; together with forty pieces of cannon.

The <i>Kbafs Pagāb</i> , or household troops,	- - - -	6,000 horse.
MULHAR ROW and HULKER,	- - - -	5,000 horse.
JUNKOOJEE SINDIA,	- - - -	10,000 horse.
AMAJEE GUICKWAR,	- - - -	3,000 horse.
JESWONT ROW, POWAR,	- - - -	2,000 horse.
SHUMSHERE BEHADER,	- - - -	3,000 horse.
BEIJAJEE JADOON,	- - - -	3,000 horse.
RAJAH BETUL SHUDEO,	- - - -	3,000 horse.
BULMONT ROW, brother-in-law to the BHOW, and his great adviser in every thing,	- - - -	7,000 horse.
BISWAS ROW's own Pagāh,	- - - -	5,000 horse.
ANTAGEE MANKESER,	- - - -	2,000 horse.

There were several other smaller bodies, which cannot now be recollected: the whole army amounted to fifty-five thousand horse, and fifteen thousand foot, including IBRAHIM KHAN's sepoy.

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There were also two hundred pieces of cannon, and rockets and *shuternals* without number.

Besides these, the *Pindary* chiefs, CHURGORY and HOOL SEWAR, had fifteen thousand *Pindarries* under their authority; and there were two or three thousand horse with the *Rbatore* and *Cutchwa* vakeels. These, with five or six thousand horse more, were left to guard *Debly*, under the command of BOWANY SHUNKER.

Two days after the *Duffara*, which was the 17th of *October*, 1760, AHMED SHAH DURRANY marched from his camp, ordering his baggage to follow the army; and marching all night, encamped next day at the ford of *Baugput*, eighteen coss above *Debly*. He searched in vain for the ford, the river being still very high, and several horsemen, attempting to pass, were drowned. The SHAH having fasted and performed religious ceremonies for two days, on the third a ford was discovered, but it was very narrow, and on each side the water was so deep, as to drown whoever went the least out of the proper track.

The troops began to pass the ford on the 23d of *October*, and the SHAH himself passed as soon as half of his army was on the other side. The whole army was completely crossed in two days; but from their numbers and the great expedition used, many people lost their lives.

As soon as the army had crossed, the SHAH marched towards the enemy, who also moved to meet him; and on the 26th of *October*, in the afternoon, the *Herawil* (or advanced guard) of the two armies, met each other near *Sumalkeh Seray*, and an action ensued, in which the *Mabrattas* had the disadvantage, and retreated at sunset with the loss of near two thousand men, while not more than one thousand were killed and wounded on the part of AHMED SHAH. The SHAH's army returned to their camp.

The next day AHMED SHAH moved forward again, and so on for several days successively, constantly skirmishing, but still gaining ground on the *Mabrattas*, till they came to *Paniput*, where the BHOW determined to fix his camp, which he accordingly did, and inclosed that, as well as the town of *Paniput*, with a trench sixty feet wide and twelve deep, with a good rampart, on which he mounted his cannon. The SHAH encamped about four coss from the *Mabratta* lines; and, as he had always during his march, surrounded his camp at night with felled trees, so in this camp, which was to remain fixed for some time, the abattis was made something stronger, and the chiefs encamped in the following order:

The SHAH in the centre ;

On his left, SHUJA-UL-DOWLAH ;

On his left, NAJEIB-UL-DOWLAH ;

On the right of the SHAH, HAFIZ RAHMUT KHAN ;

On his right, DOONDY KHAN ;

On his right, AHMED KHAN BONGUS.

The space occupied by the whole front was near three cofs and a half.

The BHOW had before given orders to GOBIND PUNDIT, who had the command and collections of *Korah*, *Kurrab*, *Etawa*, *Shekoabad*, and the rest of the *Doab*, as well as of *Kalpee*, and other districts across the *Jumna*, as far as *Sagbur*, to collect all the forces he possibly could, and to cut off all communication for provisions from the rear of the SHAH's army. GOBIND PUNDIT having got together ten or twelve thousand horse, advanced as far as *Mirbet*, in the rear of the SHAH, and so effectually cut off all supplies, that the SHAH's army was in the greatest distress for provisions, coarse flour selling for two rupees per seer, and the troops consequently very much dissatisfied. The SHAH therefore detached ATTAI KHAN, nephew to the grand vizier, with a *Dusta*, consisting of two thousand chosen horse, and ordered him to march day and night, till he should come up with GOBIND PUNDIT, and having cut off his head, to bring it to the presence. He set out accordingly, being joined by eight or ten thousand of the irregulars, and having marched about forty cofs during the night, at day break they fell like lightning upon the camp of GOBIND PUNDIT ; where, having no intelligence of the *Durrannies'* approach, they were seized with terror and amazement, and fled on all sides. GOBIND PUNDIT himself attempted to escape upon a *Turki* horse ; but being old, and not a very expert horseman, he was thrown off in the pursuit ; and the *Durrannies* coming up, cut off his head and carried it to the camp, where it was recognized for the head of GOBIND PUNDIT.

After plundering the enemy's camp, and driving away their scattered troops on all sides, ATTAI KHAN returned to the SHAH's camp, the fourth day from that on which he was detached, and presented his Majesty with the head of GOBIND PUNDIT. The SHAH was highly pleased with this effectual performance of his orders, and bestowed a very honourable *Khalat* on ATTAI KHAN. After this action, the *Durrany* army was constantly supplied with provisions.

The BHOW was much affected with this news, especially as it was accompanied with other events little favourable to his cause : but as he was a man of dignity and resolution,

resolution, he never betrayed any despondency, but made light of all the adverse circumstances which occurred.

Soon after the defeat of GOBIND PUNDIT, the BHOW sent two thousand horse to *Debly*, to receive some treasure from NAROO SHUNKER, for the use of the army. These troops were instructed to march privately, by night, and by unfrequented roads, and each man to have a bag of two thousand rupees given him to carry, as far as the sum they should receive would go. They executed their orders completely, as far as to the last march, on their return to the camp; but unluckily for them, the night being dark, they mistook their road, and went strait to the *Durrany* camp instead of their own. On coming to the outposts, thinking them those of their own camp, they began to call out in the *Mabratta* language, which immediately discovering them to the *Durrannies*, they surrounded the *Mabrattas*, cut them to pieces, and plundered the treasures.

From the day of their arrival in their present camp, AHMED SHAH DURRANY caused a small red tent to be pitched for him a cofs in front of his camp, and he came to it every morning before sun-rise; at which time, after performing his morning-prayer, he mounted his horse, and visited every post of the army, accompanied by his son TIMOUR SHAH and forty or fifty horsemen. He also reconnoitred the camp of the enemy, and, in a word, saw every thing with his own eyes, riding usually forty or fifty cofs every day. After noon he returned to the small tent, and sometimes dined there, sometimes at his own tents in the lines; and this was his daily practice.

At night there was a body of five thousand horse advanced as near as conveniently might be, towards the enemy's camp, where they remained all night under arms: other bodies went the rounds of the whole encampment; and AHMED SHAH used to say to the *Hindoostany* chiefs, "Do you sleep, I will take care that no harm befalls you:" and to say the truth, his orders were obeyed like destiny, no man daring to hesitate or delay one moment in executing them.

Every day the troops and cannon on both sides were drawn out, and a distant cannonade with many skirmishes of horse took place: towards the evening both parties drew off to their camps. This continued for near three months: during this time there were three very severe, though partial, actions.

The first was on the 29th *November*, 1760, when a body of *Mabrattas*, about fifteen thousand strong, having fallen upon the grand vizier's post on the left of the line, pressed him very hard; till a reinforcement coming to his assistance, the action became

became very obstinate: the *Mabrattas*, however, gave way about sun-set, and were pursued to their own camp with great slaughter. Near four thousand men were killed on the two sides in this action.

The second action was on the 23d of *December*, 1760, when NUJEIB-UL-DOWLAH having advanced pretty forward with his division, he was attacked with so much vigour by BULMONT ROW, that his troops gave way, and only fifty horsemen remained with him; with which small number, however, he kept his ground, till a reinforcement came to his assistance; the action was then renewed with great fury, and above three thousand of NUJEIB-UL-DOWLAH's men were killed or wounded. Among the killed was KHALIL-UL-RAHMAN, uncle to NUJEIB-UL-DOWLAH. In the last charge, which was at near nine o'clock at night, BULMONT ROW was killed by a musket-ball: upon which both parties retired to their own camps.

The third action was much in the same way; and thus every day were the two armies employed, from morning to nine or ten at night, till at length the *Hindostany* chiefs were out of all patience, and entreated the SHAH to put an end to their fatigues, by coming at once to a decisive action; but his constant answer was, "This is a matter of war, with which you are not acquainted. In other affairs do as you please, but leave this to me. Military operations must not be precipitated. You shall see how I will manage this affair; and at a proper opportunity will bring it to a successful conclusion."

As the *Durrany* army was vigilant both by day and night, to prevent the approach of any convoys, there began to be a great scarcity of provisions and forage in the *Mabratta* camp.

One night when about twenty thousand of their camp-followers had gone out of the lines, to gather wood in a jungle at some distance, they happened to fall in with a body of five thousand horse, under the command of SHAH PUSSUND KHAN, who had the advanced guard that night, and who surrounded them on all sides, put the whole to the sword, no person coming to their assistance from the *Mabratta* camp. In the morning, when the affair was reported to the SHAH, he went out with most of his chiefs to the scene of the slaughter, where dead bodies were piled up into a perfect mountain!—so great had been the destruction of those unhappy people.

The grief and terror which this event struck into the *Mabrattas*, is not to be described; and even the BHOW himself began to give way to fear and despondence.

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There was a news-writer of the BHOW's, called GONNEISH PUNDIT, who remained in the camp of the *Navab* SHUJA-UL-DOWLAH; but not being of sufficient importance to obtain access to the *Navab*, any business that he had with the *Durbar*, he transacted through my means. Through this channel the BHOW often wrote letters to me, with his own hand, desiring that I would urge the *Navab* to mediate a peace for him, in conjunction with the grand vizier; that he was ready to submit to any conditions, if he could but preserve himself and his army, and would by every means manifest his gratitude to the mediators. He also sent a handful of saffron (as is a custom with these people) and a written engagement (to which he had sworn) to abide by this promise; together with a turban set with rich jewels, as an exchange for one to be received from the *Navab*, who also returned proper presents, and promised to assist him.

The *Navab* often sent me to the vizier upon this business. He was also very well disposed to listen to the BHOW's proposals, and spoke to the SHAH about it. The SHAH said, "That he had nothing to do in the matter; that he came thither at the solicitation of his countrymen the *Robillas*, and other *Mussulmans*, to relieve them from their fear of the *Mahratta* yoke; that he claimed the entire conduct of the war, but left the *Hindoostany* chiefs to carry on their negotiations as they pleased, themselves."

All the other chiefs, HAFIZ RAAMUT KAN, DOONDY KHAN, and AHMED KHAN BUNGISH, were also satisfied to make peace with the BHOW; but every one stipulated that NUJEIB-UL-DOWLAH must also be satisfied to do so, otherwise they could not consent. Accordingly the *Navab* SHUJA-UL-DOWLAH sent me to talk over the matter with NUJEIB-UL-DOWLAH, and to obtain his consent. I therefore waited upon him, and, in a long private conference, I explained every thing that had passed, and urged every argument to persuade him to come into the views of the other chiefs; to which he replied in nearly the following words: "SHUJA-UL-DOWLAH is the son of a man, whom I look up to as my superior; and I consider him also in the same light; but at the same time, he is young and unacquainted with the world: he does not see to the bottom of things. This business is a deception: when an enemy is weak and distressed, there is no concession that he will not make, and, in the way of negotiation, will swear to any thing; but oaths are not chains, they are only words. After reducing an enemy to this extremity, if you let him escape, do you think he will not seize the first opportunity to recover his lost honour and power? At present we may be said to have
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“ the whole *Decan* at our mercy ; when can we hope for another juncture so favourable ? By one effort we get this thorn out of our sides for ever.—Let the *Navab* have a little patience ; I will wait upon him myself, and consult what is best to be done.”

After this answer, I left NUJEIB-UL-DOWLAH, and returned to my master, to whom I repeated all that had passed, assuring him that NUJEIB-UL-DOWLAH would never be brought to agree to any terms of pacification.

As soon as I had left NUJEIB-UL-DOWLAH, though it was the middle of the night, he went immediately to the SHAH, and informed him of what had passed. “ All the chiefs (said he) are inclined to make peace with the *Mabrattas*, but I think it by no means adviseable. The *Mabrattas* are the thorn of *Hindostan* ; if they were out of the way, this empire might be your Majesty’s whenever you should please. Do as seems fit to yourself. For my own part, I am a soldier of fortune, and can make terms with whatever party may prevail.”

The SHAH replied, “ You say truly : I approve of your counsel, and will not listen to any thing in opposition to it. SHUJA-UL-DOWLAH is young and inexperienced, and the *Mabrattas* are a crafty race, on whose pretended penitence no reliance is to be placed. I from the beginning made you the manager of this affair, act as seems best to yourself : in my situation I must hear every one, but I will not do any thing against your advice.”

Next day NUJEIB-UL-DOWLAH came to SHUJA-UL-DOWLAH’s tent, where they consulted till late at night, but without coming to any conclusion.

By this time the distresses in the BHOW’s camp were so great, that the troops plundered the town of *Paniput* for grain ; but such a scanty supply gave no relief to the wants of such multitudes. At length the chiefs and soldiers, in a body, surrounded the BHOW’s tent, and said to him, “ It is now two days that we have not had any thing to eat ; do not let us perish in this misery ; let us make one spirited effort against the enemy, and whatever is our destiny that will happen.” The BHOW replied, that he was of the same mind, and was ready to abide by whatever they should resolve upon. At length it was determined to march out of the lines an hour before day-break, and, placing the artillery in front, to proceed to the attack of the enemy. They all swore to fight to the last extremity ; and each person took a *betel*-leaf in the presence of his fellows, in confirmation of this engagement, as is the custom among the *Hindoos*.

In this last extremity, the BHOW wrote me a short note with his own hand,
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which he sent by one of his most confidential servants. The words of the note were these:—

“The cup is now full to the brim, and cannot hold another drop. If any thing can be done, do it, or else answer me plainly at once: hereafter there will be no time for writing or speaking.”

This note arrived about three in the morning, at which time I was with the *Navab*. As soon as I had read it, I informed his Excellency of its contents, and called in the man who brought it; who told the *Navab* all that had happened in the *Mabratta* camp. While he was doing this, the *Navab*'s harcarrahs brought word, that the *Mabrattas* were coming out of their lines, the artillery in front, and the troops following close behind.

Immediately on hearing this, his excellency went to the *SHAH*'s tent, and desired the eunuchs to wake his Majesty that moment, as he had some urgent business with him.

The *SHAH* came out directly, and enquired what news: the *Navab* replied, that there was no time for explanation, but desired his Majesty to mount his horse, and order the army to get under arms. The *SHAH* accordingly mounted one of his horses, which were always ready saddled at the tent-door, and, in the dress he then had on, rode half a cofs in front of his camp, ordering the troops under arms as he went along.

He enquired of the *Navab* from whom he had his intelligence; and, he mentioning my name, the *SHAH* immediately dispatched one on a post-camel to bring me. After I had made my obeisance, he asked me the particulars of the news. I replied, that the *Mabrattas* had quitted their lines, and would attack his army as soon as it should be light. Just at this time some *Durrany* horsemen passed by; with their horses loaded with plunder, which they said they had taken in the *Mabratta* camp; and added, that the *Mabrattas* were running away. The *SHAH* looked at me, and asked me what I said to that? I replied, that a very short time would prove the truth or falsehood of my report. While I was speaking, the *Mabrattas* having advanced about a cofs and a half from their lines, and got their cannon drawn up in a line, all at once gave a general discharge of them.

Upon hearing this, the *SHAH*, who was sitting upon his horse, smoking a *Perfian Kallian*, gave it to his servant, and, with great calmness, said to the *Navab*, “Your servant's news is very true, I see.” He immediately sent for the Grand *Vizier* *SHAH PUSSUND KHAN*, who came accordingly: he ordered *SHAH PUSSUND KHAN*

KHAN to take post, with his division, on the left of NUJEIB-UL-DOWLAH, and consequently of the whole line; the Grand *Vizier* to take post with his division, in the centre of the line; and BERKHORDAR KHAN, with some other chiefs, with their troops, on the right of HAFIZ RAHMUT KHAN; and AHMED KHAN BUNGUSH, consequently of the whole line. When this was done, he ordered the trumpets and other instruments to sound to battle.

By this time objects began to be discernible; and we could perceive the colours of the *Mabratta* line advancing slowly and regularly, with their artillery in front. The SHAH, rode along the front of the line, and examined the order of all the divisions. He then took post, where his little tent was pitched, in front of his camp, but in the rear of the present line of battle, and gave orders for the attack to begin.

The *Mabratta* army faced towards the eastward, and their order was as follows, reckoning from the left flank of their line:

IBRAHIM KHAN GARDEE,	}	Front.
AMAJEE GUICKWAR,		
SHU DEO PATEIL,		
The BHOW, with BISWAS ROW and the household troops,		
JESWONT ROW POWAR,		
SHUMSHERE BEHADER,		
MULHAR ROW,		
JUNKOOJEE SINDIA, &c.		

The whole artillery, *buternals*, &c. were drawn up in front of the line.

The *Mussulman* army faced toward the westward, and was drawn up as follows, reckoning also from the left flank of their line:

SHAH PUSSUND KHAN,	}	Front.
NUJEIB-UL-DOWLAH,		
SHUJA-UL-DOWLAH,		
The Grand <i>Vizier</i> SHAW VULLI KHAN,		
AHMED KHAN BUNGUSH,		
HAFIZ RAHMET KHAN,		
DOONDY KHAN,		
AMIR BEG KHAN, and other <i>Persian Moghols</i> ,		
BERKHORDAR KHAN,		

All the artillery and rockets were in front of the line. Behind them were the camels,

camels, mounted by the musketeers carrying *Zumburucks*, supported by a body of *Persian* musketeers.

The two armies facing each other rather obliquely, the divisions of BERKHORDAR KHAN, AMIR BEG, and DOONDY KHAN, were very near to that of IBRAHIM KHAN GARDEE. The plan of the battle here annexed will explain this more clearly than any description in writing can do.

On the 7th of *January*, 1761, soon after sun-rise, the cannon, musketry, and rockets, began to play without intermission, yet our army suffered but little by them; for the armies continuing to advance towards each other, the *Mabratta* guns being very large and heavy, and their level not easily altered, their shot soon began to pass over our troops, and fell a mile in the rear. On our side, the cannon fired but little, except from the Grand *Vizier's* division.

As the armies were advancing towards each other, IBRAHIM KHAN GARDEE rode up to the BHOW, and, after saluting him, he said, "You have long been displeased with me, for insisting on the regular monthly pay for my people; this month your treasure was plundered, and we have not received any pay at all; but never mind that; this day I will convince you that we have not been paid so long without meriting it."—He immediately spurred his horse, and returning to his division, he ordered the standards to be advanced, and taking a colour in his own hand, he directed the cannon and musketry of his division to cease firing; then leaving two battalions opposed to BERKHORDAR KHAN and AMIR KHAN'S division, to prevent their taking him in flank, he advanced with seven battalions to attack DOONDY KHAN and HAFIZ RAHMUT KHAN'S division with fixed bayonets. The *Robillas* received the charge with great resolution; and the action was so close, that they fought hand to hand. Near eight thousand *Robillas* were killed or wounded, and the attack became so hard upon them, that but few of the people remained with their chiefs; not above five hundred, or at most a thousand, with each, after the violence of the first charge.

HAFIZ RAHMUT KHAN being indisposed, was in his *palankin*, and seeing the desperate state of affairs, he ordered his people to carry him to DOONDY KHAN, that he might expire in his presence: while, on the other hand, DOONDY KHAN was giving orders to search for HAFIZ RAHMUT KHAN; for so great was the confusion, that no one knew where another was. The two battalions left to oppose the SHAH'S flank divisions, as mentioned above, exerted themselves very much, and repulsed the *Durrannies* as often as they attempted to advance. In this action, which

lasted three hours, six of IBRAHIM KHAN'S battalions were almost entirely ruined, and he himself wounded in several places, with spears, and with a musket-ball. AMAJEE GUICWAR, whose division supported IBRAHIM KHAN, behaved very well, and was himself wounded in several places.

In the centre of the line, the BHOW with BISWAS ROW, and the household troops, charged the division of the Grand *Vizier*. The *Mabrattas* broke through a line of ten thousand horse, seven thousand *Persian* musketeers, and one thousand camels with *Zamburucks* upon them, killing and wounding about three thousand of them. Among the killed was ATTAI KHAN, the Grand *Vizier*'s nephew, who had gained so much honour by the defeat of GOBIND PUNDIT. The division gave ground a little, but the Grand *Vizier* himself stood firm, with three or four hundred horse, and fifty *Zamburuck* camels: he himself, in complete armour, dismounted to fight on foot.

The *Navab* SHUJA-UL-DOWLAH, whose division was next, could not see what was going on, on account of the dust, but finding the sound of men and horses in that quarter suddenly diminish, he sent me to examine into the cause. I found the Grand *Vizier* in an agony of rage and despair, reproaching his men for quitting him. "Our country is far off, my friends," said he, "whither do you fly?" But no one regarded his orders or exhortations. Seeing me, he said, "Ride to my son SHUJA-UL-DOWLAH, and tell him, that if he does not support me immediately, I must perish." I returned with this message to the *Navab*, who said, that the enemy being so near, and likely to charge his division, the worst consequences might follow to the whole army if he made any movement at that time, which might enable the enemy to pass through the line.

The *Navab*'s division consisted of only two thousand horse, one thousand musketeers, with twenty pieces of cannon, and some swivels: but they stood in close order, and showed so good a countenance that the enemy made no attempt upon it. Once or twice they advanced pretty near, and seemed as if they would charge us; but they did not.

On the left of the *Navab*'s division was that of NUJEIB-UL-DOWLAH, who had about eight thousand *Robilla* infantry with him, and near six thousand horse. They advanced slowly under cover of a kind of breast-works of sand, which were thrown up by a great number of *Bildars* who were with them, and who, having finished one, advanced the distance of half a musket-shot in front of that, under cover of their own people, and threw up another; to which the troops then advanced, while
a third

a third was thrown up in the same manner. They had got on above a coss in this method, and were within a long musket-shot of the enemy, NUJEIB-UL-DOWLAH saying, "that it behoved him to exert himself, as he was the person most deeply interested in the event of that day, the rest being only as visitors:" and, to say the truth, he was a man of surprising activity and ability.

He was opposed by JUNKOOJEE *Sindia*, and between them there was a mortal enmity. As the *Robillas* had a great number of rockets with them, they fired volleys of two thousand at a time, which, not only terrified the horses by their dreadful noise, but did so much execution also, that the enemy could not advance to charge them. Besides which, the division of SHAH PUSSUND KHAN, was on the right flank of NUJEIB-UL-DOWLAH; and that *Durrany* chief, being a brave and experienced officer, advanced in such good order, that the *Mabrattas* could make no impression on it.

The action continued in nearly this state from morning till noon, and, though we suffered least in point of killed and wounded, yet, upon the whole, the *Mabrattas* seemed to have the advantage.

About noon the SHAH received advice that the *Robillas* and the Grand *Vizier's* divisions had the worst of the engagement; upon which he sent for the *Nesuckchees* (a corps of horse with particular arms and drefs, who are always employed in carrying and executing the SHAH's immediate commands), and two thousand of them being assembled, he sent five hundred of them to his own camp, to drive out by force all armed people whom they should find there, that they might assist in the action; and the remaining one thousand five hundred, he ordered to meet the fugitives from the battle, and to kill every man who should refuse to return to the charge. This order they executed so effectually, that after killing a few, they compelled seven or eight thousand men to return to the field. Some were also found in the camp, and some the SHAH sent from the reserve which was with him. Of these he sent four thousand to cover the right flank; and about ten thousand were sent to the support of the Grand *Vizier*, with orders to charge the enemy sword in hand, in close order, and at full gallop. At the same time he gave directions to SHAH PUSSUND KHAN and NUJEIB-UL-DOWLAH, that, as often as the Grand *Vizier* should charge the enemy, those two chiefs should at the same time attack them in flank,

About one o'clock these troops joined the Grand *Vizier*, who immediately mounted his horse, and charged the body of the *Mabratta* army, where the BHOW commanded

manded in person: SHAH PUSSUND KHAN and NUJEIB-UL-DOWLAH took them in flank at the same time, which produced a terrible effect.

This close and violent attack lasted for near an hour, during which time they fought on both sides with spears, swords, battle axes, and even daggers. Between two and three o'clock, BISWAS ROW was wounded, and dismounted from his horse; which being reported to the BHOW, he ordered them to take him up and place him upon his elephant. The BHOW himself continued the action near half an hour longer on horseback; at the head of his men; when all at once, as if by enchantment, the whole *Mabratta* army at once turned their backs and fled at full speed, leaving the field of battle covered with heaps of dead. The instant they gave way, the victors pursued them with the utmost fury; and, as they gave no quarter, the slaughter is scarcely to be conceived, the pursuit continuing for ten or twelve coss in every direction in which they fled.

Of every description of people, men, women, and children, there were said to be five hundred thousand souls in the *Mabratta* camp, of whom the greatest part were killed or taken prisoners: and of those who escaped from the field of battle and the pursuit, many were destroyed by the *Zemindars* of the country. ANTAJEE MANKEESER, a chief of rank, was cut off by the *Zemindars* of *Ferocknagur*.

The plunder found in the *Mabratta* camp was prodigiously great: you might see one of our horsemen carrying off eight or ten camels, loaded with valuable effects: horses were driven away in flocks like sheep; and great numbers of elephants were also taken.

Near forty thousand prisoners were taken alive; of which six or seven thousand took shelter in the camp of SHU'JA-UL-DOWLAH, who posted his own people to protect them from the cruelty of the *Durrannies*: but the unhappy prisoners, who fell into the hands of the latter, were most of them murdered in cold blood, the *Durrannies* saying in jest, that, when they left their own country, their mothers, sisters, and wives, desired that, whenever they should defeat the unbelievers, they would kill a few of them on their account, that they also might possess a *merit in the fight of God*. In this manner thousands were destroyed, so that in the *Durrany* camp (with an exception of the SHAH and his principal officers) every tent had heads piled up before the door of it.

As soon as the battle was over, all the chief officers presented their *Nezzurs* of congratulation to the SHAH; and his majesty, having taken a slight view of the field of battle, returned to his tent, as all the other commanders did to theirs, leaving

ing the inferior officers and private foldiers to continue the plunder and purfuit at their own difcretion.

Towards morning, fome of BERKHORDAR KHAN's *Durranies* having found the body of BISWAS ROW, on his elephant, after taking the elephant and jewels, brought the body to SHUJA-UL-DOWLAH, who gave them two thousand rupees for it, and ordered that it fhould be taken care of. IBRAHIM KHAN GARDEE, though feverely wounded, had been taken alive by SHUJA KOULY KHAN, one of SHUJA-UL-DOWLAH's own people; which being reported to his Excellency, he ordered him to be carefully concealed, and his wounds to be drefled.

The SHAH next day ordered SHUJA-UL-DOWLAH to fend the body of BISWAS ROW for him to look at; which he accordingly did. The whole camp, great and fmall, were affembled round the SHAH's tent to fee it; and every one was in admiration of the beauty of its appearance: it was not diffigured by death, but looked rather like a perfon who fleeps: he had one wound with a fword on the back of his neck, and a flight one with an arrow over his left eye, but there was no blood difcoverable on any part of his remaining clothes. Upon fight of this body, many of the *Durranies* affembled in a tumultuous manner, faying, "This is the body of the king of the unbelievers; we will have it dried and ftuffed to carry back to *Kabul*." Accordingly it was carried to the quarter of BERKHORDAR KHAN, and depofited near the tent of MOOTY LOL, a *Kettery* by caft, who was his *Dewan*.

As foon as SHUJA-UL-DOWLAH heard of this, he waited upon the SHAH, and joined with the Grand *Vizier*, reprefented to his majefty, "that enmity fhould be limited to the life of our enemy; and it is always the custom of *Hindoflan*, that after a victory, the bodies of the chiefs, of whatever race or tribe, are given up, that they may receive their proper obfequies, according to the rules of their particular religion: fuch conduct, they faid, does honour to the victors, but an opposite one difgraces them. Your majefty is only here for a time, but SHUJA-UL-DOWLAH, and the other *Hindoflany* chiefs, are the fixed refidents of this country, and may have future tranfactions with the *Mabrattas*, when their conduct on the prefent occafion will be remembered; therefore, let the body be given up to them, that they may act as is customary here."

This matter remained in agitation for near two days, NUJEIB-UL-DOWLAH, and indeed all the *Hindoflany* chiefs, joining in the fame request. I was alfo fent on this account, accompanied by MEIG RAI, the *Vakeel* of NUJEIB-UL-DOWLAH, to the

the tents of BERKOHARDAR KHAN and MOOTY LOL. A second time I went alone, when MOOTY LOL asked me if I came on that business only, or would undertake any thing further: I said, "for any thing that he chose to communicate." Accordingly he carried me privately into two inner tents; in one I found Raja BABOO PUNDIT, the BHOW's *Vakeel*, who was wounded, with whom I conversed for some time; after which I went into the other tent, where ROW JUNKOOJEE *Sindia* was sitting; he was wounded with a ball, and with a spear in the arm, which he wore in a sling, and was a youth about twenty years of age. Upon seeing me he hung down his head; on observing which, I said to him, "Why do you do so, Sir? whatever could be expected from human valour and exertion, you have done; and the deeds of that day will live for ever in the memory of mankind." Upon this, lifting up his head, he said, "True, no one can contend with destiny. I wish I had died in the field of battle; but it was my fate to be brought hither. These people now require ransom from me, nor would it be difficult for me to pay what they demand, but it is impossible for me to get it here at this time. You were a friend of my father's, and there was always friendship between my family and the *Navab's*, and my father did them considerable services: if his Excellency will pay the money required for my release, it is an obligation that I shall never forget." I assured him that the *Navab* would not be backward, and desired to know how much was required. MOOTY LOL said, seven lacks of rupees was the sum mentioned, but that it might probably be settled for less. I immediately returned to the *Navab*, whom I found sitting with NUJEIB-UL-DOWLAH; I told him all that had passed respecting the business he sent me upon; but as I well knew the enmity which NUJEIB-UL-DOWLAH bore to the family and person of JUNKOOJEE, and thought, that from his good intelligence he might have some intimation that JUNKOOJEE was taken alive, I thought it best to avoid saying any thing about him to the *Navab* at that time, and went away to another part of the tent: but NUJEIB-UL-DOWLAH, who had observed me, said to the *Navab*, "From the countenance of CASI RAJA, I perceive he has something else to say which my presence prevents." SHUJA-UL-DOWLAH replied, that there were no secrets between them two; and immediately calling me, made me swear by the *Ganges*, to speak all that I should have done if NUJEIB-UL-DOWLAH had not been there; which being thus compelled to do, I did. NUJEIB-UL-DOWLAH, who was master of the most profound dissimulation, said, that it was highly proper, and becoming great men, to relieve their enemies under such circumstances; he therefore begged that SHUJA-

UL-DOWLAH

UL-DOWLAH would settle the ransom of JUNKOOJEE, and that he himself would pay half of it. This was his profession; and soon after taking leave, he went to the Grand *Vizier*, and informed him of all the particulars.

As, on one hand, NUJEIB-UL-DOWLAH wished to exterminate the family of *Sindia*, the Grand *Vizier* also was an enemy to BERKHORDAR KHAN, whom he hoped to injure by discovering this secret negotiation: they therefore went immediately together to the SHAH, and laid the affair before him. His Majesty sent for BERKHORDAR KHAN, and questioned him about having concealed JUNKOOJEE; but he positively denied having any knowledge of it. The Grand *Vizier* then sent for me to prove the fact; but even after that, BERKHORDAR KHAN persisted to deny it. Upon which the SHAH ordered his *Nesuckchees* to search the tents of that chief. Thus driven to extremity, BERKHORDAR KHAN immediately dispatched orders to his people to put both the prisoners to death, and bury them privately, before those sent by the SHAH should arrive to look for them: which was done accordingly, and thus those unhappy people lost their lives.

IBRAHIM KHAN GARDEE had hitherto remained in SHUJA-UL-DOWLAH's camp, and it was his Excellency's intention to send him privately to *Lucnow*; but some of the SHAH's people getting information of this, informed his Majesty of it, who sent for his Excellency, and questioned him on the subject. He at first denied it, but at length the SHAH, by dint of persuasion and flattery, got him to confess it. Immediately (as had been preconcerted) a great number of *Durranies* surrounded the SHAH's tent, crying out, "IBRAHIM KHAN is our greatest enemy, and has been the destroyer of multitudes of our tribe; give him up to us, or let us know who is his protector, that we may attack him." SHUJA-UL-DOWLAH put his hand upon his sword, and said, "Here he is:" and things were very near coming to extremity, when the Grand *Vizier* interfered, and taking SHUJA-UL-DOWLAH aside, he entreated him to consign IBRAHIM KHAN to his care for one week, promising to restore him safe at the end of that time. The *Navab* expressed some apprehension of intended treachery; but the Grand *Vizier* swearing on the *Koran* that no harm should befall the prisoner, SHUJA-UL-DOWLAH sent for IBRAHIM KHAN, and delivered him into the Grand *Vizier*'s hands.

The SHAH ordered him to be brought into his presence, and insultingly asked him, "how a man of his courage came to be in such a condition?" He answered, "that no man could command his destiny; that his master was killed, and himself wounded and prisoner; but that, if he survived, and his Majesty would employ
" him

“ him in his service, he was ready to shew the same zeal for him as he had done for the BHOW.” The SHAH gave him back in charge to the Grand *Vizier*, where he was treated with the greatest cruelty; and, as it is said, they ordered poison to be applied to his wounds, so that he died the seventh day after.

The day after the battle, the SHAH, superbly dressed, rode round the field of battle, where he found thirty-two heaps of the slain of different numbers, most of them killed near each other, as they had fought; besides these, the ditch of the BHOW's camp, and the jungles all round the neighbourhood of *Paniput*, were filled with bodies. The SHAH entered the town of *Paniput*, and, after visiting the shrine of BOO ALLY KALINDER, he returned to his tents.

SHUJA-UL-DOWLAH took some hundreds of *Bishties* with him to the field of battle, to wash the bodies, and look for those of the chiefs, especially for that of the BHOW; and carried the *Mabratta Vakeels* SINADUR PUNDIT, and GUNNEISH PUNDIT, and other prisoners, who knew the persons of all the chiefs, to assist him in finding them out. Accordingly they found the bodies of JESWUNT ROW POWAR, and the son of PALA JADOO, and many others.

The second day, after the strictest search had been made for the body of the BHOW, advice was brought that a body was laying about fifteen coss from the field of battle, which appeared to be that of a chief: SHUJA-UL-DOWLAH immediately went to the place, and had the body washed: some pearls of the value of three or four hundred rupees each, being found near the body, confirmed the belief of its being that of a person of rank. The pearls the *Navab* gave to SINADUR PUNDIT the *Mabratta Vakeel*, who, as well as the rest of the *Mabrattas* who came to find out the bodies burst into tears, and declared this to be the body of the BHOW, which they discovered by several natural marks, which the BHOW was known to have about him. First, a black spot about the size of a rupee on one of his thighs; secondly, a scar in his back, where he had been wounded with a *Kuttar* by MAZUFFER KHAN; and thirdly, in his foot the fortunate lines, called by the astrologers, *Puddum Mutch*. The body was that of a young man about thirty-five years old, and strongly made; and as it was known that the BHOW every day made one thousand two hundred prostrations before the sun, so were there the marks of such a practice on the knees and hands of this corpse.

While we were thus employed, I observed one of the *Durranies*, who stood at a distance and laughed; which I remarked to the *Navab*, and told him, that perhaps that man might know something respecting the body. The *Navab* took him
aside,

aside, and questioned him; to which he answered, " I saw this person several
 " times during the battle; he was extremely well mounted, and, in the course of
 " the action two of his horses were killed under him; at last he received several
 " wounds, and was dismounted from his third horse. About this time the *Mab-*
 " *ratta* army fled on all sides, yet this person seemed still to preserve his presence
 " of mind. He was well dressed, and had many jewels on, and he retired with a
 " short spear in his hand, and with a resolute aspect. I and some others pursued
 " him for the sake of his jewels, and, having surrounded him, we asked him if
 " he was some chief, or the BHOW himself: and told him not to be afraid, for
 " we would do him no harm, but carry him wherever he desired. As he made
 " no reply one of my companions grew angry, and wounded him with a spear,
 " which he returned; upon which we killed him, and cut off his head, but not
 " without his wounding two or three of us: the head another person has got."
 This last circumstance was not true, for the head was afterwards found with this
 very man.

The *Navab* carried the body, and that of SUNTAJEE NAJAH (which had forty
 cuts of swords upon it) to the camp, upon two elephants, and informed the SHAH
 of all the circumstances.

The SHAH, in compliment to SHUJA-UL-DOWLAH, gave orders that these two bo-
 dies, together with the body of BISWAS ROW, should be burnt, according to the
 custom of their casts; and sent twenty of his *Nesuckchees* to attend, and prevent the
Durrannies from giving any interruption to the ceremony. His excellency gave
 the bodies in charge to me, and told me that I was of the same country and tribe,
 and therefore he desired that I would burn them with the proper ceremonials; and he
 sent *Rajab ANUGHIRE* with the *Nesuckchees* to attend me. Accordingly I carried
 them to a spot between the SHAH's camp and the *Navab's*, and, having washed
 them with *Ganges* water, and perfumed them with sandal wood, I burnt them.

About two thousand of the fugitives from the BHOW's camp, who had escaped
 from slaughter by SHUJA-UL-DOWLAH's protection, were present on this occasion,
 and all were of opinion that the headless body was the BHOW's; but still, the head
 not having been seen, there was some room for doubt. In the evening, after burn-
 ing the bodies, we returned to camp. At night SHUJA-UL-DOWLAH went to
 the Grand *Vizier*, and told him what the *Durrany* had said respecting the head.
 The *Vizier* sent for the *Durrany* who belonged to BERKHORDAR KHAN, and told
 him not to fear being obliged to give up his plunder, that he should keep it all if

he would confess where the head was. Upon this the *Durrany* brought it wrapped up in a cloth, and threw it down before the Grand *Vizier*. *Rajah BABOO PUNDIT*, the *Mabratta Vakeel*, being sent for to look at the head, immediately said, "This is the head of the *BHOW*: he was my master, and the care of this is a sacred duty to me; let me beg that this head may be given to me, and that I may be permitted to burn it, according to the ceremonial of our religion." The Grand *Vizier* smiled at this request, and gave the head to him, at the same time sending some *Nesuckchees* with him for his protection. *Rajah BABOO PUNDIT* carried the head on the outside of the camp, and burnt it; after which no man doubted that the *BHOW* was actually killed. And this concludes all that I personally know respecting this battle and the death of the *BHOW*.

I afterwards learned from other parts of the country, that *MULHAR ROW*, *AMAJEE GUICKWAR*, *BETAL SHU DEO*, and some other chiefs, fled from the battle and escaped. One of the *BHOW*'s wives escaped on horseback, and got safe to *Deig*, where *Rajah SURJA MUL* received her with great respect, gave her money, clothes, and a *palankin*, and sent her with an escort to *Jansy*, whence she got safe to the *Decan*.

SHUMSHERE BEHADER got to *Deig*, wounded; *SURJA MUL* had his wounds taken the greatest care of, but he died soon after; and his tomb is at *Deig*.

The fifth day after the battle, the *SHAH* returned to *Debly*, which he reached in four marches. He wished to seize on the empire of *Hindoestan*; but *GOD* disapproved of this design.

After our return to *Debly*, *SHUJA-UL-DOWLAH* sent all the fugitives from the *Mabratta* camp, who had taken shelter with him, under a guard of his own troops, to the boundary of the *Jauts* dominions, where they were safe.

Eight days after this, by the pleasure of *GOD*, all the *Durranies* mutinied in a body, and insisted on the discharge of their arrears for the two years past, and also that they should immediately march back to *Kabul*. This confusion lasted for some days, during which time the *Durranies* quarrelled with *SHUJA-UL-DOWLAH*'s people, and threatened to attack his camp. His Excellency, highly provoked at this, went to the Grand *Vizier*, and asked him, "if that was the treatment he was to experience after all the fine promises that had been made to him?" The *Vizier* assured him, that both the *SHAH* and himself had the highest respect and attention for his Excellency; but that the *Durranies* were out of all power of controul. "Then (said the *Navab*), I see the value of your promise;" and got up to depart.

depart. The *Vizier* embraced him, saying, "We shall meet again;" but his Excellency made no reply.

As soon as he returned to his own camp, he consulted with his friends; and all agreed that it was no longer adviseable to remain with the SHAH's army. Accordingly in the afternoon he decamped, and marched fifteen cofs that night; and in this manner, by five forced marches, he got to *Mindy Gaut* on the *Ganges*. He was apprehensive that the SHAH might be so provoked at the abruptness of his departure, as to order him to be pursued; but no such step was taken; and the *Navab* crossed the *Ganges*, and returned with safety into his own dominions.

After this, we learned from the news-writers, the SHAH, finding it impossible to pacify his army by any other means, was obliged to give up his views in *Hindostan* and to return to *Kabul*; having received above forty lacks of rupees from NUJEIB-UL-DOWLAH for the assistance which he had given him.

Though this narrative is written from memory, and long since the events happened, I do not believe that I have omitted any circumstance of importance; and those who reflect upon these transactions, will believe that Providence made use of AHMED SHAH DURRANY, to humble the unbecoming pride and presumption of the *Mabrattas*; for in the eyes of GOD pride is criminal.

NOTES.

P. 412. *inviting*) This measure of the BHOW's seems to have been merely a political artifice, to disunite the *Hindostany* chiefs, by exciting in some of them a hope of a participating in his conquests; for the preceding conduct of the BHOW gives little reason to believe that, if the *Durrannies* and *Robillas* had been out of the question, he would have allowed the existence of any power in *Hindostan* but that of the *Mabrattas*.

P. 416. *children*) This is a compliment very common among eastern nations; and, like most of their other compliments, means nothing at all.

P. 417. *address*) Of this they are extremely tenacious; and it is a thing so very particularly attended to in the east, that those who have occasion to correspond with the *Afsaticks*, cannot be too well acquainted with every one's address; for any deviation excites either disgust or ridicule.

P. 420. *Pagab*) The word *Pagab* has the same signification among the *Mabrattas* as *Risalah* has among the *Persians* and *Moguls*; and, being indefinite in the number of troops of which it consists, may be rendered pretty fairly by our word *brigade*. I have known it applied to a command of three hundred horse; and I have also known it used in the same sense to describe one of some thousands of horse and foot with artillery.

P. 421. *Pindarries*) The *Pindarries* are the freebooters of the *Mabratta* armies, and usually as numerous as those they account their regulars. They are mounted on small but hardy horses, and serve for plunder only. The chiefs under whom they engage, enter into certain articles of agreement with the chief commanding

commanding the *Mahratta* army, respecting the division of plunder; and the *Pindarries* also have particular conditions, on which they serve under their chiefs. Their principal use is in laying waste an enemy's country, or their own when invaded; which they do with great alacrity and effect: also in attacking the baggage and camp-followers of an enemy's army. Another thing, which makes them extremely useful to their own army, is, that every *Pindarry* has a pair of large bags on his saddle, which, after his day's excursion, he in the evening brings into camp, filled with wheat, barley, rice, or some other useful grain, plundered from the villages, which is sold in the bazar for something below the market-price; so that ten thousand *Pindarries* are at least as useful to the supply of their own army as an equal number of *Bunneahs* with carriage-bullocks would be.

P. 421. *The troops*) This seems to have been the crisis of the BHOW's fortune: had he boldly attacked the SHAH while he was passing the *Jumna*, he would probably have totally defeated him.

Ibid. his camp.) Colonel DOWE says, that the BHOW occupied the lines formerly thrown up by MAHOMMED SHAH, and that the DURRANY SHAH posted himself in the more fortunate camp of NADIR SHAH. KASSI RAJH does not notice this, but says that the BHOW dug a trench round his camp. The point however is of little consequence.

P. 429. *January*) Colonel DOWE says, it was on the 20th, not the 6th of *Jemad-ul-Sani*. The reader may believe either, without any injury to the fact of the battle itself. Dates are exceedingly inaccurate in all oriental productions.

P. 430. *dust*.) This may appear extraordinary to those who have never seen a large army of horse galloping about on a dusty plain, in a hot climate, but is a very natural and true description to those who have.

If I am not mistaken, PLUTARCH mentions, as one of the most cruel sufferings of CRASSUS's army, when defeated in *Parthia*, that the *Parthians* galloped round them continually, and almost suffocated the soldiers with dust.

P. 431. *enmity*.) DATTEA JU PATEIL, the brother of JUNKOOGEE, had been killed the year before, in the battle of *Badelly*, against NUJEIB-UL-DOWLAH.

Ibid. orders.) These orders of AHMED SHAH evince much military knowledge: perhaps better can scarcely be imagined in the situation of affairs; and the success was complete.

P. 432. *enchantment*.) The *Mahratta* army fled in consequence of the death of BISWAS ROW, their chief. This is always the case with *Asiatic* armies.

Ibid. souls.) This number seems very great, but any person acquainted with the multitude of followers in an *Indian* camp, will not disbelieve it. Even in *English* camps in *India*, three followers to each fighting man, is considered as a moderate number.

Ibid. merit.) This is looked upon as highly beneficial to the souls of the faithful; and almost a certain passport to paradise.

P. 434. *Ganges*.) This is one of the many instances among this people, where absurd superstition is brought in excuse of lax morality. What the author adverts to is very common, both among *Hindoos* and *Mussulmans*. It is rather an adjuration than any thing that might reasonably be deemed obligatory (even though its object were innocent) on the person on whom it is involuntarily imposed; and is usually practised to make men betray secrets which they are bound in honour to conceal. He who wishes to discover the secret, says, "I adjure you by the *Ganges*, or the *Koran*, or your son's head." This the other pretends to consider

consider a sufficient compulsion for him to betray his trust : I say pretends, because where the secret regards their own interest or safety, they are very far from allowing an equal force to the adjuration.

P. 436. *cruelty*) The cause of this extraordinary enmity to IBRAHIM KHAN, was his having fought on the side of the infidels against the true believers.

P. 438. *killed*) Notwithstanding all this, however, in the year 1779, a man appeared, who called himself the BHOW, and from many circumstances obtained credit for some time.

He came first to *Etaiwa*, and made himself known to LALA BALGOBIND, a merchant with whom the BHOW had been on terms of friendship. BALGOBIND was so far persuaded of his identity, that he treated and entertained him with great respect : but, though he brought many circumstantial proofs that he was the BHOW, and his age, person, and several marks about his body, strongly supported that belief, still there appeared a difference in temper and manner, which excited doubt. BALGOBIND having expressed his wish to be satisfied respecting this, the person replied, that after the battle and pursuit, from which he escaped alive, though wounded, he fled to the hills of *Kamabun*, where he lived five years among a fraternity of *Fakeirs*, conforming to all their austerities ; which must necessarily have made a great change in his manners. That after this, he had resided some time in *Robilcund*, and had travelled to many places in the disguise of a *Byragby fakeir*. “ At length,” said he, “ I am arrived here, and we must devise the best method for me to declare myself.” BALGOBIND told him, that, as there were many *Mabrattas* at *Benares* to whom the BHOW was known, he had better first shew himself there. Accordingly he went to *Chutterkote*, in *Bondelcund*, from whence he wrote (as the BHOW) to MORJEE BHUT, RAMCHUND GOTKUR, and GUNNEISH BHUT, at *Benares* ; informing them that he was arrived at *Chutterkote*, and desiring them to come to him immediately.

Upon receipt of this letter, MORJEE BHUT, the son of RAMCHUND GOTKUR, and DOONDOO BHUT, who was an old servant of the BHOW, set out for *Chutterkote*, where they immediately waited upon the supposed BHOW, and had a long conference with him ; after which they retired to a house in the town. Next day they waited upon him again, when, in the course of the conversation, the supposed BHOW told them, that as he had left many lacks of rupees, as a deposit with them, before the battle of *Paniput*, he desired that they would furnish him with some money, to defray the expence of the rank which he meant to assert. On this they immediately got up, and went away ; and from that time they began to circulate a report that this was not the BHOW, but an impostor. When he heard this, he reproached them with ingratitude, and told them that he would come to *Benares*, and establish his claims upon them : they however persisted to deny them, and returned to *Benares*. The supposed BHOW followed them, and arriving at *Benares*, went to reside at the house of DOONDOO BHUT, who all along acknowledged him. Here several *Mabrattas*, and other considerable inhabitants of that town went to see him, and were so far convinced of his identity, that they gave and lent him large sums of money. Several of the *Mabrattas* also ate with him, in proof of their belief of his story. But four or five of the principal merchants, whom he had asserted to be his debtors, would not visit him ; at which he was so much provoked, that he sent word to MORJEE BHUT, RAMCHUNDER GOTKUR, and GUNNEISH BHUT, either to pay him what they owed him, by fair means, or that he would compel them by force : at the same time he began to raise some troops in the town, and soon got together some hundreds of the kind of soldiery procurable in every town of *Hindostan*. He also got a palkey, and two or three horses for himself, with which cavalcade he used to come into the town, and pass in terror round the houses of his debtors, who were much alarmed lest he should seize upon them and carry them off.

Mr. THOMAS GRAHAM, who at this time was resident on the part of the company at *Benares*, hearing
of

of these proceedings, inquired of several persons of character, whether, in their opinion, this man was the BHOW or not; who all replied that he certainly was an impostor. While this inquiry was going on, it was discovered that DOONDoo BHUT, a confidential friend of the BHOW (as has been said before) was carrying on some secret negotiation with RAJA CHEYT SING, who had sent him money at different times. Mr. GRAHAM was led to believe, from many circumstances, that one object of this negotiation was to have him destroyed, under cover of some popular insurrection; the *Raja* having at that time conceived a jealousy of him, on account of his knowledge in the affairs of that district, which the *Raja* wished as much as possible to conceal. As the *English* were then at war with the *Mahrattas*, and RAJA CHEYT SING thought to be rather dissatisfied with the government, Mr. GRAHAM was very naturally alarmed at this intelligence, and sent a message to the *Raja*, requesting that he would explain himself. In reply, RAJA CHEYT SING assured him that he was perfectly ignorant of the matter in question, and desired that Mr. GRAHAM would send for the person himself and inquire. Mr. GRAHAM accordingly did send for him, but he peremptorily refused to come, with expressions of contempt for the resident's authority.

Mr. GRAHAM having advised the *Raja* of this, and called upon him for assistance, as the person in whose hands the government of the country was, as to its police, the *Raja* immediately sent the *Ameer* and *Cutwal* of *Benares* with a detachment of Sepoys, to seize upon the supposed BHOW, and confine him. They accordingly surrounded the house in which he resided, and, after some little resistance, they took him prisoner, and carried him to Mr. GRAHAM, who asked him some questions; to which his answers were not satisfactory, and rather tending to confirm the suspicions already conceived of RAJA CHEYT SING.

The supposed BHOW remained a prisoner in the *Aumeins* Cutcherry at *Benares*, till Mr. GRAHAM having consulted the board at *Calcutta*, received their orders to send him to *Chunarghur*, and deliver him in charge to the commanding officer there; and they at the same time directed him to inquire particularly into the truth or falsehood of his story. This person was accordingly confined at *Chunarghur*, where Mr. GRAHAM went several times, and sent for the prisoner, whom he questioned particularly respecting his whole story; the result of which was, his feeling some disposition to credit his being the BHOW, and occasionally assisting him with money. Soon after, Mr. GRAHAM went to *Calcutta*, carrying with him an agent on the part of the supposed BHOW; but in a short time after, he himself going to *Madras* as secretary to Sir EYRE COOTE, nothing was determined respecting that affair, and the unfortunate man remained a prisoner till *August*, 1781, when Mr. HASTINGS, the Governor General, came to *Benares*, and the troubles with RAJA CHEYT SING commenced. During the time of Mr. HASTINGS's residence at *Chunarghur*, he sent for the prisoner, and, after hearing his story, ordered him to be released. The man returned to *Benares*, where he died soon after.

Among others, KASSI RAJH PUNDIT, the author of this book, being at *Benares*, when the supposed BHOW resided there, went to see him, and said (as BALGOBIND had done) that the person exactly resembled the real BHOW, and that the marks upon him (the same as mentioned in his narrative of the battle of *Paniput*) exactly corresponded, but that the manner and temper were different.

Thus the affair stands at present a subject for unbounded conjectures; and the *Benares* BHOW will generally be classed with LAMBERT SIMNEL, PERKIN WARBECK, the *Russian* DEMETRII, and many others whom ill success has transmitted to posterity as impostors, when better fortune in the precarious appeal to the sword, would perhaps have stamped them the real much-injured heirs of their domains, restored by the hand of Heaven, to bless their subjects by the benign exercise of legitimate authority.

“ The vanquish'd rebel like a rebel dies :

“ The victor rebel plumes him on a throne.”

This

This man had written a history of himself in the *Persian* language, which he gave to Mr. THOMAS GRAHAM, who would have indulged me with the perusal of it, but having left it behind him when he went to the coast with the late Sir EYRE COOTE, in a place not sufficiently dry, it was unfortunately destroyed by vermin.

P. 438. SHUMSHERE.) This was the father of ALY BEHADER, now at *Muttra* (in 1790) with TOKOJEE HULKER.

Ibid. He wisbed) This is the only historical intimation that I remember to have met with of this fact, yet it is extremely probable; and I was told by people of the first authority, when I was at *Dehly*, that the connection which AHMED SHAH DURRANY formed with the house of TIMUR when he was in *Hindostan*, was with that view. He himself married a daughter of MOHAMMED SHAH, and gave a young daughter of ALUMGHIRE SANI (consequently a sister or half-sister of SHAH ALUM) to his son TIMUR SHAH, who has since succeeded him in the throne of *Kabul*, &c. But his constant apprehensions on the side of *Persia*, and a disposition void of enterprize, have hitherto prevented TIMUR SHAH from attempting any thing in *Hindostan*; and, as he grows older, it is probable that his pacific conduct will still continue.

P. 439. *Navab.*) It cannot fail to strike every reader, that though KASSI RAJH PUNDIT was a servant, and evidently a great admirer of SHUJA-UL-DOWLAH, omitting no fair occasion of praising him, yet he says nothing of what DOWE and some others tell us of SHUJA-UL-DOWLAH's being highly instrumental to gaining the victory at *Paniput*, by wheeling round upon the flank of the *Mabrattas*, at a critical part of the battle. On the contrary, by his very clear and minute detail, it appears that SHUJA-UL-DOWLAH's division never moved from their first post, but thought themselves fortunate in not being attacked where they were. As, independent of historical truth and his master's credit, KASSI RAJH would himself have derived some share of reputation from the gallant actions performed by that division, it does not seem likely that he would have passed such a circumstance over in silence, if it had ever happened.

AN EXPLANATION OF THE PLAN.

- A. *Paniput*, with the *Mabratta* Camp.
- 1 Division of IBRAHIM KHAN.
 - 2 Division of AMAJEE GWICKWAR.
 - 3 Division of SHU DEO PATUL.
 - 4 Division of the BHOW and BISWAS ROW.
 - 5 Division of JESWONT ROW.
 - 6 Division of SHUMSHERE BEHADER.
 - 7 Division of MULHAR ROW.
 - 8 Division of JUNKOOGEE *Sindia*.

- B. The *Durrany* Camp.
- C. The SHAH's advanced Tent.
- 1 Division of BERKHORDAR KHAN.
 - 2 Division of AMIR BEG, &c.
 - 3 Division of DOONDY KHAN.
 - 4 Division of HAFIZ RAHMUT KHAN.
 - 5 Division of AHMED KHAN BUNGUSH.
 - 6 Division of the Grand *Vizier*.
 - 7 Division of SHUJA-UL-DOWLAH.
 - 8 Division of NUJEIB-UL-DOWLAH.
 - 9 Division of SHAH PUSSUND KHAN.
 - 10 *Persian* Musketeers.

Remark by the PRESIDENT.

THE preceding narrative brings to my mind an anecdote, which I received from BAHMEN of *Yezd*, whose father BAHRAM had been a confidential servant of
CARI'M

CARI'M KHA'N, and heard it at *Sbiráz* from the lips of the KHA'N himself. Both CARI'M *Zend* and AHMED *Abdáli* were officers of NA'DIR *Sháh*; and, having displeased him at the same time, for a little neglect of their duty as commissaries, were put under arrest, and confined for some days in the same guard-room; but such are the vicissitudes of life in unsettled countries, that a short time after, NA'DIR was assassinated by one of his own kinsmen; CARI'M became, at length, sovereign of all *Iran*, where he reigned near thirty years univervally beloved; and AHMED, having founded a new kingdom at *Kábul*, obtained the victory at *Pánipat'b*, without which the *Mahráttas* would, perhaps, at this day have been the most powerful nation of *India*.

TO COLONEL PEARSE.

DEAR SIR,

THE following is an extract from a paper written in 1782, and intended for a periodical mathematical publication, which I then had the care of: as it mostly relates to a subject of which no person is a better judge than yourself, if you think it worthy of a place in the *Transactions* of the *Asiatick Society*, I request you will transmit it.

I am, dear Sir,

Your most obedient and
most humble servant,

Fort William,
June 10, 1787.

REUBEN BURROW.

VI.

A SPECIMEN OF A METHOD OF REDUCING PRACTICAL TABLES
AND CALCULATIONS INTO MORE GENERAL AND COMPENDIOUS
FORMS.

THOUGH practices usual in one science may often be transferred with advantage to another, yet the general class of writers are so much more intent upon making books than improvements, that it very seldom happens to be the case: and therefore, though the following hints can have little claim to ingenuity, they are certainly valuable on account of their use.

It

It is common in Astronomy, when there are two series of quantities, whose respective terms depend on each other, to find a general expression for an intermediate term, by what is called the method of interpolation: that is applied by NEWTON to *Comets*, and by DE LA CAILLE to *Eclipses*; and I shall here, as a specimen, apply it to some few examples in artillery and fortification.

Let $g+hx$ be an expression by which the quantity x is derived from m , and b from n ; then if N is any term in the series m, n , the term derived from it, in the series a, b , will be $(an-bm) : (n-m) + N(b-a) : (n-m)$.

In p. 174 of MULLER'S Artillery, the length of a battery for two pieces of cannon is forty-feet; and for four pieces, fifty-eight feet: now if N be the number of cannon, a general expression for the length of the battery may be found, by substituting two for m , and four for n ; forty for a , and fifty-eight for b , in the foregoing form, which then becomes $22+9N$; and therefore, for twenty pieces of cannon, the length of the battery is 202 feet.

By a similar substitution, if fifty men are required to make the battery for two pieces, and seventy for that of four pieces, as in MULLER'S Table; then $30+10N$, is the expression for the men required for any number N of pieces in general.

Instead, therefore, of MULLER'S Table, the following general one may be inserted for the number of men, tools, &c. for making a battery for any number of cannon in one night.

Number of Pieces.	Length of the Battery	Men to make the		Tools.	Fascines in feet.			Pickets.	Mallets.	Hand Bills.	Platforms.			Barrels.
		Battery	Fascines.		10	8	6				Planks.	Sleepers	Pickets.	
N	$22+9N$	$30+10N$	$5+5N$	$40+15N$	$20+25N$	$20+14N$	$8N$	$180+205N$	$2+4N$	$8+2N$	$18N$	$5N$	$32N$	$25N$

In the same manner, from having a few particular cases in other kinds of rules, general ones may be found; for example, if N be a number whose r root is required; and if x^r be its nearest complete power, then we know already, that

$$x : N \approx x^r :: x : N^{\frac{1}{r}} \approx x \text{ for the one root.}$$

$$\frac{1}{2}x^2 + \frac{1}{2}N : N \approx x^2 :: x : N^{\frac{1}{2}} \approx x \text{ for the square root.}$$

$$2x^3 + N : N \approx x^3 :: x : N^{\frac{1}{3}} \approx x \text{ for the cube root.}$$

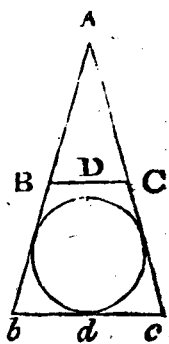
Now the general form of the three last terms is evident; and to find those of the first term, let one and two be put for m and n ; and one and three halves for a and b ; and by substituting in the foregoing expression, the general coefficient of x is found to be $(r+1)$; again if we put 0 and one half for a and b , we find the coefficient of N to be $(r-1)$.

If we use the second and third proportions, putting two and three for m and n , and for a and b , three halves and two, in the first case; and one-half and one, in the

second we get the same values. Hence in general; $\frac{r+1}{2}x + \frac{r-1}{2}N : N \approx x :: x : N^{\dagger} \approx x$.

Another example of the advantage of transferring practices from one subject to another is this. Dr. HALLEY has applied a method similar to that of interpolation to find the time of the tropicks: now the sun's meridian altitude may be found in the same way, from altitudes taken near the meridian, and if the observer begins a little before noon to take altitudes and the times, and continues to do so till a little after noon, a number of meridian altitudes may be deduced from these, and the latitude found much more exactly from them, than can be expected from a single meridian altitude, by using the expression for the maximum, or otherwise.

Analogous to these, are methods of generalizing properties from particular cases: thus, if Ab Ac be tangents to a circle, and if any lines BC bc , be also drawn to touch the circle; then the perimeters of all the triangles $A B C$, will be constant, and also the difference between the sum of Ab and Ac and the base bc : this property is of uncommon use in the construction of problems, relative to plain triangles and trapeziums; and if lines be supposed drawn from the centre, or a point in the circumference of a sphere, to each part of the figure, it will be found, that the projection of the figure upon the sphere will have analogous properties, and that the theorem is also true in spherical triangles. By a little mode of consideration, problems similar to those of APOLLONIUS on tangencies may be constructed on the sphere: for instance, having three circles given upon a sphere, a fourth may be found to touch them; for their positions on the sphere being given, their projections will also be given on a plane stereographically; and as a circle may be found in VIETA's method to touch them on that plane, the situation of that circle may be found upon the sphere, and hence properties may be found for constructing the



the problem independent of the stereographic projection: and if we suppose the centre of projection to be the centre of focus, &c. of a spheroid or other solid, innumerable properties may be found relative to their tangents, curvatures, &c. regard being had to the position of the plane, &c.

To give a specimen of the aforesaid method in fortification, let h (see pp. 22, 23, 24, and 25; of DEIDIER's *Perfect French Engineer*) represent the height of a wall; then, according to VAUBAN's measures, if five feet be the thickness at the top, $\frac{1}{3}h+5$ will be the thickness at the bottom; and, according to BELIDOR's method $\frac{1}{4}h+3,5$ will be the thickness at the top, and $\frac{1}{4}h+3,5$ that at the bottom. The length of the counterfort (according to VAUBAN) will be $\frac{1}{3}h+2$; also $\frac{1}{3}h+2$ is the thickness next the wall, and $(\frac{1}{3}h+4)$ the thickness at the other end of the counterfort. If part of the wall is gazoned, let e be the height of that part and h that of the wall; then $\frac{1}{3}(h+e)+5$ is the thickness at the bottom; $\frac{1}{3}e+5$, is the thickness at the top; $\frac{1}{3}(h+e)+2$ is the length of the counterfort; $\frac{1}{3}(h+e)+2$, its thickness next the wall, and $\frac{1}{3}(\frac{1}{3}(h+e)+4)$ its thickness farthest from the wall. When there are cavaliers, let c be their height in feet; then $\frac{1}{3}(2e+c+50)$ is the thickness of the revêtement at the top, and $\frac{1}{3}(2h+2e+c+50)$ is the thickness at the bottom.

A DEMONSTRATION OF ONE OF THE HINDOO RULES OF ARITHMETICK.

By Mr. REUBEN BURROW.

THE art of invention being in a great measure dependent on the doctrine of combinations; every additional improvement in the last must of consequence be useful in the former; and as the following ancient rule for "*finding the sum of all the different permutations of a given numeral quantity, consisting of a given number of places of figures,*" is not, I believe, extant in any *European* Author, and is besides very ingenious; I take the liberty to insert it, and also to add the demonstration.

Rule. Place an Arithmetical progression over the figures, beginning with unity at the unit's place, and increasing by unity; divide the product of the terms of this progression by the number of places of figures in the given quantity: multiply the
sum

sum of the figures in the given quantity by the quotient, and set down the product as often as there are places in the given quantity; removing it each repetition one place to the right hand, and the sum of these lines is the sum of all the permutations.

Example. Required the sum of the different permutations of 893.

				$\frac{1 \times 2 \times 3}{3} = 2; (8+9+3)2=40;$	893
					839
3	2	1		40	983
8	9	3		40	938
				40	389
				<hr style="width: 10%; margin: 0 auto;"/>	398
				4440	<hr style="width: 10%; margin: 0 auto;"/>
					4440

DEMONSTRATION.

First, it is evident that if all the permutations of any number of letters expressing figures be put down; and those in the first place to the right hand be multiplied by unity; those in the second place by ten; those in the third place by 100, and so on; then the sum of all these will be the sum of the permutations required.

Secondly, Supposing the different permutations to be put down one under another, it will really appear; from the manner in which permutations are generated, that all the letters occur an equal number of times in each perpendicular column; and also that the number of times of occurrence in the permutations of n letters, is equal to the permutations of $n-1$ letters; but the permutations of $n-1$ letters is equal to $1.2.3... (n-1)$ or $1 \times 2 \times 3$ carried to $n-1$ terms; and consequently if there be n letters in the given number, each letter in the columns aforesaid will occur $1.2.3... (n-1)$ times).

Thirdly, Let $1.2... (n-1) = m$ then,

$m (a+b+c+...n) 1 =$ sum of numbers in the unit's place or first column.

$m (a+b+c+...n) 10 =$ sum of numbers in the tens or second column.

$m (a+b+c+...n) 100 =$ ditto third column.

$m (a+b+c+...n) 100... \text{ to } (n-1) \text{ Cyphers} =$ ditto in the n column; and the sum of these is evidently equal to

$m (a+b+c+...n) . (1+10+100+... \text{ to } n \text{ terms});$ and putting for $(1+10+100...n)$ its value $111...n$, the expression becomes

(1.2.

$(1.2.3..(n-1)) + (a+b+c+..n) + (111...n)$; but $1.2.3...(n-1)$ is equal to $\frac{1.2.1..n}{n}$ and therefore the expression for the sum of all the permutations is $(\frac{1.2.1..n}{n}) \times (a+b+c+..n) \times (111...n)$, which is the Hindoo rule when the figures of the given number are all unlike.

Lastly, It is evident that $1.2.3...n$ is the number of permutations of n different things; but if several sets of figures are alike, as r figures of one kind, s figures of another, for instance; then let

$(1.2.3...n) : (1.2..r) \times (1.2...s)$, &c. the number of permutations in that case be called N ; then the sum of the permutations is $N:n \times (a+b+c+...n) \times (111...n)$ in general.

Example. Required the sum of the permutations of 11335?

$$\frac{1.2.3.4.5}{1.2.1.2} = 30; \frac{30}{5} = 6; 6 \times 13 = 78;$$

78
78
78
78
78

866658 the Sum required.

VII.

ON THE NICOBAR ISLES AND THE FRUIT OF THE MELLORI.

By NICOLAS FONTANA, Esq.

THE south-west monsoon having strongly set in on the *Malabar* coast, it was deemed unsafe to remain there any longer: we therefore took our departure from *Mangalore* on the 20th of *May*, 1778, directing our course towards the gulph of *Bengal*; and in less than ten days, we came in sight of the *Carnicobar* islands; the appearance of which, at seven or eight leagues distance, is much like a chain of mountains covered with woods: we anchored to the N. E. of one of them, in five fathoms

fathoms with a good sandy bottom; supplied ourselves with water and wood, and proceeded in quest of the other *Nicobars* or *Nancaveris*, as they are called, situated between eight and nine degs. N. lat. to the northernmost point of the island of *Sumatra*. They were descried on the 4th of *June*, to the S. W. $\frac{1}{2}$ W. at the distance of ten leagues: the position of three of those islands forms one of the safest harbours in *India*, where ships of all sizes may ride with the greatest security, sheltered from all winds, about half a mile from shore; with the additional advantage of two entrances, that may serve for getting in and out, both with a N. E. and S. W. monsoon, having a clear deep channel on each side.

In one of the bays formed within those islands, we moored in twelve fathoms, and there remained until the S. W. monsoon was quite over, which was in the beginning of *September*. The largest of those islands is called *Nancaveri* or *Nancowry*, about five or six leagues in circumference; and better inhabited than any of the other two. The second is called *Soury* or *Chowry*, and the other *Tricut*, all closely situated: about ten leagues to the N. E. of them is another called *Catchoul**.

Almost the whole of those islands is uncultivated, though there are a number of large valleys that might be rendered very fruitful, with little trouble, the soil being naturally fertile, where the cocoa-nut, and all other tropical fruits, come spontaneously to the highest perfection, together with yams and sweet potatoes, to obtain which it is only necessary to scratch the earth superficially, and the seeds so planted come forth in a few days †.

The surrounding sea abounds with exquisite fish, shell-fish, as cockles and turtles; and a most splendid display of beautiful shells of the rarest sort are to be met with on the shore. The birds' nests ‡, so much esteemed in *China*, are also to be found among the rocks: ambergris is likewise to be met with, but the inhabitants have learned a mode of adulterating it, and it is therefore seldom to be found in a

* In the year 1756, the *Danish* E. I. Company erected on one of these islands a house to serve as a factory, but on their failure, in the year 1758, it was evacuated. On the re-establishment of the Company in 1768, another house was built on *Soury* Island, which was, in 1773, in like manner, ordered to be evacuated as useless to the Company's interests: three or four *European* missionaries, with a view of making profelytes, remained behind, and have continued there ever since, but without effecting even the conversion of a single person: they collect, however, cocconut oil, shells, and other natural curiosities, which they send annually to their brethren at *Tranquebar*.

An exact plan of those islands may be seen in the *Neptune Oriental*.

† *Tricut*, being the flattest of those Islands, is divided amongst the inhabitants of the other two, where they have their plantations of Cocconut and *Aveca* trees; these last being very abundant all over the islands.

‡ *Nidos* hos, rupibus oceani orientalis affixos, parant hirundines marini, domesticis multo majores, ex holothuriis mari innatantibus materiam decerpentis. KOEMPF. *Amæn.*—p. 833.

genuine state: if adulterated with any heterogeneous matter, such as wax, or resin, the mode of discovery is simply by placing a small bit of it upon the point of a knife when hot, and if it evaporates without leaving any calx or *Caput Mortuum*, and diffuses a strong fragrant smell, it is certainly genuine.

The inhabitants of the *Nicobar* islands are of a copper colour with small eyes obliquely cut, what in ours is white being in theirs yellowish; with small flat noses, large mouths, thick lips, and black teeth; well proportioned in their bodies, rather short than tall, and with large ears, in the lobes of which are holes, into which a man's thumb might be introduced with ease: they have black strong hair, cut round; the men have little or no beard; the hinder part of their head is much flatter and compressed than ours; they never cut their nails, but they shave their eye-brows*. A long narrow cloth, made of the bark of a tree, round their waist and between their thighs, with one extremity hanging down behind †, is all their dress. The women and men are of the same copper colour, and very small in stature; a bit of cloth made with the threads of the bark of the cocoa-nut tree fastened to the middle and reaching half way down the thigh, forms all the covering of the women. Both sexes are, however, very fond of dress; and when the men go into the presence of strangers, they put on hats and old clothes, that had been given them by *Europeans*; but among themselves they are almost naked.

They live in huts, made of cocoa-nut leaves of an oval form, supported on bamboos, about five or six feet high from the ground; the entrance into the huts is by a ladder; the floor is made partly of planks, and partly of split bamboos. Opposite to the door, in the furthest part of the hut, they light their fire and cook their victuals; six or eight people generally occupy one hut, and a number of skulls of wild boars forms the most valuable article of furniture.

* It is a custom among them to compress with their hands the occiput of the new-born child, in order to render it flat; as, according to their ideas, this kind of shape constitutes a mark of beauty, and is universally esteemed such by them: by this method, also, they say that the hair remains close to the head, as nature intended it, and the upper fore teeth very prominent out of the mouth.

† A traveller called KROPING, a *Swede*, who went to the *East Indies*, on board a *Dutch* ship in the year 1647, which anchored off the *Nicobar* Islands, relates that they discovered men with tails, like those of cats, and which they moved in the same manner. That having sent a boat on shore with five men, who did not return at night, as expected, the day following a larger boat was sent, well manned, in quest of their companions, who, it was supposed, had been devoured by the savages, their bones having been found strewed on the shore, the boat taken to pieces, and the iron of it carried away.

The account of this voyage was reprinted at *Stockholm* by SILVIUM in the year 1743—LINNÆUS seems to have been too credulous, in believing this man's story, for in all my examinations, I could discover no sort of projection whatever on the *os Coccygis* of either sex. What has given rise to this supposed tail, may have been the stripe of cloth hanging down from their posteriors; which when viewed at a distance, might probably have been mistaken for a tail.

The occupation of the men consists in building and repairing their huts, which affords them an annual employment for six months, at least, and in fishing and trading to the neighbouring islands. The women are employed in preparing the victuals and cultivating the ground; they also paddle in the canoes, when the men go out. They unite in matrimony through choice; and, if the man is not satisfied with the conduct of the woman, either from her inattention to domestic concerns, or sterility, or even from any dislike on his part, he is at liberty to discharge her, and each unites with a different person, as if no such connection had taken place. Adultery is accounted highly ignominious and disgraceful; particularly with persons not of the same cast: should it be proved, the woman would not only be dismissed with infamy, but, on some occasions, even put to death; although by the intervention of a small token given publickly, and consisting of nothing more than a leaf of tobacco, the reciprocal *lending of their wives of the same cast* is exceedingly common.

A woman who bears three children, is reckoned very fruitful; few bear more than four; the cause may be attributed to the men, from a debility occasioned by the early intrusion of the testicles into the abdomen, the hard compression of them and the penis, by the bandage round those parts, from premature venery, and hebetation brought on by the immoderate use of spirits; and from the very inactive and sedentary life those people lead, it will not be difficult to account for that want of longevity, which seems to prevail much in those islands, more especially amongst the men, where none were to be seen older than forty or forty-eight years. The women, on the contrary, seem to live much longer.

They are themselves so sensible of the scanty population of their islands, that they study to increase it by inviting, and even seducing, some *Malabars* or *Bengal-se* to remain amongst them, when brought thither by the country ships, and of whom there are in almost all villages some to be found, who may be easily discerned from the natives by their figure, features, colour, and language. The natives encourage their stay by grants of land with plantations of cocotrees and arecas, and, after a certain number of years, they are permitted to make choice of a female companion.

Their indolence is not to be equalled by any other people of the east. They go out a-fishing in their canoes at night; and with harpoons, which they dart very dexterously at the fish, after having allured them into shallow water with burning straw, a sufficient number is soon caught to serve the family for a meal: they immediately

mediately return home; and if, by chance, they catch a very large fish, they will readily dispose of one half, and keep the remainder for their own use.

They entertain the highest opinion of such as are able to read and write: they believe, that all *Európeans*, by this qualification only, are able to perform acts more than human; that the power of divination, controlling the winds and storms, and directing the appearance of the planets, is entirely at our command.

This people, like other savage nations, dread the evil genius; some among them give themselves the air of divination, and presume to have secret consultations with him: superstition must ever be in its full dominion, where ignorance is so gross.

Some of the natives, having begun to fabricate earthen pots, soon after died; and the cause being attributed to this employment, it has never been resumed; since they prefer going fifteen or twenty leagues to provide them, rather than expose themselves to an undertaking attended, in their opinion, with such dangerous consequences.

Whenever they visit one another, no sort of compliment or salutation takes place between them; but when the visitors take leave, they are profuse in good wishes, that last for some minutes, with different inflections of voice, to which the other constantly answers, by repeating the words *Callá callá condí condí quíagé*, which may be rendered in *English* thus: "Very well, very well, go, go and return soon."

Behind, or close by, their huts the dead are buried; all the relations and acquaintance cry for some hours before the corpse is put into the grave, where it is interred with all possible solemnity, and in the best dress they can muster, and with abundance of food. After the body is covered with earth, a post is raised and fixed in the ground over the head of the deceased, about four-feet high, to the top of which they suspend strips of cloth with meal and areca nuts, and strew cocoa-nuts all around. This supply of food for the deceased is even after continued; a cocoa tree is also cut down for every person that dies. As soon as a man is dead, his name is never mentioned, even if repeatedly asked: every one of the mourning visitors brings a large pot of toddy. The women sit round the corpse howling and crying, and by turns they go and put their hands on the breast and belly of the deceased, who is covered with striped cloth: the men are seated at a little distance, drinking, and inviting all the visitors to do the same; endeavouring thus to dispel their grief, by a complete general intoxication, which never lasts less than a couple of days after the interment.

The different changes of the moon are productive of great festivity and mirth among the *Nicobarians*, when the doors of their huts are decorated with branches of palms and other trees: the inside is also adorned with festoons made of slips of plantain leaves. Their bodies are in like manner, decorated with the same ornaments; and the day is spent in singing, and dancing, and eating, and drinking toddy, till they are quite stupified.

The idea of years, and months, and days, is unknown to them, as they reckon by moons only, of which they number fourteen, seven to each moon. At the fair season, or the beginning of the N. E. monsoon, they sail in large canoes to the *Car Nicobars*, called by them *Champaloon*. The object of this voyage is trade; and for cloth, silver coin, iron, tobacco, and some other articles; which they obtain from *Europeans*, together with fowls, hogs, cocoa, and treca nuts, the produce of their own island, they receive in exchange, canoes, spears, ambergris, birds' nests, tortoise shell, and so forth.

Ten or twelve huts form a village. The number of inhabitants on any one of these islands does not exceed seven or eight hundred. Every village has its *Head Man*, or *Captain*, as they term him, who is generally the oldest. Few diseases are known amongst them; and the venereal not at all: the small-pox visits them occasionally, but not of the confluent kind: what is more prevalent amongst them, is the cedematous swelling of one or both of the legs, known in the west of *India* under the name of the *Cochin Leg*, from the place where this disorder generally prevails. This endemial disease may be imputed to the following causes; ill chosen and badly prepared diet; the bad choice of habitations; and an extremely indolent, inactive life. Fevers and cholicks are also frequent among them: when a person falls sick, he is immediately removed to the house of one of their priests, or conjurers, who orders the patient to be laid in a supine posture for some time; then friction with some oily substance is applied to the upper part of the body, and often repeated; which remedy they indiscriminately use for all complaints, never administering medicines internally.

The only quadrupeds on these islands are hogs and dogs: of the former, however, only the sows are kept, and they are fed principally with the milk of the cocoa-nut and its kernel, which renders the meat of a firmness and delicious taste, even superiour, both in colour, and flavour, to the best *English* veal. It may be worthy remark, that, although the neighbouring *Car Nicobar* woods abound with monkeys of different species, none are to be seen in these islands, notwithstanding their

their having been repeatedly brought over; they neither propagate, nor do they live for any time.

Among the feathered tribe wild pigeons are pretty abundant from June to September, on account of a berry which is then ripe, and on which they feed with great eagerness: at the same time pheasants and turtle doves are frequently found. The constant inhabitants of the wood are a species of the green parrot, or paroquet, with a black bill and collar: no other birds are to be found in them.

The climate is pure, and might, with little trouble, be rendered very salubrious: constant sea breezes fan their shores, thus preserving them from oppressive heat; vegetation continues without intermission, the woods are very thick, and the trees bound together by a kind of twig or creeping shrub, that renders them almost impervious.

The *Nicobar* dance is as dull and inanimate as can be conceived, as well for the slowness and heaviness of its motions, as for the plaintive monotonous tune that accompanies it; with no instrument but their mournful low voices, which are in perfect unison with the motion of their bodies. Men and women form a circle, by putting their hand on each other's shoulders; they move slowly, backwards and forwards, inclining sometimes to the right, and sometimes to the left.

The whole of their musick consists of the few following notes.



The basis of the language spoken by these islanders is chiefly *Malay*, with some words borrowed from *European*, and other strangers, as will appear by the following specimen:

<i>Cbia</i>	Father	<i>Cbegnoun</i>	Child
<i>Cioum</i>	Grandfather	<i>Cboi</i>	Head
<i>Cbia Enchāna</i>	Mother	<i>Lai</i>	Forehead
<i>Ochia</i>	Uncle	<i>Moba</i>	Nose
<i>Encognee</i>	Man	<i>Holmar</i>	Eyes
<i>Covon</i>	Son	<i>Manonge</i>	Lips
<i>Encand</i>	Woman	<i>Caleta</i>	Tongue
<i>Cance</i>	Wife	<i>Incaougn</i>	Chin

Nann

<i>Nann</i>	Ears	<i>Lapoa</i>	Is good
<i>Encbjon</i>	Hairs	<i>Pifi</i>	Is enough
<i>Halikolala</i>	Neck	<i>Tbiou</i>	Me or I
<i>Tbà</i>	Breast	<i>Mbibe</i>	You
<i>Vbian</i>	Belly	<i>Kalakala yunde</i>	Farewel
<i>Foun</i>	Navel	<i>Emloum</i>	Gold
<i>Choal</i>	Arm	<i>Henoe</i>	Fire
<i>Eckait</i>	Shoulders	<i>Dbeab</i>	Water
<i>Ocb</i>	Back	<i>Lboe</i>	Cloth
<i>Kinitay</i>	Hand and fingers	<i>Lanoa</i>	A strip they wear
<i>Poto</i>	Thigh	<i>Gni</i>	House
<i>Colcanon</i>	Knee	<i>Tanop</i>	Pipe
<i>Hanban</i>	Leg	<i>Carrovaj</i>	Lemon
<i>Ciscoa</i>	Nail	<i>Hoat</i>	Old Cocoa-nut
<i>Hignoughn</i>	Beard	<i>Gninga</i>	Green Cocoa-nut
<i>Tobon</i>	Sick	<i>Nat</i>	Cane
<i>Lba-ba</i>	Dead	<i>Pantan</i>	Rattan
<i>Hivi</i>	Devil	<i>Aptejo</i>	Chest
<i>Hen</i>	Sun	<i>Cerum</i>	Needle
<i>Chae</i>	Moön	<i>Hende</i>	Musket
<i>Hayi</i>	Wind	<i>Henathoa</i>	Knife
<i>Otjo</i>	Water	<i>Danon</i>	Medicine
<i>Gnam</i>	Calm	<i>Heja</i>	Betel nut
<i>Tenfagi</i>	Day-light	<i>Arba</i>	Betel leaf
<i>Sciain</i>	Evening	<i>Cion</i>	Lime
<i>Hatabom</i>	Night	<i>Chapeo</i>	Hat
<i>Kamhen</i>	Noon	<i>Lenzo</i>	Handkerchief
<i>Menzovi</i>	Yesterday	*** These two last words are borrowed from the <i>Portu-</i> <i>tuguese</i>	
<i>HolaEas</i>	To-morrow	<i>Hanban Chapeo</i>	Put on your hat
<i>Charou</i>	Great	<i>Not</i>	A hog
<i>Mombescbi</i>	Small	<i>Hant</i>	A dog
<i>Koan</i>	Strong	<i>Gabin</i>	A cat
<i>At'loan</i>	Weak	<i>Taffach</i>	Herb
<i>Jo</i>	Yes		
<i>At chiou</i>	No		

<i>Obia</i>	Egg	<i>Pousbili</i>	To set down
<i>Inlegne</i>	Birds nest	<i>Hababon</i>	To vomit
<i>Cattoch</i>	Parrot	<i>Abcicenga</i>	To stand
<i>Cba</i>	Fish	<i>Hicbiackeri</i>	To speak
<i>Cap</i>	Tortoisehell	<i>Athe bet</i>	To write
<i>Hazino</i>	To eat	<i>Ajouby</i>	To light
<i>Peoum</i>	To drink	<i>Lirva</i>	Lead
<i>Etaja</i>	To sleep	<i>Carán</i>	Iron
<i>Há-caou</i>	To buy	<i>Cbáno</i>	Shirt and coat
<i>Hen vhej</i>	To sell	<i>Hánbá</i>	Breeches
<i>Laam</i>	To lay down	<i>Hanbo lola</i>	Stockings
<i>Hancibatena</i>	Come hither	<i>Dhanapolá</i>	Shoes
<i>Ciou</i>	Be gone	<i>Halbat</i>	Bracelet
<i>Hébjaj</i>	To laugh	<i>Henpòjou</i>	Chair
<i>Houm</i>	To weep	<i>Cberácha</i>	Table
<i>Hanan</i>	To dance	<i>Pará</i>	Dollar, or silver
<i>Hame</i>	To rain	<i>Tbanula</i>	Black
<i>Pbeumboj</i>	To smoke	<i>Cbunla</i>	Red
<i>Hansciounga</i>	To walk	<i>Unat</i>	White
<i>Duonde</i>	To paddle or row	<i>Cambalamagn</i>	Striped cloth

NUMERALS.

<i>Heàn</i>	One	<i>Eancata</i>	Nine
<i>Haà</i>	Two	<i>Sicom</i>	Ten
<i>Loe</i>	Three	<i>Sicom bean</i>	Eleven
<i>Toan</i>	Four	<i>Sicom báa</i>	Twelve
<i>Tandè</i>	Five	<i>Hemon thouma</i>	Twenty
<i>Tafoul</i>	Six	<i>Rocate</i>	Thirty
<i>Ifat</i>	Seven	<i>Toanmoan thiuma</i>	Forty
<i>Enfoan</i>	Eight	<i>Sicom ficón</i>	Hundred

It seems that they have no expression for the numbers beyond forty, except by multiplication.

Trees of great height, and size are to be seen in their woods of a compact texture.

ture, well calculated for naval constructions*: but the productions of which they are more particularly careful, are the cocoa and *areca* trees, the last being chiefly for their own consumption; as they chew it all day long with tobacco, betel-leaf, and shell-lime: the former is not only useful for their own and their hogs' nourishment, but also an object of trade. Most of the country ships that are bound to *Pegu*, from either of the coasts of *India* touch at the *Nicobar* Islands, in order to procure a cargo of cocoa-nuts, which they purchase at the rate of four for a tobacco-leaf, and one hundred for a yard of blue cloth, and a bottle of cocoa-nut oil for four leaves of tobacco. The tropical fruits grow in those islands exquisitely flavoured, the pine-apple in particular: wild cinnamon and saffraas grow there also; the coffee-tree in two years yields fruit; yams are to be found for three or four months in the year only, and are eaten by the natives instead of the *Larum*, a nutritive fruit; in the description of which, and the tree that produces it, we shall here endeavour to be very particular.

The tree, that bears this nutritive fruit, is a species of *Palm*, called by them *Larum*, by the *Portuguese Mellori*; and is very abundant in those islands, as well as in *Carnicobar*: it grows promiscuously in the woods among other trees, but it delights more particularly in a damp soil. The trunk is often straight, thirty or thirty-five feet high, and ten or twelve inches (the oldest even two feet) in circumference: the bark is smooth, ash-coloured, with equidistant interfections, of a compact hard texture in its interior part, but soft and quite hollow in the centre from the top of the trunk; the leaves grow disposed like a calyx about three feet long and four inches broad, uniform and aculeate, of a dark green hue, and of a tenacious hard substance: the roots are out of the ground, and inserted at eight or ten feet on the trunk, according to its age, being not quite two feet in the earth: the fruit, which has the shape of a pine, and the size of a large *Jaca*, comes out of the bottom of the leaves: the age of a man is seldom sufficient to see the trees bearing fruit: its weight forces it out of the leaves, and, when it is nearly ripe, which is known by the natives on the change of its colour from green to yellowish, it is gathered, and weighs from thirty to forty pounds. The drupes are loosened by thrusting a piece of iron between their interstices: the exterior surface is cut off, and thus put into earthen pots covered with leaves, then boiled on a slow fire for several hours together: the fruit is sufficiently boiled, when the medullary part of

* One of these trees our people cut down, that measured nine fathoms in circumference, or fifty-four feet.

it becomes soft and friable; it is then taken from the fire and exposed to the cold air: when cold, the drupes are separated from the stalk, and the medullary part pressed out by means of a shell forced into them. Within the woody part of the drupes, there are two seeds, in shape and taste much like almonds: the soft part is then collected into a spherical mass, and, in order to extract all the stringy fragments remaining in it by the compression of the shell, a thread is passed and re-passed, until the whole is extracted, and it comes out perfectly clean: it is then of a pale yellow colour, much resembling *panada*, or the dressed meal of the *Zea Mays*, and in taste much like it: when not newly prepared, it has an acidity, to which it tends very strongly, if long exposed to the atmosphere; but it may be preserved a long time, if well covered.

It is certain, that the *Nicobar* bread-fruit tree differs very essentially from the palm described by Mr. MASSON, and found in the interior parts of *Africa*, which bears a sort of bread-fruit. On my showing to Mr. MASSON, in *March*, 1790, the drawing of the tree here described, he was pleasingly surprized at the novelty, and declared he had never before seen it. It differs also from the bread-tree found in *Otabeite*, and described by Captain COOK in his Voyage round the World, as will appear very evident on a reference to the notes of that work. Some shrubs, whose leaves resemble much those of the *Nicobar* bread-fruit tree, are to be seen on the *Coromandel* Coast, and in the isle of France, where they thrive in some degree, but never attain the height of those at *Nicobar*: imperfect small fruits are seen once a year sprouting out, and the inhabitants derive an advantage from the leaves of the tree, which they convert into mats and bags to hold coffee.

[For Note and Plate—See the Works of Sir William Jones, Vol. II. p. 37.]

NOTE on Page 450.

Though little can be added to M. POIVRE's description of the *Splangane*, or *Hirundo, nidis edulibus*, yet, as Captain FORREST was a perfect master of the *Malay* tongue, and described only what he had seen, it will not be amiss to subjoin his account of that singular bird. "The bird with an edible nest is called, says he, *Jai-maláni* by the natives of the *Maluccas*, and *Layang-layang* by the *Malays*: it is black as jet, and very much like a marten, but considerably smaller. Its nests, which the *Malays* call *Sarang*, are found in caves, and generally in those to which the

" the sea has access: and, as they are built in rows on perpendicular rocks, from
 " which the young birds frequently fall, those caves are frequented by fish, and
 " often by snakes, who are hunting for prey: they are made of a limy gelatinous
 " substance found on the shore, of the sea-weed called *agal agal*, and of a soft
 " greenish fizy matter often seen on rocks in the shade when the water oozes from
 " above. Before a man enters such a cave, he should frighten out the birds, or
 " keep his face covered. The *Jaimalan* lays her eggs four times a year, but only
 " two at a time: if her nest be not torn from the rock, she will use it once more,
 " but it then becomes dirty and black: a nest, used but once before it is gathered,
 " must be dried in the shade, since it easily absorbs moisture, and, if exposed to the
 " sun, becomes red. Such edible nests are sometimes found in caves, which the sea
 " never enters, but they are always of a dark hue, instead of being like that now
 " produced, very nearly pellucid: they may be met with in rocky islands over the
 " whole eastern Archipelago (by far the largest in the world), but never, I believe,
 " on the coast of China, whither multitudes of them are carried from *Batavia*.
 " The white and transparent nests are highly esteemed, and sold at *Batavia* for seven,
 " eight, nine, or ten dollars a catty of 1 lb. but the crafty *Chinese* at that port, who
 " pack up the nests, one in another to the length of a foot or eighteen inches, that
 " they may not easily be broken, seldom fail, by a variety of artifices, to impose on
 " their employers."

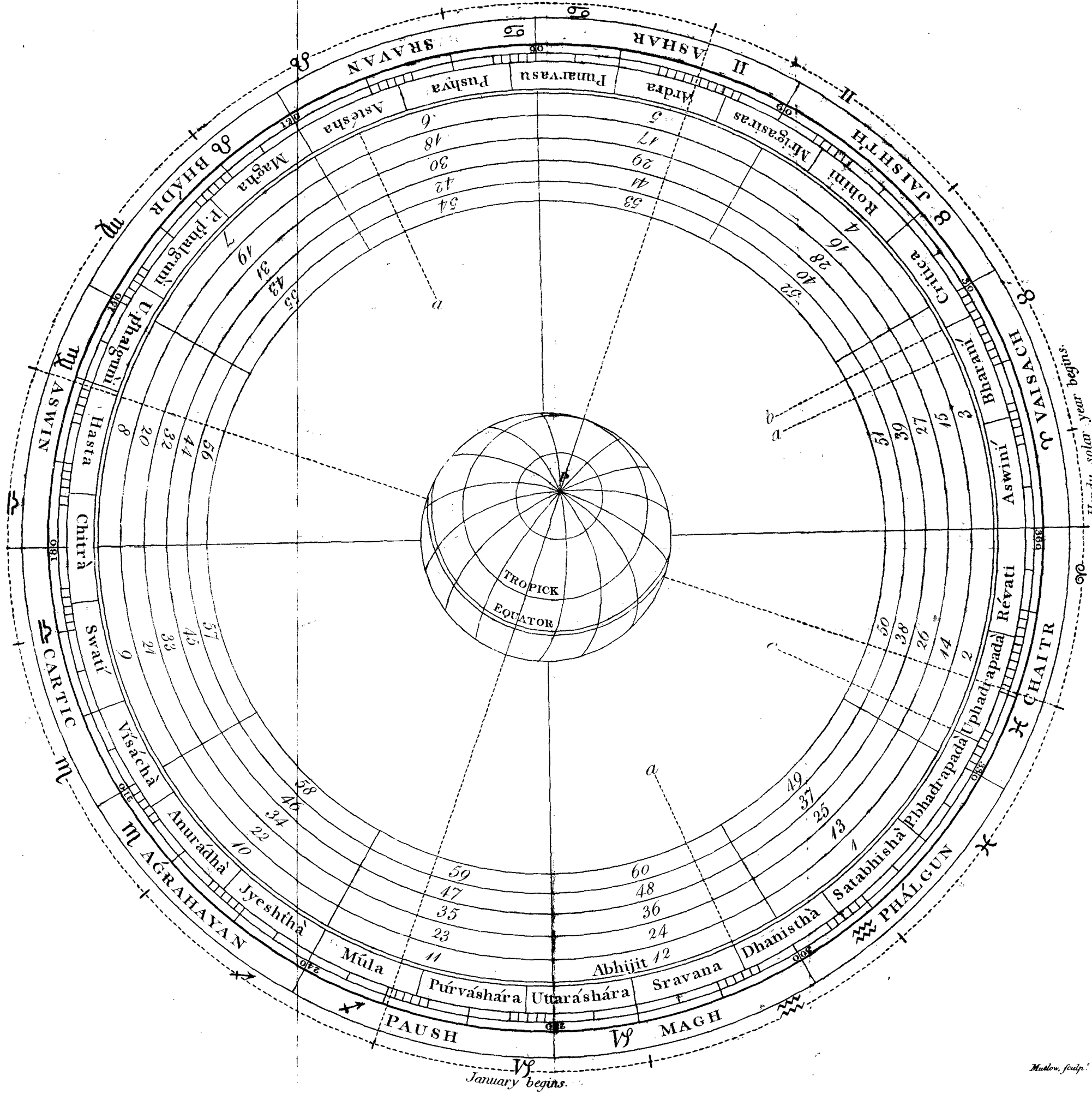
 VIII.

ON THE MYSTICAL POETRY OF THE PERSIANS AND HINDUS.—

• See the Works of Sir William Jones, Vol. I. p. 445.

GITAGOYINDA; OR; THE SONGS OF JAYADEVA.—See the Works of
 Sir William Jones, Vol. I. p. 463.

THE HINDU ECLIPTICK.



NOTE on p. 316, Vol. I. See *William Jones's Works*

By the PRESIDENT

A desire of translating the couplets of VARA HAMIHRA with minute exactness, and of avoiding the *Sanskrit* word *ayana* in an *English* phrase, has occasioned a little inaccuracy, or at least ambiguity, in the version of two very important lines, which may easily be corrected, by twice reading *adyan* in the fifth case for *adyan* in the first: so that they may thus be translated word for word: "Certainly the southern road of the sun was, or began, once from the middle of *Alaska*; the northern, from the first of *Dhanishtha*. At present the southern road of the sun begins from the first of *Carata*; and the other from the first of *Mriga*, or *Macra*."

IX.

ON THE INDIAN CYCLE OF SIXTY YEARS.

By SAMUEL DAVIS, Esq.

IN the *Philosophical Transactions* published for 1790, there is an account given of the *Hindu* cycle of sixty, which being in many particulars deficient, and in some erroneous, I shall endeavour to shew the true nature and computation of that cycle, from the explanation which is given of it by the *Hindus* themselves.

The following two *Shloks*, extracted from the last section of the *Surya Siddhanta*, enumerate the several distinctions of time in astronomical use among the *Hindus*:

शुक्रं दैवं त्रयापिवां प्राजापत्यं गुरोरात्रथा ।
शौबं चन्द्रकं चात्र माकं मानानि वैश्वया ।
चतुर्दशवर्षावति शौबं चन्द्रकं मावतेः ।
वैश्वयात्तन्मयावत्क्षेपं नान्यसु नितामः ॥

"In their current transactions, the inhabitants of the peninsula employ a mode of computation, which, though not unknown in other parts of the world, is confined to these [the southern] people amongst the *Hindus*. This is a cycle or revolving period of sixty *Jala* years, which has no further correspondence with the æras above mentioned [of *Bikramajit* and *Sakaha*] than that of their years respectively on the same day." &c.

Brahman daivan tat ha pitryam prajapatyam gurustat ha.

Sautan che savana chandrah arshan manani va nava:

Chaturbhir vyavaharo (13) saurachandrarcaha savanaib;

Varhaspatyena shash tyabdan jneyan nanyaisunityasah.

and the translation of them is as follows: "The *Bráhma*, the *Dárva*, the *Pitrya*, the *Prajapatya*, that of *Guru*, the *Sautra*, the *Savana*, the *Chandra*, the *Nacshatra*, are the nine distinctions of time. Four of those distinctions are of practical use to mortals; namely, the *Saura*, the *Chandra*, the *Nacshatra*, the *Savana*. That of *Vrihaspati (Guru)* is formed into sixty years. The other distinctions occur but seldom in astronomical practice."

Brabma's year is that, whereof the *Calpa* is one day. The *Darva* year consists of 360 revolutions of the sun through the ecliptick. The *Pitrya* is from lunation to lunation. The *Prajapati-mána* is the *manwantara*. The cycle of *Guru* or *Vrihaspati*, which is the subject of this paper, will be explained further on. The *Chandra* is lunar, and the *Nacshatra* sidereal time. The *Saura* and *Savana*, are the same solar sidereal year differently divided; the sun's passage through each degree of the ecliptick being accounted as a day of the first, and the time contained between sun-rise and sun-rise as a day of the last; consequently, there are 360 days, or divisions, in the former year; whereas, the latter year is determined, according to the astronomical rules of the best authority, as containing 365 15 31 31 24 of

Hindu, or 365 ^D 6 ^H 12 ^M 36 33 36 of our time.

The *Savana* year may, as the *Hindus* observe, be measured by the following method, which is little more than a translation from the *Sanscrit*.

Upon a large horizontal circle, note the point whereon the sun rises, at any time near the equinox, or, when his motion in declination is the most perceptible; and count the number of *Savana* days, or of his successive risings, from that time, until having visited the two solstices, he shall be returned near to the original mark; then repeat the operation, until he rises next after passing over that original or first-made mark, and compute the proportion which the space, whereby he shall have fallen short of it, in the last observation but one, bears to the whole space contained between the marks made of his two last risings, accounting that space to contain 65 *Dandas*, or one *Savana* day; the result will be the fraction (allowing for precession)

precession) of a day, and it will be the excess of the year over 354 days, or number of times that the sun will have been found to rise above the horizon during such an observation of his progress through the ecliptick. This fraction the *Sūrya Siddhānta* takes as $\frac{1}{31} \frac{31}{24}$, and the *Siddhānta Siromani* as $\frac{1}{15} \frac{9}{22} \frac{3}{31}$ but it is not probable, that either quantity was determined by so simple and mechanical a method alone, or without recourse to a series of observations made at distant periods.

The *Vrihaspati māna*, of which the cycle of sixty years is composed, is thus described in the comment on the foregoing *śloka*:

ब्रह्मर्षेः मानं यथा मन्वन्तरे भिन्नो गेनोत्तं ॥

Vrihaspetermānanamadhya marāṣibhogenōctan.

It is his (*Vrihaspati's*) mean motion (*madhyama*) through one sign.

To explain what is meant by the *madhyama*, in contradistinction to the *sihbra*, motion of *Jupiter*, and the other planets, and to shew that, by compounding them in eccentric circles and epicycles, the *Hindus* compute the apparent places of the planets on the principles of the *Ptolemaic* astronomy, is not the object of this paper: I shall, therefore, only desire it may be understood, that the *madhyama* of *Jupiter* answers to his mean motion in his orbit, and the amount of it computed for any particular interval, to his mean heliocentrick longitude in the *Hindu* ecliptick. The rule then for computing his *māna*, or year, of which the cycle of sixty years is formed, is evident; and it is thus given in the 45th *śloka* of the first section of the *Sūrya Siddhānta*.

दादाग्नागुरो यथा भगाना वर्तमानासाह

राशिभूतः सप्तः पञ्चः सप्तः सप्तः सप्तः सप्तः सप्तः ॥

Dwadaḡghna gūrō yathā bhagānā vartamānacāh
Rāṣibhūh sahitāh saptāh pañcāh saptāh saptāh saptāh saptāh saptāh

Correct an error in p. 269, in the note on the Hindu cycle of sixty, for *seven* read *ten*.

Multiply by 2 *Jupiter's* expired *bbaganas* (revolutions), and (6 the product) add the sign he is in, divide (the sum) by 60; the remainder, or fraction, shows his current year, counting from *Vijaya* as the first of the series.

To apply this rule in finding the *Vishvaspati* year, for a given time, as for the commencement of the current year of the *Janug*, or when 4892 years of that era were expired, corresponding with the 10th of last *April*, we have the following data:—The revolutions, or mean motion of *Jupiter*, 364220, in 4320000 solar

years, and the term expired of the *calyug*, 4892 years, which, for the reason given in page 277, may in this case be used to save trouble, instead of the period expired of the *Calpa*: then, as 4320000 to 364220, so 4892 to 412, 5, 10, 21, 12, which shows *Jupiter's* *madhyama*, or mean heliocentric longitude to be 102° 23' 12" after 412 complete revolutions through his own.

But as in the influence of the moon's node (see page 297), a correction of *bijas* here to be applied to *Jupiter's* mean place at the rate of 8 revolutions in the *Yuga-yug* subtractive. But 8 revolutions in 4320000 years are as 1° to 540000 years, therefore by a shorter process, the term expired of the *Kali yug*, divided by 1500, quotes the *bija* in degrees; and $\frac{4892}{1500} = 3^{\circ} 15' 41'' 48$ is the correction subtractive, which re-

duces *Jupiter's* mean place to (412) $\times 7^{\circ} 5' 30''$: then, $412 \times 12 = 4944$, to which add 6, *Jupiter* being in the sixth sign; the sum 4950 is the number of the *Kali bhaspa* years elapsed since the beginning of the *calyug*, which, divided by 60 for cycles, quotes 82 cycles expired, leaving a fraction of $\frac{30}{60}$ to find his current year, which counted as the rule directs from *Vijay* as the first, falls on *Dundubhi*, which is the 56th of the cycle, and of this year, the fraction $\frac{7}{60} \times 30$ reduced at the

rate of 2° 30' to 1 month, shows 2, 23, 6, 12 to have been expired on the 11th of *Vaisakh* or the 10th of *April*, for which time the computation is made, and likewise that the next year *Rudhikogari* will commence in the ensuing solar month of *Magh*.

A *Siddhi* almanack for the present year states, that on the 11th of last *Vaisakh*, there were expired of the *Vishvaspati* cycle, 3 years, 2 months, 23 days, and 30 *dandas*; and that the current year *Dundubhi* will continue until the 7th day of the solar month of *Magh*: the difference, of one day and 6 *dandas*, between this and the foregoing result, is too great to be accounted for by the difference of longitude be-

between *Nabha* and *Ujein*, for the meridian of which latter place computations by the *Surya Siddhanta* were made: but it is of no consequence to the intended purpose of this paper.

There is another rule for computing the *Vrihaspati* year given in an astrological book named *Jyotishikāra*. The *śra* years are noted down in two places. Multiply (one of the numbers) by 22. Add (to the product) 429. Divide (the sum) by 1875. The quotient add to the second number noted down, and divide (the sum) by 60. The remainder or fraction will show the year last expired, counting from *Prabhava* as the first of the cycle. The fraction, if any, left by the divisor 1875 may be reduced to months, days, &c. expired of the current year.

The *śra* years expired on the first of last *Vaiśākh*, corresponding with the expired years 4892 of the *cali yug*, were 1713; then, by the rule,

$$\frac{1713 \times 22 + 429}{1875} = 20 \frac{77}{1875} \text{ and, } \frac{1713 + 22}{60} = 28 \frac{33}{60}$$

which shows the last expired year of *Vrihaspati* to have been the 35th year of the cycle named *Durmāti*; and the fraction $\frac{77}{1875}$, when reduced, that 4 months, 13 days, and 13 *ḍandas* were expired of the current year *Dundubhi* when last *Vaiśākh* began.

The numbers 22 and 1875, used in this computation, are evidently derived from the planetary periods, as given by *ARYABHATTA*; which, according to *VARA-HANHIRA* are of *Jupiter*, 364224 mean revolutions in 4220000 solar years; but 364224 revolutions of *Jupiter* contain $\frac{1}{1000}$ of his years, which exceed the correspondent solar years 4220000 by 50680, and those two numbers reduced to their lowest terms are 1875 and 22; or, in 1875 solar years, there is an excess of 22 *Vrihaspati* years, and hence the use of those numbers is obvious. The additive number 4892, of the *Hindu* astronomers termed *śra*, adjusts the computation to the commencement of the era *śaka*, which began when the 310th year expired of the *cali yug*; and it shows that 2 years, 3 months, and 13 days were then expired of the current cycle of *Jupiter*; or 3 months and 13 days of the year *śukla*, which is the third of that cycle. A computation by the *Surya Siddhanta* of the same period, with a correction of *bija*, as in the foregoing example, makes 2 months, 9 days, 36 *ḍandas*, and 12 *paras* to have been elapsed of that year, and that consequently there were 57 years, 9 months, 20 days, 3 *ḍandas*, and 12 *paras* then wanting to complete the cycle, instead of 49 years as it is stated in the *Philosophical Transactions*.

uons; and, by the same rule, the year of CHRIST 781 corresponded with the 45th and 36th cycle, or *Jyestis* and *Ráshtak*.

This mode of computation disagrees with the date of a grant of land mentioned in Vol. II p. 335, *See William Jones's Works*; for *Sica* 939 must have ended in the 3d month of the 53d year of the *Vrikshpati* cycle; but as the grant in question appears to have been made in the vicinity of *Banar*, the difference may be accounted for in a manner, that will equally explain the disagreement noticed by Mr. MARSDEN between his authorities and the *Banar's* almanack. We learn from VARAHAMIHIRA's commentator, there were some who erroneously supposed the solar and *Vrikshpati* years to be of the same length. An memorial *Sica* known to most *Pandits*, furnishing a concise rule to find the *Vrikshpati* year, mentions *Utrah* nears in countries south of the *Narmada* to be in their reckoning of it ten years behind those situated on the north side of that river; by the foregoing comparison of the date in the Asiatick Researches with a computation by the *Sica* *Sikhs*, the difference is found to be 8 years; and the *Banar's* almanack for the present year mentions, that south of the *Narmada*, the 45th year of the cycle, named *Vrikshpati*, was accounted to begin on last *Mágh*; in which month it is further observed, began at *Banar*, the present year *Dundabhi*, which is the 6th of the cycle. This difference then increases, and from the *Sica* year 939, when it was 1 year, it had to last *Mágh* become 11 years. Now, in the interval of 773 solar years between those points of time, the *Vrikshpati* reckoning must have gained upon the solar reckoning about 9 years, which, added to the former difference of 8 years, is equal to the difference now actually noticed in the *Banar's* almanack; and we may then conclude, that the erroneous notion mentioned and refuted by VARAHAMIHIRA's commentator still prevails to the south of the *Narmada*, from which part of *Mr. MARSDEN's* information on the subject seems to have been originally procured. But there is no reason to suppose, that the *Vrikshpati* year is anywhere considered as commencing on the same day with the years of *VICRAMA*, *CHITRA* and *SALIVAHAN*; nor is it possible that it should; because the latter, which is solar-lidereal, commences with the sun's entrance on *Mes* in the *Hil* eclipses; and the former, which is luni-solar, with the preceding new moon in the month of *Chait*.

It may not be deemed superfluous here to add VARAHAMIHIRA's explanation of *Jupiter's* two cycles of 12 and 60, more especially as he cites certain particulars with a reference

a reference to the position of the colures as described by PĀRA'SARA, and explained in the preceding volume of this work:

Text.—*Of Vṛiṣṣpati's 12 years.* The name of the year is determined from the *Nacshatra*, in which *Vṛiṣṣpati* rises and sets (belicably) and they follow in the order of the lunar months.

Commentary.—But if, as it may happen, he should set in one and rise in another *Nacshatra*, which of the two it may be asked, would give name to his year? Suppose him, for example, to set in *Rōhini* and to rise in *Mṛigashira*.—I answer, that in such a case, the name must be made to agree with the order of the months; or, it must be that name, which in the regular series follows the name of the year expired. According to SASIPUTRA and others, the *Nacshatra* in which *Jupiter* rises gives the name to his year. CĀSĀPA says, the names of the *Sāmvatsara Yuga*, and the years of the cycle of sixty, are determined from the *Nacshatra* in which he rises, and GARGA gives the same account. Some say that *Cartic*, the first year of the cycle of 60, begins on the first day of the month of *Chaitr*, whatever may be the *Nacshatra* which *Jupiter* is then in, and that *Prabhava* likewise, the first year of the cycle of sixty, begins in the same manner; and some say that *Jupiter's* years are coincident with the solar years; but that cannot be true, because the solar year exceeds in duration the *Vṛiṣṣpati* year.”

Text.—The years beginning with *Cartic* commence with the *Nacshatra Criticā*, and to each year there appertain two *Nacshatras*, except the 5th, 11th, and 17th years, to each of which appertain three *Nacshatras*.

Commentary.—The years and their corresponding *Nacshatras* are

YEARS	NACSHATRAS
Cartic	Criticā, Rōhini
Agrahayan	Mṛigashira, Aśvini
Pauṣ	Ārdrā, Pūṣya
Māgh	Aślēṣā, Maghā
Phālgun	Pūrvaphālgunī, Uttaraphālgunī, Hāstā
Chaitr	Chitrā, Svātī
Vaiśākh	Vīśākhā, Anurādhā
Jyāishth	Jyēṣṭhā, Mūlā
Āṣar	Pūrvāṣāḍhā, Uttarāṣāḍhā
Sravan	Srāvanā, Dhaniṣṭhā
	Bhādr

Bhadra, Satabhisha, Purvabhadrapada, Uttarabhadrapada.
 Afwin, Revati, Bharani.
 "Some, on GARGA's authority, hold it to be the 11th instead of the 12th year
 to which three *Nacshatras* appertain. GARGA's arrangement of them is thus:

Phalgun, Purvap'halguni, Uttarap'halguni, Hasta.
 Sravan, Sravana, Dhanisht'hà, Satabhisha.
 Bhadr, Purvabhadrapada, Uttarabhadrapada, Revati.
 Afwin, Afwini, Bharani.

PARASERA's rule states, that when *Vrihaspati* is in
 " *Critica* and *Rohini*, the year is bad.
 " *Mrigashira*, *Ardra* - - - - - bad.
 " *Punarvasu*, *Pushya* - - - - - good.
 " *Ashlesha*, *Magha* - - - - - bad.
 " *Purvap'halguni*, *Uttarap'halguni*, *Hasta* - - - - - neutral.
 " *Chitra*, *Swati* - - - - - good.
 " *Vishakha*, *Anuradha* - - - - - bad.
 " *Jyestha*, *Mula* - - - - - bad.
 " *Purvashada*, *Uttarashada* - - - - - good.
 " *Sravana*, *Dhanistha*, *Satabhisha* - - - - - good.
 " *Purvabhadrapada*, *Uttarabhadrapada*, *Revati* - - - - - good.
 " *Afwini*, *Bharani* - - - - - good.

"On those authorities, therefore, it is the 10th and not the 12th year to which
 three *Nacshatras* appertain."

Text.—"Of the *Vrihaspati* cycle of sixty years. Multiply the expired years of
Saca by 11, and the product by 4. Add the *Alpa* 8589. Divide the sum by
 371*, and the quotient add to the years of *Saca*. Divide the sum by 60 to find
 the year, and by 12 to find the *yuga*. The *Devas* who preside over the twelve
 years of the *yuga* are,

Vishnu,	The Puris,
Surya,	Viswa,
Indra,	Soma,
Agni,	Indragni.

* The numbers, $\times 4$ and 8750 are in the same ratio as those used in the foregoing example from the *Yautistava*:
 the two rules therefore are the same, with an inconsiderable difference in the *Alpa*.

Iwastha,

Twashtā; A'swinar
Ahivradna; Bhaga."

Commentary.—“It is in the *Somasanhitā* that the presiding *Dēvas* are thus stated. In the cycle of sixty are contained five cycles of twelve; which five cycles, or *yugas*, are named

“*Samvat̄sara*, over which presides
“*Parivat̄sara*
“*Idavat̄sara*
“*Anuvatsara*
“*Uaravat̄sara*

Agni.
Arca.
Chandra.
Brabmā.
Siva.

Text.—“The first year of the cycle of sixty, named *Prabhava*, begins, when, in the month of *Māgh*, *Vṛiṣṭpati* rises in the first degree of the *Nac̄śatr̄a Dhanishṭhā*; and the quality of that year is always good.”

Commentary.—“The month of *Māgh* here meant is the lunar *Māgh*: it cannot be the solar *Māgh*, because when *Vṛiṣṭpati* rises in $0^{\circ} 23' 20''$ *Sūrya* must be in $10^{\circ} 6' 12''$.”

The years of the cycle and the presiding *Deities*, are thus arranged by *VARAHAMIHIRA* in six memorial couplets.

BRĀHMA.
Prabhava,
Vibhava,
Sucla,
Pramōda,
Prajāpati,
Angira,
Srimūc'ha,
Bháva,
Yuvá,
10. Dhátā,
Itwara,

VAISHNAVA.
Bahudhanya,
Pramat̄hi,
Vīcrama,
15. Brīṣya,
Chitrabhānu,
Subhānu,
Tāraṇa,
Pārthiva,
20. Vyāya,
Sarvājī,
Sarvadhāri,

SAIVA.
Vjrodhi,
Vicrita,
25. C'hara,
Nandana,
Vijaya,
Jaya,
Manmat'ha,
30. Durmūc'ha,
Hēmalamva,
Vilāmva,
Vicari,

* Because the beginning of *Dhanishṭhā* is west of the end of *Māgh* only $62^{\circ} 40'$, at which distance from the sun, *Jupiter* would not rise heliacally, or be seen disengaged from his rays; but the lunar *Māgh* might extend to near the end of the solar *Phālgun*. Should the moon, however, change very soon after the sun's entrance of the *Hindu* sign *Capricorn*, coincident with *Māgh*, then, neither the solar nor the lunar month of that name would agree with the terms of the proposition, which is an instance of an imperfect astronomy.

Sarvari,	Saumya,	Calayucta,
35. Plava,	Sádhána,	Sidhárthi,
Subhacrit,	45. Viródhacrit,	Raudra,
Sóbhana,	Paridhávi,	55. Durmati,
Crádhi,	Pramádi,	Dundubhi,
Vifwáyafu,	A'nanda,	Rudhiródgári,
40. Parábhava,	Rácthafa,	Ráctáctha,
Plavanga,	50. Anala,	Cródhana,
Cilaca,	Pingala,	60. Cshaya.

It may be remarked, that, in the foregoing arrangements of the *Vrihaspati* years, *Cártic* is always placed the first in the cycle of twelve; and, since it is a main principle of the *Hindu* astronomy to commence the planetary motions, which are the measures of time, from the same point of the ecliptick, it may thence be inferred, that there was a time when the *Hindu* solar year, as well as the *Vrihaspati* cycle of twelve, began with the sun's arrival in, or near, the *Nacshatra Crítica*. That this year has had different beginnings is evinced by the practice of the *Cbinese* and *Siamese*, who had their astronomy from *India*, and who still begin their years, probably by the rule they originally received, either from the sun's departure from the winter solstice, or from the preceding new moon, which has the same reference to the winter solstice that the *Hindu* year of *VICRAMADITYA* has to the vernal equinox. The commentator on the *Súrya Siddhánta* expressly says, that the authors of the books generally termed *Sambitás*, accounted the *Déva* day to begin in the beginning of the sun's northern road: now, the *Déva* day is the solar year; and the sun's northern road begins in the winter solstice; and hence it should seem, that some of those authors began the solar year exactly as the *Cbinese* do at this time. This might moreover have been the custom in *PARÁSARA*'s time; for the phenomenon, which is said to mark the beginning of the *Vrihaspati* cycle of sixty, refers to the beginning of *Danishtha*, which is precisely that point of the ecliptick through which the solstice passed when he wrote.

There are, beside these apparent changes made by the *Hindus* in their mode of commencing the year, abundant instances of alterations and corrections in their astronomy, an inquiry into which might, by fixing certain chronological data, throw considerable light on their history; and it is scarcely necessary to observe, with how much more advantage an investigation of this kind would be made with the assistance

assistance of such astronomical books, written in the *Déva Nagari* characters, as might easily be had from *Haidarâbad* and *Pûna*, if the *English* residents there would interest themselves to procure them. Copies of the astronomical rules, followed at *Bombay* and *Gujarat*, might also prove of use, if NIEBUHR* was not misinformed, who says the natives there begin the year with the month of *Cártic*, which has an evident reference to the autumnal equinox, and may perhaps be computed by the *Arsha Siddhânta*, mentioned in Vol. I. as accounting the day to begin at sunset; for sunset with the *Dévas* is the sun's departure from the autumnal equinox, and it is invariably observed in their astronomy to account the different measures of time as having begun originally from the same instant.

But of all places in *India*, to which *Europeans* might have access, *Ujjein* is probably the best furnished with mathematical and astronomical productions; for it was formerly a principal seminary of those sciences, and is still referred to as the first meridian. Almost any trouble and expence would be compensated by the possession of the three copious treatises on Algebra, from which BHASCARA declares he extracted his *Bija Genita*, and which in this part of *India* are supposed to be entirely lost. But the principal object of the proposed inquiry would be, to trace as much as possible of that gradual progress, whereby the *Hindu* astronomy has arrived at its present state of comparative perfection; whence might be formed more probable conjectures of its origin and antiquity than have yet appeared: for I imagine, there are few of M. BAILLY's opinion that the *cali yug*, or any *yug*, had its origin, any more than our *Julian* period, in an actual observation, who have considered the nature and use of those cycles, of the relative *bbaganas*, or revolutions of the planets, and the alterations † which the latter have at different times undergone; concerning which several particulars M. BAILLY, it must be acknowledged, had but little information ‡. What was the real position of the planets and the state of astronomy when the *cali yug* began, or 4892 years ago, will probably never

* "Le nouvel an chez les Indiens à Guzerat, que ceux de Bombay suivent aussi, vient du mois *Kartig*, mais à *Scind* on le célèbre au mois *Afar*." Tom. ii. p. 21.

† Instances in *Jupiter's* mean motion. ARYABHATTA gave the revolutions as 364224 in 4320000 solar years. BHASCAR in his *Sirâmani* 364226455 in 4320000000 solar years. The *Sûrya Siddhânta* 364220 in 4320000 solar years; which latter, by the *bija* introduced since, are reduced to 364212 in the same period.

‡ But it is not thence to be inferred, that the *Hindus* did not exist as a nation, or that they made no observations of the heavens as long ago as 4890 years: all that is here meant is, that the observation ascribed to them by M. BAILLY does not necessarily follow from any thing that is known of their astronomy; but, on the contrary, from the nature of the subject it appears, that the *Cali yug* was, like the *Julian* period, fixed by retrospective computation; which might still have happened although astronomy had originated, which is not at all improbable, in much higher antiquity.

Neither

never be known; but the latter must certainly have undergone considerable improvement since the last quoted *śloka* of VARA'HAMIHIRA was received as a rule; for it supposes the mean motion of *Jupiter* to be to that of the sun, as 60 to some integer; apparently to 720; as 5 to 60, or as 1 to 12; without which, the beginning and successive returns of the cycle of sixty could never be denoted by the heliacal rising of *Jupiter* in *Dhanisht'bhā*, or in any constant point of the zodiack; and at a time when the mean motion of *Jupiter* was so much mistaken, it may reasonably be supposed, that the more difficult parts of astronomy were very imperfectly understood. If the ratio were as 1 to 12, which is implied by the *yuga* of twelve (for the term *yuga* means conjunction, or coincidence), then a conjunction of the sun and *Jupiter* would happen at the end of every period of twelve years in the same point of the zodiack, and the cycle of sixty might begin in the manner described: but this must long since have ceased to be the rule, or at least since the time of A'RYABHATTA; for, if the cycle be supposed to begin with the sun and *Jupiter* in *Dhanisht'bhā*, then in sixty of *Jupiter's* years that planet will again be in *Dhanisht'bhā*; but, in sixty of such years there are, by the data ascribed to A'RYABHATTA, only 59 years, 3 months, and some days of solar time; the next cycle, therefore, could not have the same beginning, because the sun would be found more than 90 degrees distant from *Jupiter's* mean place, and in 60 years more that distance would be doubled. As this disagreement with the rule could not have been unknown to VARA'HAMIHIRA, who gives the *bbaganas* from A'RYABHATTA as 364224 in 4320000 solar years, he may be supposed to have only cited what he had learned from other treatises merely as an astrological maxim, his *Sanhitā* being a treatise on *astrology* not on practical *astronomy*; and this conjecture will appear the more reasonable, when it is considered, that notions wholly incon-

Neither LE GENTIL, nor BAILLY, had any other authority for placing the origin of the *Hindu* zodiack in longitude 10. 6°, at the beginning of the *cali yug*, than results from a computation of the precession for 3600 years, at the end of which expired term of the *cali yug*, it coincided with the equinox: it is certain, that the *Brāhmins* in this part of *India* suppose, as their astronomy implies, a similar coincidence, together with a conjunction of the planets in the same point by their mean motions when the *cali yug* began; and since in the present amount of the precession, and consequently in the origin of the zodiack, as well as in many other particulars, the *Brāhmins* of *Trivalore* agree with those of *Bengal*, it is not at all probable, that they should have different systems. But M. BAILLY thinks the *Indian* zodiack has had two origins; one of them as I describe it, the other, as he computes it from the beginning of the *cali yug*:—it may indeed have had many origins, although there seems at present but one to be found; for it is not in the least inconsistent with the principles of the *Hindu* astronomy to suppose that, if ever an alteration took place in the mode of beginning the year, some alteration was at the same time made in the origin of the zodiack likewise. The origin of the *Chinese* zodiack is described to be in a part of the heavens opposite to that of the *Hindus*; for *Spica* distinguishes their constellation *Kiv*, which is the first of their twenty-eight lunar mansions; and since it is agreed, that both systems were originally the same, a considerable alteration, with respect to the origin of the zodiack, must necessarily have happened in one of them.

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sistent with the latter, and which must have originated in remote ages, when science of any kind had made but small progress, are still preserved in different *śāstras*, as in the *Bhāgavat*, which, treating on the system of the universe, places the moon above the sun, and the planets above the fixed stars.

To render this paper more intelligible, I have subjoined a diagram of the *Hindu* ecliptick, which may also serve to illustrate some astronomical papers in the preceding volume. Its origin is considered as distant 180 degrees in longitude from *Spica*: a star, which seems to have been of great use in regulating their astronomy, and to which the *Hindu* tables of the best authority, although they differ in other particulars, agree in assigning six signs of longitude counted from the beginning of *Ashwinī*, their first *Nacshatra*. From the beginning of *Ashwinī* (according to the *Hindu* precession, now $19^{\circ} 22'$, but which is in reality something further distant from the vernal equinox) the ecliptick is divided into twenty-seven equal parts, or *Nacshatras*, of $13^{\circ} 20'$ each; the twenty-eighth, named *Abhijit*, being formed out of the last quarter of *Uttarāshāra*, and as much of *Sravanā* as is necessary to complete the moon's periodical month. The years of *Jupiter's* cycle are expressed in their order with numerals: *a* is the former position of the colures, as explained in Vol. II. and *b, c*, mark the limits of the precession resulting from the *Hindu* method of computing it. The outer dotted circle is the *European* ecliptick, in which is noted the beginning of the *Hindu*, and likewise of the *European* year. For want of room the signs are distinguished in both with the usual characters. The two stars pointed out by the most skilful *Pandit* I have yet met with, as distinguishing *Ashwinī*, are β and γ *Arietis*, which distinguish also *al Jbaratān*, the first *Arabian menzil*; and the latter is said to be the *yōga*, whose longitude and latitude are stated certainly with great incorrectness, as 8° and 10° north; but the error, if it be not owing to transcribers, is inexplicable.

The solar months, it may be observed, correspond in name with the like number of *Nacshatras*: this is ascribed to the months having been originally lunar, and their names derived from the *Nacshatras*, in which the moon, departing from a particular point, was observed to be at the full; for, although the full moon did not always happen in those particular *Nacshatras*, yet the deviation never exceeded the preceding or the succeeding *Nacshatra*; and whether it fell in *Hasta*, *Chitra*, or *Swātī*, still that month was named *Chaitrā*; and so of the rest. This is the explanation of the month given by *NRISINHA*, who in the same manner explains *Jupiter's* cycle of twelve

twelve years, the names of which could not always correspond with those of the *Nacshâtras*, in which he rose heliacally.

Of the *Hindu* method of intercalating the lunar month, M. BAILLY conceived a right idea from what P. DU CHAMP had said on the subject; but he has omitted to mention a curious circumstance consequent to it, which is, that sometimes there happen *two* intercalary months in the same year; or, to be more precise, *two* lunar months are named *twice* over: thus, as was actually the case in 1603 *Sâca*, there may be two lunar *Ashwinas* and two *Chaitras*; but then some one intervening month, as *Agrabâyan*, would be omitted, because the change of the moon would not happen at all during the solar month of that name. During the present position of the sun's apsis, this *ch'che* (chaya?) or discarded month, is limited to *Agrabâyan*, *Pausb* or *Mâgh*, those being the three shortest solar months; and, by the *Hindu* computation, the discarded month will again fall on *Agrabâyan* in 1744 *Sâca*.

Bhâgalpur, 1 Dec. 1791.

X.

AN ACCOUNT OF THE METHOD OF CATCHING WILD ELEPHANTS
AT TIPURA.

By JOHN CORSE, *Esq.*

IN the month of *November*, when the weather has become cool, and the swamps and marshes, formed by the rains in the five preceding months, are lessened, and some of them dried up, a number of people are employed to go in quest of elephants.

At this season the males come from the recesses of the forest into the borders and outskirts thereof, whence they make nocturnal excursions into the plains in search of food, and where they often destroy the labours of the husbandman, by devouring and trampling down the rice, sugar canes, &c. that they meet with. A herd or drove of elephants, from what I can learn, has never been seen to leave the woods:

woods: some of the largest males often stray to a considerable distance, but the young ones always remain in the forest under the protection of the *Palmai* or leader of the herd, and of the larger elephants. The *Goondabs*, or large males, come out singly, or in small parties, sometimes in the morning, but commonly in the evening, and they continue to feed all night upon the long grass, that grows amidst the swamps and marshes, and of which they are extremely fond. As often, however, as they have an opportunity, they commit depredations on the rice fields, sugar canes, and plantain trees, that are near, which oblige the farmers to keep regular watch, under a small cover, erected on the tops of a few long bamboos, about 14 feet from the ground: and this precaution is necessary to protect them from the tigers, with which this province abounds. From this lofty station the alarm is soon communicated from one watchman to another and the neighbouring villages, by means of a rattle with which each is provided. With their shouts and cries, and noise of the rattles, the elephants are generally scared and retire. It sometimes however happens that the males advance even to the villages, overturn the houses, and kill those who unfortunately come in their way, unless they have had time to light a number of fires: this element seems to be the most dreaded by wild elephants, and a few lighted wisps of straw or grass seldom fail to stop their progress. To secure one of the males a very different method is employed from that which is taken to secure a herd: the former is taken by *Koomkees*, or female elephants trained for the purpose, whereas the latter is driven into a strong enclosure called a *Keddab*.

As the hunters know the places where the elephants come out to feed, they advance towards them in the evening with four *Koomkees*, which is the number of which each hunting party consists: when the nights are dark, and these are the most favourable for their purpose, the male elephants are discovered by the noise they make in cleaning their food, by whisking and striking it against their fore-legs, and by moon-light they can see them distinctly at some distance.

As soon as they have determined on the *Goondab* they mean to secure, three of the *Koomkees* are conducted silently and slowly by their *Mabotes* (drivers) at a moderate distance from each other, near to the place where he is feeding; the *Koomkees* advance very cautiously, feeding as they go along, and appear like wild elephants that had strayed from the jungle. When the male perceives them approaching, if he takes the alarm and is viciously inclined, he beats the ground with his trunk and makes a noise, shewing evident marks of his displeasure; and that he will not allow them

them to approach nearer; and if they persist, he will immediately attack and gore them with his tusks: for which reason they take care to retreat in good time. But should he be amorously disposed, which is generally the case (as these males are supposed to be driven from the herd at a particular period by their seniors, to prevent their having connection with the females of that herd), he allows the females to approach, and sometimes even advances to meet them.

When from these appearances, the *Mabotes* judge that he will become their prize, they conduct two of the females, one on each side close to him, and make them advance backwards, and press gently with their posteriors against his neck and shoulders: the third female then comes up and places herself directly across his tail: in this situation, so far from suspecting any design against his liberty, he begins to toy with the females and caresses them with his trunk. While thus engaged, the fourth female is brought near, with ropes and proper assistants, who immediately get under the belly of the third female, and put a slight cord (the *Cbilkab*) round his hind legs; should he move, it is easily broken, in which case, if he takes no notice of this slight confinement, nor appears suspicious of what was going forward, the hunters then proceed to tie his legs with a strong cord (called *Bunda*) which is passed alternately, by means of a forked stick and a kind of hook, from one leg to the other, forming the figure of 8, and as these ropes are short, for the convenience of being more readily put around his legs, 6 or 8 are generally employed, and they are made fast by another cord (the *Dagbearee*) which is passed a few turns perpendicularly between his legs, where the folds of the *Bundabs* intersect each other. A strong cable (the *Pband*) with a running noose, 60 cubits long, is next put round each hind leg immediately above the *Bundabs*, and again, above them, 6 or 8 additional *Bundabs*, according to the size of the elephant, are made fast, in the same manner as the others were: the putting on these ropes generally takes up about 20 minutes, during which the utmost silence is observed, and the *Mabotes*, who keep flat upon the necks of the females, are covered with dark-coloured cloths, which serve to keep them warm, and at the same time do not attract the notice of the elephant. While the people are busily employed in tying the legs of the *Goon-dab*, he caresses sometimes one, and sometimes another of the seducers (*Kootnee*), examining their beauties and toying with different parts, by which his desires are excited and his attention diverted from the hunters, and in these amorous dalliances he is indulged by the females. But if his passions should be so roused, before his legs are properly secured, as to induce him to attempt leaping on one of the females,

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the *Mabote*, to ensure his own safety and prevent him gratifying his desires any farther, makes the female run away, and at the same time, by raising his voice and making a noise, he deters the *Goondab* from pursuing. This however happens very seldom; for he is so secured by the pressure of a *Koomkee* on each side and one behind, that he can hardly turn himself, or see any of the people, who always keep snug under the belly of the third female, that stands across his tail, and which serves both to keep him steady and prevent his kicking any of the people, who are employed in securing him; but in general he is so much taken up with his decoyers, as to attend very little to any thing else. In case of accidents, however, should the *Goondab* break loose, the people upon the first alarm can always mount on the backs of the tame elephants, by a rope that hangs ready for the purpose, and thus get out of his reach. When his hind legs are properly secured, they leave him to himself, and retire to a small distance: as soon as the *Koomkees* leave him, he attempts to follow, but finding his legs tied, he is roused to a proper sense of his situation, and retreats toward the jungle; the *Mabotes* follow at a moderate distance from him on the tame elephants, accompanied by a number of people that had been previously sent for, and who, as soon as the *Goondab* passes near a stout tree, make a few turns of the *Pbands*, or long cables that are trailing behind him, around its trunk; his progress being thus stopped, he becomes furious and exerts his utmost force to disengage himself, nor will he then allow any of the *Koomkees* to come near him, but is outrageous for some time, falling down and goring the earth with his tusks. If by these exertions the *Pbands* are once broken, which sometimes is effected, and he escapes into the thick jungle, the *Mabotes* dare not advance for fear of the other wild elephants, and are therefore obliged to leave him to his fate; and in this hampered situation, it is said, he is even ungenerously attacked by the other wild elephants. As the cables are very strong and seldom give way, when he has exhausted himself by his exertions, the *Koomkees* are again brought near and take their former positions, viz. one on each side and the other behind. After getting him nearer the tree, the people carry the ends of the long cables around his legs, then back and about the trunk of the tree, making, if they can, two or three turns, so as to prevent even the possibility of his escape. It would be almost impossible to secure an elephant in any other manner, as he would tear up any stake, that could at the time be driven into the ground, and even the noise of doing it would frighten the elephant: for these reasons, as far as I can learn, nothing less than a strong tree is ever trusted to by the hunters. For still farther security, as well as to confine him

from moving to either side, his fore-legs are tied exactly in the same manner as the hind-legs were, and the *Pbands* are made fast one on each side, to trees, or stakes driven deep into the earth. During the process of tying both the hind and fore legs, the fourth *Koomkee* gives assistance, where necessary, and the people employed cautiously avoid going within reach of his trunk; and when he attempts to seize them, they retreat to the opposite side of the *Koomkees*, and get on them, if necessary, by means of the rope above mentioned, which hangs ready for them to lay hold of. Although, by these means, he is perfectly secured and cannot escape, yet as it would be both unsafe and inconvenient to allow him to remain in the verge of the jungle, a number of additional ropes are afterwards put on, as shall be mentioned, for the purpose of conducting him to a proper station. When the *Goondab* has become more settled; and eat a little food, with which he is supplied as soon as he is taken, the *Koomkees* are again brought near, and a strong rope (*Pbara*) is then put twice round his body, close to his fore-legs like a girth, and tied behind his shoulder; then the long end is carried back close to his rump and there fastened after a couple of turns more have been made round his body. Another cord is next fastened to the *Pbara* and from thence carried under his tail like a crupper (*Dooblab*), and brought forward and fastened by a turn or two, to each of the *Pbaras* or girths, by which the whole is connected, and each turn of these cords serves to keep the rest in their places. After this a strong rope (the *Tooman*) is put round his buttocks and made fast on each side to the girth and crupper, so as to confine the motion of his thighs and prevent his taking a full step. These smaller ropes being properly adjusted, a couple of large cables (the *Dools*) with running nooses are put around his neck, and after being drawn moderately tight, the nooses are secured from running closer, and then tied to the ropes on each side forming the girths and crupper already mentioned; and thus all these ropes are connected and kept in their proper places, without any risk of the nooses of the *Dools* becoming tight, so as to endanger the life of the elephant in his exertions, to free himself. The ends of these cables are made fast to two *Koomkees*; one on each side of the *Goondab*, by a couple of turns round the belly, close to the shoulder, like a girth, where a turn is made, and it is then carried across the chest and fastened to the girth on the opposite side. Every thing being now ready, and a passage cleared from the jungle, all the ropes are taken from his legs, and only the *Tooman* remains round his buttocks to confine the motion of his hind-legs: the *Koomkees* pull him forward by the *Dools*, and the people from behind urge him on. Instead of advancing in the direction

fection they wish, he attempts to retreat farther into the jungle, he exerts all his force, falls down, and tears the earth with his tusks, screaming and groaning, and by his violent exertions often hurts and bruises himself very much, and instances happen of their surviving these violent exertions only a few hours, or at most a few days. In general, however, they soon become reconciled to their fate, will eat immediately after they are taken, and, if necessary, may be conducted from the verge of the jungle as soon as a passage is cleared. When the elephant is brought to his proper station and made fast, he is treated with a mixture of severity and gentleness, and in a few months (if docile) he becomes tractable and appears perfectly reconciled to his fate. It appears somewhat extraordinary, that though the *Goondab* uses his utmost force to disengage himself when taken, and would kill any person coming within his reach, yet he never, or at least seldom, attempts to hurt the females that have ensnared him, but on the contrary seems pleased (as often as they are brought near, in order to adjust his harnessing, or move and slacken those ropes which gall him), soothed and comforted by them, as it were, for the loss of his liberty. All the elephants, soon after they are taken, are led out occasionally for exercise by the *Koomkees*, which attend for that purpose.

Having now related, partly from my own knowledge and partly from comparing the accounts given by different people employed in this business, the manner in which the male elephants, called *Goondabs*, are secured, I shall next, entirely from my own knowledge, describe the methods I have seen employed for securing a herd of wild elephants. Female elephants are never taken singly, but always in the herd, which consists of young and old of both sexes. This noble, docile, and useful animal, seems naturally of a social disposition, as a herd in general consists of from about 40 to 100, and is conducted under the direction of one of the oldest and largest females, called the *Palmai*, and one of the largest males. When a herd is discovered, about 500 people are employed to surround it, who divide themselves into small parties, called *Chokeys*, consisting generally of one *Mabote* and two *Coolies*, at the distance of twenty or thirty yards from each other, and form an irregular circle in which the elephants are enclosed: each party lights a fire and clears a footpath to the station that is next him, by which a regular communication is soon formed through the whole circumference from one to the other. By this path reinforcements can immediately be brought to any place where an alarm is given: and it is also necessary for the superintendants, who are always going round, to see that the people are alert upon their posts. The first circle (the *Dawkee*) being thus formed, the

the remaining part of the day and night is spent in keeping watch by turns or in cooking for themselves and companions. Early next morning, one man is detached from each station, to form another circle in that direction, where they wish the elephants to advance. When it is finished, the people, stationed nearest to the new circle, put out their fires and file off to the right and left, to form the advanced party, thus leaving an opening for the herd to advance through, and by this movement both the old and new circle are joined and form an oblong. The people from behind now begin shouting and making a noise with their rattles, *tomtoms*, &c. to cause the elephants to advance; and as soon as they are got within the new circle, the people close up, take their proper stations, and pass the remaining part of the day and night as before. In the morning the same process is repeated, and in this manner the herd advances slowly in that direction, where they find themselves least incommoded by the noise and clamour of the hunters, feeding, as they go along, upon branches of trees, leaves of bamboos, &c. which come in their way. If they suspected any snare, they could easily break through the circle: but this inoffensive animal, going merely in quest of food, and not seeing any of the people who surround him, and who are concealed by the thick jungle, advances without suspicion, and appears only to avoid being pestered by their noise and din. As fire is the thing elephants seem most afraid of in their wild state, and will seldom venture near it, the hunters always have a number of fires lighted, and particularly at night, to prevent the elephants coming too near, as well as to cook their victuals and keep them warm. The sentinels supply these fires with fuel, especially green bamboos, which are generally at hand, and which, by the crackling and loud report they make, together with the noise of the watchmen, deter the elephants from coming near; so that the herd generally remains at a distance near the centre of the circle. Should they at any time advance, the alarm is given, and all the people immediately make a noise and use their rattles, to make them keep at a greater distance. In this manner they are gradually brought to the *Keddab*, or place where they are to be secured. As the natives are extremely slow in their operations, they seldom bring the herd above one circle in a day, except on an emergency, when they exert themselves and advance two circles. They have no tents or covering but the thick woods, which, during the day, keep off the rays of the sun; and at night they sleep by the fires they have lighted, upon mats spread on the ground, wrapt up in a piece of coarse cloth. The season is then so mild that the people continue very healthy, and an accident seldom happens except to stragglers about the outskirts of the wood,

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who are sometimes, though very rarely, carried off by tigers. The *Keddab*, or place where the herd is to be secured, is differently constructed in different places; here it consists of three enclosures communicating with each other by means of narrow openings or gateways. The outer enclosure, or the one next to the place where the elephants are to enter, is the largest; the middle one is generally, though not always, the next in size, and the third or furthestmost is the smallest: these proportions, however, are not always adhered to in the making of a *Keddab*, nor indeed does there appear to me any reason for making three enclosures; but as my intentions are merely to relate facts, I shall proceed to observe, that when in the third or last enclosure, the elephants are then only deemed secure: here they are kept six or eight days, and are regularly, though scantily, fed from a scaffold on the outside, close to the entrance of an outlet called the *Roomee*, which is about sixty feet long, and very narrow, and through which the elephants are to be taken out one by one. In many places this mode is not adopted; for as soon as the herd has been surrounded by a strong palisade, *Koomkees* are sent in with proper people, who tie them on the spot, in the same manner as was mentioned above of the *Goondabs*, or male elephants, they are taken singly. These enclosures are all pretty strong, but the third is the strongest, nor are the elephants deemed secure, as already observed, till they have entered it. This enclosure has, like the other two, a pretty deep ditch on the inside; and upon the bank of earth, that is thrown up from the excavation, a row of strong palisades of middle-sized trees is planted, strengthened with cross bars, which are tied to them about the distance of fourteen inches from each other; and these are supported on the outside by strong posts like buttresses, having one end sunk in the earth and the other pressing against the cross bars to which they are fastened. When the herd is brought near to the first enclosure, or *Baigcote*, which has two gateways towards the jungle, from which the elephants are to advance (these as well as the other gateways are disguised with branches of trees and bamboos stuck in the ground, so as to give them the appearance of a natural jungle), the greatest difficulty is to get the herd to enter the first or outer enclosure; for notwithstanding the precautions taken to disguise both the entries as well as the palisade which surrounds this enclosure, the *Palmai*, or leader, now appears to suspect some snare, from the difficulty and hesitation with which in general she passes into it; but as soon as she enters, the whole herd implicitly follows. Immediately, when they are all passed the gateway, fires are lighted round the greatest part of the enclosure, and particularly at the entries, to prevent the elephants from returning. The hunters:

hunters from without then make a terrible noise by shouting, beating of *tomtoms* (a kind of drum), firing blunt cartridges, &c. to urge the herd on to the next enclosure. The elephants, finding themselves ensnared, scream and make a noise; but, seeing no opening except the entrance to the next enclosure, and which they at first generally avoid, they return to the place through which they lately passed, thinking perhaps to escape; but now find it strongly barricaded; and, as there is no ditch at this place, the hunters, to prevent their coming near and forcing their way, keep a line of fire constantly burning all along where the ditch is interrupted, and supply it with fuel from the top of the palisade, and the people from without making a noise, shouting and hallooing to drive them away. Wherever they turn, they find themselves opposed by burning fires or bundles of reeds, and dried grafs, which are thrust through the opening of the palisades, except towards the entrance of the second enclosure or *Doobrazecote*. After traversing the *Baigcote* for some time, and finding no chance of escaping but through the gateway into the next enclosure, the leader enters, and the rest follow: the gate is instantly shut by people who are stationed on a small scaffold immediately above it, and strongly barricaded, fires are lighted, and the same discordant din made and continued, till the herd has passed through another gateway into the last enclosure, or *Rajecote*, the gate of which is secured in the same manner as the former was. The elephants, being now completely surrounded on all sides, and perceiving no outlet through which they can escape, appear desperate, and in their fury advance frequently to the ditch, in order to break down the palisade, inflating their trunks, screaming louder and shriller than any trumpet, sometimes grumbling like the hollow murmur of distant thunder, but, wherever they make an attack, they are opposed by lighted fires, and by the noise and triumphant shouts of the hunters. As they must remain some time in this enclosure, care is always taken to have part of the ditch filled with water, which is supplied by a small stream, either natural or conducted through an artificial channel from some neighbouring reservoir. The elephants have recourse to this water to quench their thirst and cool themselves after their fatigues, by sucking the water into their trunks, and then squirting it over every part of their bodies. While they remain in this enclosure, they continue sulky, and seem to meditate their escape, but the hunters build huts and form an encampment, as it were, around them, close to the palisade; watchmen are placed, and every precaution used, to prevent their breaking through. This they would soon effect, if left to themselves, notwithstanding the palisade is made of very strong stakes sunk into the earth on the out-

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side of the ditch, and strengthened by cross bars and buttresses as already mentioned.

When the herd has continued a few days in the *Keddab*, the door of the *Roomee* is opened, into which some one of the elephants is enticed to enter, by having food thrown first before, and then gradually further on into the passage, till the elephant has advanced far enough to admit of the gates being shut. Above this wicker gate, or door, two men are stationed on a small scaffold, who throw down the food. When the elephant has passed beyond the door, they give the signal to a man who, from without, shuts it by pulling a string, and they secure it by throwing two bars that stood perpendicular on each side, the one across the other thus \times , forming the figure of St. ANDREW'S Cross, and then two similar bars are thrown across each other behind the door next to the *Keddab*, so that the door is in the centre: for farther security, horizontal bars are pushed across the *Roomee*, through the openings of the palisades, both before and behind those crosses; to prevent the possibility of the doors being broken. The *Roomee* is so narrow, that a large elephant cannot turn in it, but, as soon as he hears the noise that is made in shutting the gate, he retreats backwards, and endeavours to force it; being now secured in the manner already noticed, his efforts are unavailing: finding his retreat thus cut off, he advances and exerts his utmost force to break down the bars, which were previously put across a little farther on in the outlet, by running against them, screaming and roaring, and battering them, like a ram, by repeated blows of his head, retreating and advancing with the utmost fury. In his rage, he rises and leaps upon the bars with his forefeet, and strives to break them down with his huge weight. In *February*, 1788, a large female elephant dropt down dead in the *Roomee*, from the violent exertions she made. When the elephant is somewhat fatigued by these exertions, strong ropes*, with running nooses, are placed in the outlet by the hunters; and as soon as he puts a foot within the noose, it is immediately drawn tight and fastened to the palisades. When all his feet have been made pretty fast, two men place themselves behind some bars, that run across the *Roomee*, to prevent his kicking them, and with great caution tie his hind-legs together, by passing a cord alternately from the one to the other, like the figure 8, and then fastening these turns as above described. After this, the *Pbara*, *Dools*, &c. are put on in succession, in the same manner as on the *Goondab*, only that here the people are in greater security. While these ropes are

* These are of the same form and size nearly as the *Phands*, but much shorter in proportion.

making

making fast, the other hunters are careful not to go too near, but keep on the outside of the palisade, and divert his attention as much as they can, from those employed in fastening them, by supplying him with grass, and sometimes with plantain leaves and sugar canes, of which he is remarkably fond, by presenting a stick, giving him hopes of catching it, or by gently striking or tickling his proboscis. He frequently, however, seizes the ropes with his trunk, and endeavours to break them, particularly those with which his feet are tied, and sometimes tries to bite them through with his grinders (as he has no incisors or front teeth), but the hunters then goad him with sharpened bamboos, or light spears, so as to make him quit his hold. Those who are employed in putting the ropes around his body, and over his head, stand above him, on a small kind of platform, consisting of a few bars run across through the openings of the palisades, and, as an elephant cannot see any thing that is above, and rather behind his head, they are very little incommoded by him, although he appears to smell them, and endeavours to catch them with his trunk. When the whole apparatus is properly secured, the ends of the two cables (*Dools*) which were fastened round his neck, are brought forward to the end of the *Roomee*, where two female elephants are waiting; and to them these cables are made fast. When every thing is ready, the door, at the end of the outlet, is opened, the cross bars are removed, and the passage left clear. The ropes, that tied his legs to the palisades, are loosened, and, if he does not advance readily, they goad him with long poles sharpened at the ends or pointed with iron, and urge him on with their noise and din, and, at the same time, the females pull him gently forward: as soon as he has cleared the *Roomee*, his conductors separate, so that if he attempts to go to one side, he is prevented by the elephant, that pulls in the opposite direction, and *vice versa*. The *Bundabs*, which tie his hind legs, though but loosely, yet prevent his going fast; and, thus situated, he is conducted like an enraged bull, that has a cord fastened to his horns on each side, so that he cannot turn either to the right or left to avenge himself. In like manner is this noble animal led to the next tree, as the *Goondabs*, before mentioned, were. Sometimes he becomes obstinate, and will not advance; in which case, while one of his conductors draws him forward, the other comes behind and pushes him on: should he lie down, she puts her snout under and raises him up, supporting him on her knees, and with her head pushing him forward with all her strength, the hunters likewise assist by goading him, and urging him forward by their noise and din: sometimes they are even obliged to put lighted torches near, in order to make him advance. In conducting small elephants

from

from the *Roomee*, only one cable and one *Koonkee* are made use of. As soon as each elephant is secured, he is left in charge to the *Mabote*, or keeper, who is appointed to attend and instruct him; and, under him, there are from two to five *Coolies*, according to the size of the elephant, in order to assist and to supply food and water, till he becomes so tractable as to bring the former himself. These people erect a small hut immediately before him, where the *Mabote*, or one of the *Coolies*, constantly attends, supplies him with food, and soothes and caresses him by a variety of little arts. Sometimes the *Mabote* threatens and even goads him with a long stick pointed with iron, but more generally coaxes and flatters him, scratching his head and trunk with a long bamboo, split at one end into many pieces, and driving away the flies from any sores occasioned by the hurts and bruises he got by his efforts to escape from the *Roomee*. This animal's skin is soft, considering his great size, and is extremely sensible, is easily cut or pierced, more so than the skin of most large quadrupeds. The *Mabote* likewise keeps him cool, by squirting water all over him, and standing without the reach of his trunk; in a few days, he advances cautiously to his side, and strokes and pats him with his hand, speaking to him all the while in a soothing tone of voice, and, in a little time, he begins to know his keeper and obey his commands. By degrees, the *Mabote* becomes familiar to him, and at length gets upon his back from one of the tame elephants, and, as the animal becomes more tractable, he advances gradually forward, towards his head, till at last he is permitted to seat himself on his neck, from which place he afterwards regulates and directs all his motions. While they are training in this manner, the tame elephants lead out the others in turn, for the sake of exercise, and likewise to ease their legs from the cords with which they are tied, and which are apt to gall them most terribly, unless they are regularly slacked and shifted. In five or six weeks the elephant becomes obedient to his keeper, his fetters are taken off by degrees, and generally, in about five or six months, he suffers himself to be conducted by the *Mabote* from one place to another: care, however, is always taken not to let him approach his former haunts, lest a recollection of the freedom he there enjoyed should induce him again to recover his liberty. This obedience to his conductor seems to proceed partly from a sense of generosity, as it is, in some measure, voluntary; for, whenever an elephant takes fright, or is determined to run away, all the exertions of the *Mabote* cannot prevent him, even by beating or digging the pointed iron hook into his head, with which he directs him; on such an occasion the animal totally disregards these feeble efforts,

efforts, otherwise he could shake or pull him off with his trunk, and dash him in pieces. Accidents of this kind happen almost every year, especially to those *Mabotes* who attend the large *Goondabs*, but such accidents are in general owing entirely to their own carelessness and neglect. It is necessary to treat the males with much greater severity than the females, to keep them in awe; but it is too common a practice among the *Mabotes*, either to be negligent in using proper measures to render their elephants docile, or to trust too much to their good nature, before they are thoroughly acquainted with their dispositions. The iron-hook, with which they direct them, is pretty heavy, about sixteen inches long, with a straight spike advancing a little beyond the curve of the hook, so that altogether it is exactly like that which ferrymen or boatmen use fastened to a long pole.

In this account of the process for catching and taming elephants, I have used the masculine gender, to avoid circumlocution, as both males and females are treated in the same manner: the former are seldom so docile, but, like the males of other animals, are fiercer, stronger, and more untractable than the females.

Before I conclude, it may be proper to observe, that young elephants suck constantly with their mouths, and never with their trunks, as *BUFFON* has asserted: a conclusion he made merely from conjecture, and the great and various uses to which they are well adapted and applied, by every elephant.

I have seen young ones, from one day to three years old, sucking their dams, but never saw them use their trunks, except to press the breast, which, by natural instinct, they seemed to know would make the milk flow more readily. The mode of connection between the male and female is now ascertained beyond the possibility of a doubt; as *Mr. BULLER*, *Lieu. HAWKINS*, and many others, saw a male copulate with a female, after they were secured in the *Keddab*, in a manner exactly similar to the conjunction of the horse with a mare.

This fact entirely overturns what has been so often related, concerning the supposed delicacy of this useful animal, and a variety of other hypotheses, which are equally void of foundation. As far as I know, the exact time an elephant goes with young, has not yet been ascertained, but which cannot be less than two years, as one of the elephants brought forth a young one twenty-one months and three days after she was taken. She was observed to be with young in *April* or *May*, 1788, and she was only taken in *January* preceding; so that it is very likely she must have had connection with the male some months before she was secured, otherwise they could not discover that she was with young, as a foetus of less than

six months cannot well be supposed to make any alteration in the size or shape of so large an animal. The young one, a male, was produced October 16th, 1789, and appeared in every respect to have arrived at its full time. Mr. HARRIS, to whom it belongs, examined its mouth a few days after it was brought forth, and found that one of its grinders on each side had partly cut the gum. It is now alive and well, and begins to chew a little grass.

I have further to remark, that one of the tusks of the young elephant has made its appearance, so that we can now ascertain it to be of that species called *Mucknab*, the tusks of which are always small, and point nearly straight downwards. He was thirty-five inches high, at his birth, and is now thirty-nine, so that he has grown four inches in nearly as many months. Elephants are always measured at the shoulder; for the arch or curve of the back, of young ones particularly, is considerably higher than any other part, and it is a sure sign of old age, whenever this curve is found flattened or considerably depressed, after an elephant has once attained his full growth.

Though these remarks, as well as several others in the above relation, do not come within the plan I proposed, which was merely to describe the method of taking wild elephants in the province of *Tipura*, yet I hope they will not be deemed impertinent or superfluous, especially as several of them tend to establish some important facts in the natural history of this animal, that are not known or not attended to, at least in any accounts that I had an opportunity of seeing.

EXPLANATION of several words used by the natives who catch elephants.

Bundab—a middle-sized cord, six or eight cubits long, which is put round either the hind or fore legs of elephants, in order to secure them. From ten to twenty are employed.

Cbilkáb—is a very slight soft cord, which the hunters at first put around the hind-legs of a *Goondab*, before they begin to tie him: this is not used for *Keddab* elephants.

Dáugbearée—is generally a continuation of every second *Bundab* that is put on, a few turns of which are passed round, where the folds of the *Bundabs* intersect each other, in order to fasten and keep them firm. When the *Bundab* is not long enough, another cord is made use of.

Dooblab—is that rope which is made fast on one side to the aftermost *Pbarab*,
then

then carried under the tail and fastened to both the *Pbarabs* on the opposite side, so as to answer the purpose of a crupper, and to keep the *Pbarabs* in their places.

Dool—is a large cable, about sixty cubits long, with a running noose. Two of them are put round the neck of the elephant, and fastened to the foremost *Pbara* or girth, one on each side, in such a manner, as to prevent the nooses from being drawn too tight or coming too far forward, and this is effectually done by the *Dooblab*; for whenever the elephant draws back, the *Dools* pull the crupper forward, which must gall him very much, and prevent him from using all the force he might otherwise exert in order to free himself.

Pband—is a cable nearly the same size as the *Dool*, the noose of which is put round each leg of the *Goondabs*, and then it is tied to trees or stakes. The *Pbands*, used for the *Keddab* elephants, are only about thirty cubits long.

Pharab—a rope that is put round the body of an elephant, like a girth, and to which the *Dooblab* and *Dools* are connected.

Tooman—is the rope that is passed round the buttocks of an elephant, and prevents his stepping out freely: it is fastened to the girth and crupper, that it may not slip down.

*Tipura**, March 29th, 1790.

THE PLAN OF A COMMONPLACE - BOOK.

By J. HARRINGTON, Esq.

MR. *Locke* esteèmed his method of a commonplace-book “so mean a thing, as “not to deserve publishing in an age full of useful inventions,” but was induced to make it publick at the request of a friend. This perhaps should have deterred me from offering a paper of the same denomination, to a society instituted for enquiring into the more essential parts of literature; yet, since Mr. *Locke* bears testimony to the utility of his method, after five-and-twenty years’ experience, and since whatever may tend to assist the acquisition of knowledge, cannot, I conceive, be deemed

* The ancient name of the province was *Tripara*, or with three towns, which has been corrupted into *Tipra* or *Tipara*.
undeserving.

undeserving of attention, I venture to submit the plan of a commonplace-book, which has occurred to me, founded on Mr. *Locke's*, but calculated, I think, to obviate an inconvenience to which his is subject.

On considering the method described and recommended by Mr. *Locke*, it appeared to me that the number of words, having the same initial letters and following vowels, might frequently make it tedious to find a particular head, if noted in the index by a numerical reference to the page only; and that the same cause might render it difficult to ascertain whether any particular head had been entered. For instance, *balm, bark, bard, bat, baron*, having, with numerous other words, the same initial letter and succeeding vowel, several references to the pages pointed out by Mr. *Locke's* numerical index might be necessary, before any one of them, in particular, could be found; or before it could be ascertained, whether any one of them had been previously entered in the book. An index, of which the following is a specimen, would, it is presumed, remedy these apparent disadvantages. How far it is free from others, will be known from experience.

A short explanation of the method adopted for this book will be sufficient. One-and-twenty pages, divided each into five columns, and subdivided in the several columns for the number of the folios, the letters of the alphabet written at the head of each page, and the five vowels inserted in the columns under each letter, will form a sufficient index, provided the letters J, Q, V, X, and Z, instead of having distinct pages appropriated to them, be written in the same pages with I, P, U, W, and Y, which they may be without inconvenience.

The *Index*, thus prepared, is ready to receive the heads of whatever subjects may be entered in the book under their corresponding initial letters and following vowels, or under their initial letters and similar vowels, when the head is a monosyllable and begins with a vowel. It is hardly necessary to repeat Mr. *Locke's* remark, that "every head ought to be some important and essential word or term." If a small margin be left in each folio of the book, and the indicative word or head be written on it, it will be conspicuous, although several heads should be included in the same folio; but, until it become necessary, from there being no remaining folios wholly blank, it is advisable to appropriate a separate folio to each head, as, by this means, the several subjects entered are kept more distinct, and any additions may be made to the same head, without the trouble of reference to other folios; for which purposes it is also advantageous to place the folio-numbers on the left pages only, leaving the right-hand pages for a continuation of the subjects entered on the left, or for re-

marks

marks thereon, until it become necessary to appropriate them to new heads, in order to fill the book.

To these remarks, which may appear more than adequate to the occasion, it will be sufficient to add, that, if the heads in the index swell, under any letter, beyond the dimensions of the single page assigned to them (which however in a book of moderate size is not probable) they may be continued on a second page, to be prepared for the same letter, at the end of the original index, for which purpose ten or twelve blank leaves may be left between the index and the commencement of the book: and lastly, that if the entries in the book, under any head, fill more than the two pages first appropriated to it, the same head may be continued in any subsequent blank folio, by obvious notes of reference, at the foot of the former and top of the latter, without any new entry in the index, which would then be unnecessarily filled.

The *Asiatick* Society was instituted for enquiring into the antiquities, arts, sciences, and literature of *Asia*; and the humble plan of a commonplace-book cannot claim admission among any one of these objects: it may however be considered as connected with all, since it may assist enquiries concerning the whole of them. If it be asked, whether such a plan be within the local limits of this society, it may be answered, that it is, in its nature, universal; but if any particular plan be designed in *Asia*, such plan may, with propriety, be tendered to the *Asiatick* Society, for the benefit either of publication in their Transactions, if deemed worthy of it, or of suppression, for the author's sake, if deemed useless. A similar index with thirty pages and ten columns, according to the number of the *Nagari*-consonants and vowels, which are mostly in use, would suit a commonplace-book intended to comprise the whole extent of *Asiatick* literature.

Each of the figures A, B, C, must be considered as representing a large folio page; and it seemed unnecessary to exhibit the specimen, on a more extensive scale: the numbers of the *folios* are supposed to be those of the commonplace-book. The names *Arabia*, *Babmen*, *Campilla*, and the rest, are given by way of example, but were not set down with any particular selection.

A.

a	fol.	e	fol.	i	fol.	o	fol.	u	fol.
<i>Arabia.</i>	256	<i>Abremen.</i>	256	<i>Abilya.</i>	255	<i>Afoca.</i>	254	<i>Aguru.</i>	256

B.

a	fol.	e	fol.	i	fol.	o	fol.	u	fol.
<i>Babmen.</i>	255	<i>Beli.</i>	255	<i>Bilva.</i>	256	<i>Borax.</i>	255	<i>Bhuchampac.</i>	254

C.

a	fol.	e	fol.	i	fol.	o	fol.	u	fol.
<i>Campilla.</i>	255	<i>Cefari.</i>	255	<i>Crisbna.</i>	254	<i>Ghorapushpi.</i>	255	<i>Cusba.</i>	255

Afoca: This is the true name of a charming tree, inaccurately named *Asjogam* in the *Hort. Malab.* vol. 5. tab. 59. It is a plant of the *eighth* class and *first* order, bearing flowers of exquisite beauty; and its fruit, which *Van Rbeede* had not seen, is a *legume*, compressed, incurved, long pointed, with six, seven, or eight seeds: it will be described very fully in a paper intended for the Society. The *Brahmens*, who adore beautiful objects, have consecrated the lovely *Afoca*: they plant it near the temples of *Siva*, and frequently mention a grove of it, in which *Ravan* confined the unfortunate *Sita*. The *eighth* day from the new moon of *Chaitra* inclusive, is called *Afocastami*.

Crisbna: Properly *black* or *dark blue*, an epithet of the *Hindu* God, whose youthful

- ful exploits resemble those of *Apollo Nomius*: he was particularly worshipped by the *Surasena*, or people of *Matthura*: and *Arrian* says, that the *Suraseni* adored *Hercules*; but the deity whom he means, was *Hercules Musagetes*, or *Gopinat'ba*, who was the patron of science, according to *Mr. Bryant*, or the 'God of Eloquence, with the Muses in his train.' See *Anal. Anc. Mythol.* vol. 2. p. 74. The *Gopyab* were the patronesses of musick and poetry.
- Bbuchampac*: So the *Hindus* call a beautiful plant described by *Rbeede*, and admitted by *Linnaeus*, under the names of *Kæmpferia rotunda*. The *Indian* appellation is very improper, as the flower has no resemblance to the *Champac*, except in the richness of its odour. *Bhu* means *ground*, from which the blossoms rise with a short scape, and scarce live a whole day.
- Cesari*: A lion in *Sanfcrit*, so named from his mane: *Cesa* and *Cesara* signify *hair*. Etymologists will decide whether *Cæsaries* and *Cæsar* had an affinity with those *Indian* words.
- Abilya*: The celebrated consort of an old *Indian* sage, named *Gotama*: hence it is the name of a rich *Mabratta* lady, who employs her wealth in works of devotion at *Benares* and *Gaya*, as well as in her own country.
- Borax*: A corruption of the *Arabick* word *burak*, or *brilliant*. It is found in its native state, both in *Tibet*, according to *Giorgi*, and in *Nepal*, according to *Father Giuseppe*.
- Cusha*: Pronounced more correctly *Cusa*, with a palatal *s*; a grass held sacred by the *Brahmens*, from time immemorial. It is the *Poa Cynosuroides* of *Dr. Koenig*.
- Beli*: The *Belus*, probably of the *Greeks*; for though *bal* signifies lord, in most eastern dialects, yet in *Chaldaic*, according to *Selden*, it was written *Bel*, exactly as the name of the *Hindu* monarch is vulgarly pronounced.
- Chorapushpi*: Or *Thief-flowered*; the corymbed *Scirpus* with awled spikes, so troublesome in our *Indian* walks.
- Campilla*: Commonly called *Camala-guri*, a plant used by dyers, of a new genus; described by *Dr. Roxburgh*.
- Bahmen*: An old *Persian* month and the genius presiding over it: the name also of a celebrated king and hero.
- Bilva*: The *Cratæva Marmelos*, but certainly misplaced in *Linnaeus*; its fruit has lately been found very beneficial in diarrhoeas.

Abremen:

Abremen : So *Hafiz* writes the vowels in this name of the *evil genius* ; but, in some *Arabian* books, it is written *Abermen*.

Arabia : In this celebrated peninsula, the richest and most beautiful of languages was brought to perfection : the *Arabick* dictionary by *Golius* is the most elegant, the most convenient, and, in one word, the *best* that was ever compiled in any language.

Aguru : The true name of the fragrant aloe-wood : the tree grows in *Silbet*, but has not blossomed in gardens near *Calcutta*.

END OF VOLUME I.

Directions to the Binder.

Cancel pages 493 and 494, where the Volumes divide.

There being no Signatures or Folios to three Sheets of Tables, the following Words must fold so as to indicate the signature Page of each Sheet :

Last line, <i>February 1786</i>	}	To be placed in this Order between Sig. <i>B b</i> and <i>G g</i> .
Ditto (<i>C c</i>), &c.		
Ditto (<i>O</i>), &c.		