N.B.Edmonstone to W.A.Edmonstone(brother)
Camb: Add MS 7616:Corres of NBE

27 May 1788 (on march from Midnapur southwards)

(2)...the several zemindars have been directed to get us supplied in their districts with whatever we may want and we have always found the zemindars of the villages very zealous in procuring it. ...(4).. the servants and the camp followers are so insolently pressing to get their own things over that it is with the utmost difficulty we can get a boat for ourselves. Russsell and I waited full half an hour in the sun at the Soan river (near Balasore) unable to get one, nor should we have till all the people had crossed, had not Doveton and Mr Binny come up who having authority over the sepoys procured one but even then it was by main force we prevented its being over-loaded. In consequence of this the Companies will henceforward be drawn up at the ghaut of a river to prevent this insolence and to suffer all our baggage to be crossed first. On occasion of the above as well (5) as at two or three other places on the same account our kitchen apparatus was retarded so much that we did not get dinner till near sunset. ...(8).. The servants have got (p9)into the habit of packing and carrying my baggage and I have no trouble . I have had several attacks(?) for an increase of wages under the denomination of Khooraucky which would amount to about two rupees each man, but I have positively refused it and threatened to send back the first that repeats the demand, a step they are very much averse to, for they are afraid to return singly now that they have come so far. One of Kennaway's servants lagging behind was robbed in passing thro' Mohurbunge (near Ballasore) and it has had a very good effect for the fear of it prevents any from running away and makes them keep up with the baggage. Altho there is not the least danger except in that district which being an independent zemindary the zemindar (10) is under no control, but we have industriously propagated the apprehension amongst all our people...

19 June 1788(camp at Chicacole)

No art and but little care is required to improve it (Chilka area) more, but as it is I think few scenes in England can equal it.

12 August 1788(Hyderabad)

The inhabitants are very insolent which makes us the more averse to live in the town. In going to the Durbar the common servants elbowed and pushed us about. It would have been dangerous to have resented it but we longed to chastised their insolence. There are some very pretty rides around the town.

September 1789 (Hyderabad)

Perhaps there never was a court where so much dullness and insipidity reigned as does in this. The whole purpose of government seems to be an exaction of compliance with forms and ceremonies. No kind of public duty ever engages the Nizam's attention, and the minister is left to manage it wholly in his own way. In short such a set of contemptible fellows I never (p) met with. Even the Bengallis (whom you have such a respect for) do not exceed them in meanness falsehood and rascality. I understand however that all the Indian courts do not resemble this, which may be called Empire of dullness meanness hypocricy and dishonesty.

March 1797(Lucknow)

Sir John tells me I am entitled to the repayment of all my extra charges so that my expences here will ultimately be reduced to a small sum. My servants are my principal charge. I thought it proper to have a pretty large retinue and I have consequently entertained 3 chobdars and 6 hircarrahs besides my own 3 who arrived three days ago. Other servants in proportion. I doubt if I can properly charge Government however with the whole expence of them, as they may not be considered as strictly necessary. But I shall settle that matter privately with Sir John Shore before I deliver in my accounts.

Edmonstone to NAE

27 March 1799(Madras; 22pages,latter part deals with Cherry affair)

(p18) Our Government never can be secured by conciliation. I have long thought and I am fully convinced that the idea of attaching the natives of this country by kindness lenity and a participation of rights is as much a chimera as the modern French philosophy and every step we take (and long have we been taking such) to approximate the natives to ourselves is dangerous to our existence. I will allow that the body of the low class of inhabitants are as well contented under our Government as they would be under another, but history and experience tells us that revolutions do not originate with them. They are engines in the hands of men who have views of their own and have capacity to use them. The great body of Mussulman from whom we have wrested the government and whom we now exclude from all situations of extensive trust and honour, will ever (p) harbour a wish to regain the supremacy. They hate us not only as we are usurpers but as they are bigots. Their religion will justify while their interest prompts attempts to destroy us. In this class too I reckon and very large proportion of Hindus. To conciliate enemies of this description is impracticable. We must contoul them. We have been hitherto maintained in a great degree by opinion. That opinion is daily losing ground; let any one compare the behaviour of the natives towards us at the present day, to what it was in former times and let him say whether our ascendancy is in any degree of comparison with what it formerly was. When we lose that ascendancy we lose our stability and under the present system there is no check to conspiracy. One principal remedy is the establishment of a better police, in its most extended sense -- by which I mean effectual (p) and general watchfulness over the conduct of all under our immediate controul. The reform should begin in all our principal cities and be extended as may be. We daily see persons going about the streets of Calcutta (and it is so in a greater degree up the country) with considerable bodies of armed men while we go singly and unarmed. We pay no sort of regard to what manner of people come and go, nor what their occupations and their conduct are. A few men combined, might unregarded by us arm a rabble in a week that should cut all our throats. Is it not easy to conceive a plan supported by foreign partizans as well as internal accomplices that might create a general insurrection? Is there not an excessive degree of folly in suffering persons whom we ought to consider as our unwitting subjects to (p) parade our streets in a condition to rise upon us without the fear of resistance?,to allow the multitude men and arms while the few who govern are naked and defenceless. This reflection when applied to Vazir Ali(?) is particularly striking after what has passed and the justice of it is further exemplified by the annual or rather daily practice of allowing large bodies of armed men to come to Benares and other places within our dominions under the plea of pilgrimages. The uses that might be made of this supineness on our part are sufficiently obvious and lendly(?) call for remedy. I am happy to know that the subject has engaged Lord Mornington's attention. He has indeed desired me to draw up a plan for the purpose and I have for some time past been revolving the subject in (p) mind with that view.

CAMB UNI: Correspondence of NB Edmonstone(presented 1962)

NBE arrived in India in 1783 as a writer to Bengal. He seemed to have been a protegy of the Duke of Argyll. He was in Hyderabad with Kennaway from Aug 1788 to July 1790 and learnt Persian while there, He was a secretary to the Government in Bengal in the early 1800s The above is from a bound volume of original letters addressed by him to his brother William who was also in Bengal. Most of the letters are from 1788-90, and 1797-99.

According to one letter Ellio$ was accompanied on his visit to England in 1775 by Meer Hudseen, and the latter later on wrote a book of these travels.

18

6 H.

David Anderson to Dr Alexander Mackenzie, Stoneyhill, (Edinburgh). (per Nottingham)

11 September 1772

My dear Sir

As there are no incidents in life which we recollect with so much pleasure as those which ~~xx~~ occurred in our infancy, so the friends who have manifested their regard to us in our youth we remember with particular warmth, and the impressions they have made in our mind, instead of being anywise effaced become stronger and stronger by time and distance. When these are my sentiments, need I assure you, that it is with uncommon satisfaction I hear from my father of your being in good health, and that you are so kind as express to him a continuance of that friendship, which you formerly evinced towards me.

Since my arrival in this country the little time which I have been able to spare from the business of the Company, has been chiefly devoted to the study of the Persian language, In this pursuit, the my (ff 70v) attention has frequently been distracted by other cares, I flatter myself, I have not been altogether unsuccessful. The arts and sciences seldom flourish under an arbitrary government so that a person of a literary turn is not to look for improvement in the books of the modern East. It is only however by perusing them that a person curious in the affairs of this country can push his researches into the nature and origin of the laws and peculiar customs, which are found to prevail amongst the natives of Indostan. And this object is of great importance to every one, who wishes to distinguish himself in the service of the country. For if he is ignorant in these respects he is but ill ~~xxxxxxx~~ qualified to act in a legislative capacity, which sooner or later may be the lot of every individual of their civil establishment. But it is in the first ~~xxxxxxx~~ stage of his service, and in the detail of business, that he feels most sensibly the satisfaction and advantage he derives from a knowledge of the Persian, and it is with this view, that it is chiefly studied.

It is not my intention from what I have already advanced, to imply that the arts and sciences are entirely unknown in this country. It is generally, I believe, admitted that many of them took their rise in Arabia, and as the Arabians over-ran and subdued the greatest part of their neighbouring nations, (ff 71r) they diffused their knowledge with their religion throughout the countries, which they conquered, and from thence they gradually spread to the most eastern boundaries of Indostan. Had the nature then of the government been as favourable for the cultivation of the arts in the eastern, as it is in the western nations, of the world, possibly they might at this date have acquired an equal degree of perfection. Whereas on the contrary they have remained in the same state without the smallest alteration or improvement. The mathematicks in particular stand still, and consequently the number and branches which depend upon them. In mechanicks their operations are extremely simple, and the grand principles so well known in Europe, seem now to lay concealed. I say concealed, because from some stupendous works, which I have heard of on the Coromandel coast, I am apt to think they have not always been entirely unknown. Astronomy is little studied and those who have acquired but a very small knowledge of it are able to impose on the unlettered multitude, who are easily persuaded to believe that they have the knowledge ascribed to astrologists, and consult them to fix upon an auspicious day, before they undertake any business of consequence, This superstition seems to have been borrowed from the Hindoos. You will at once conceive a just idea of Indian astronomy, when I tell you, that the system followed seems (ff 71v) exactly the same which was adopted formerly Ptolomeus (?). I have procured

BM: Add Ms 45438: ff 70-3 (p 112-8: Letter Book (to England) 1770-80: Indexed.

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for you an Astrolabe, which a learned man and my acquaintance assures me is the only instrument they have for taking altitudes, or ascertaining the time of the day with precision. It will be forwarded to you by my father, and I shall be happy if it proves new or curious to you. On finishing this letter, if I can find leisure, I shall send you an account of the manner in which it is used, which tho you do not understand the figures, will serve to explain to you the principles, on which it is made.

Physick is studied here, and there are some who have acquired reputation from their having obtained a knowledge of the virtues of a few plants. These indeed and a few nostrums (?) compose the principal part of the science of physick in India. The anatomization of bodies is held in abhorrence and never practised. Consequently their knowledge of the human frame, and the disorders to which it is subject, must be very deceptive.

In a country where the subjects are governed by the arbitrary will of a despotick monark unrestrained by constitutional laws, and where they are hourly liable to the oppressions of his officers, fear is the predominant principle of their actions, and the good or evil which they do seldom proceeds from any sense (ff 72r) of moral obligation. But tho the natives of Indostan rarely practice these virtues which are found to flourish in free states, they are not entirely destitute of written systems of moral philosophy. Persia in former times supplied the East with many works of this kind, some of which are not without a degree of merit. Amongst these are the works of Shegh Saddee and the Ehlak al Musanein. The last of these books is now laying before me, and as it may afford you entertainment, I shall extract a page of it, which, making proper allowances for what it suffers on the translation, will give you an idea of the whole.

On the Proper Use of Time

"It is apparent and manifest to men of wisdom and speculative knowledge, whose illuminated minds cast a lustre around them like the bright rays of the sun, that the life of man passes away like the flashes of lightening, and that the days of his existence like the waves of the ocean are instable and transitory. As every moment that elapses is an irreparable jewel we ought to learn to value it; and as every minute affords us an irrevocable opportunity it behoves us not to let it escape. It is beyond the limits of human power to recall that part of our life which is past, and that which is to come lays concealed under the dark veil of futurity. But betwixt the past and the future, there is a period of time which (ff 72v) is called the present, and being the only part of our life we can actually command, we ought to endeavour to accomplish our ends in it before it elapses. And he alone can be deemed fortunate, who in this fleeting and transitory life acquires reputation and fame by actions of humanity, mercy and benevolence; for fame/like a second life /is and often exists for many generations."

The author then proceeds to illustrate what he has advanced by relating some anecdotes of Moshirvan (?), who reigned about 1200 years ago, and is still famous for his clemency and justice. He afterwards in the same manner goes through the several virtues, shews how far each is conducive to a man's happiness, and gives an instance drawn from authentic history. Many of his maxims coincide with those laid down by our moral philosophers, and the whole book tho written by a Mussulman seldom discover any of the tenets, of which distinguish his faith.

Want of leisure obliges me to draw to a conclusion. To this more than want of inclination you are being obliged for being so soon relieved from the perusing of a dull letter.

Before however that I finish it, it is necessary I should

inform you that the observations I have made chiefly relate to the Mahometan part of the natives of this country; they are indeed proportionately (ff 73r) very few in number, but the Government being in their hands, they have long had the ascendancy and it is their language only that I understand. Possibly I may hereafter trouble you with a letter on the Gentoos, who are with vast strides now daily regaining the pre-eminence.

My father will make you acquainted with the success which has in general attended my labours. On this subject therefore I need say nothing. My brother James is with me. He desires his grateful remembrance to you. He has had a very narrow escape from shipwreck. Accept my best wishes that you may long enjoy health and happiness.

I am
(D. A.)

Mootey Jill
11 September 1772.

in Bengal and the term of that event is supposed by some ... to be at a great distance.

As for the medical art, it is perhaps happy for the Indians that its practitioners have not improved it farther than the hint you have given me of it, and well were it for us Europeans that Asia, Africa and America had not been ransacked for drugs to feed the vanity of some of us and kill the luxury of many more; While the medical virtue of trees, plants, flowers, fruits and seeds, fittest for our food and physick and growing up with ourselves in abundance are so shamefully disused or neglected by our modern practitioners. (ff 284r) But leaving arts and sciences to your further discussion in return to your pompous extract from your favourite philosopher Mussanein give me leave to excite and exercise your curiosity by the following copy of a passage taken from a treatise of natural, or if you please, unnatural philosophy lately published here by a senator of the college of justice. Lord Mantaddo(?) relates and believes that a Swede named Keating Leiutenant aboard a Dutch East India ship of force, saw on the island Nicobar in the Gulf of Bengal a race of men with taills like those of catts which they moved in the same manner. That they were canniballs, ... Now as a tradition of human cats which were seen not earlier than 1647 of our era may yet remain in the memory of some (ff 284v) old inhabitants on the coast of that Gulf, it would not be pains or labour lost to enquire into the truth of a phenomena so singular in its kind a task which lyes at your door to clear up for or against an ugly tail with which his lordship is disgracefully painted in this island. ...

BM: Add Ms 45430: Correspondence of D. Anderson (mostly letters received) 1770-1773: ff 282-5 Note Anderson letter of 11.9.1772 to which the above is a reply is in Add Ms 45438, ff 70-3. There does not appear to be any further correspondence between them nor is their any other correspondence of this nature in the Anderson Collection (Add Ms 45417-41). David Anderson was in the Bengal service, joining the military service on coming to Bengal, from about 1768 to 1785. In the latter years of his service he was for a time president of Committee of Revenue in Bengal. For a year or so in 1781-2 he also acted as ambassador from the Bengal Government to the Scindia(and perhaps to other Marattha rulers also).

David Anderson to his father in Edinburgh: Calcutta Dec 18, 1776
(Extract)

In my letter from Moorshedabad I acquainted you that I was soon to leave that station in consequence of my being appointed to superintend an office instituted at Calcutta for preparing materials for the ensuing settlement of the revenues and for investigating some general subjects relative to the land tenures of Bengal. I have now the pleasure to inform you that I arrived here about a fortnight ago and have entered upon the duties of my new office. The reception I have met with from all my superiors and more particularly from the Governor General has afforded me much satisfaction. The Council have given me a salary of 1200 Rs per month. It is fully adequate to my wishes. To you I imagine it will appear Extraordinary. (ff 126r) If I succeed in the task I have undertaken (and at present I foresee no insuperable obstacle) I cannot fail of getting some appointment at the end of it, at least as good, and in all probability better than that which I have relinquished at Moorshedabad. I have taken a house with Mr Bogle one of my colleagues and Mr Alexander, relation of Mr Russells. With these friends and a very few more I expect to spend my leisure time in a sociable and agreeable manner. I have given you this short account lest I should not hereafter find time to write a fuller one to you and my mother jointly. But the chief intention of my letter is business.

...(about) ...money remitted this year:
(in gold and silver Current Rs 2,448-10
By Bill on Dutch Co for Guilders 12,786-shs 9- sd 8)

..I shall remit to them on my own account about £ 1500 more by the later ships of this year. ....

David Anderson to his father in Edinburgh: 11.1.1778
(Extract)

The following is a short state of my remittances to M/S Tod & Co last year and this: (Details.;(ff 141r)...)
Total £ Stg 6,371-3-0

My principal inducement in remitting so great a part of my fortune to a country where it will bear a lower interest than if it had remained in Bengall, is that I may have a chance of (ff 141v) hearing before I leave India that I have so much money securely disposed of in England and if I can do this I shall think myself independent, even if I were not to carry any more with me.

BM:Add Ms 45438: The first letter to his father is on ff 19v-26r, dated Calcutta 28.12.1770.

D. Anderson to Mrs Campbell regarding the Famine: 1.11.1770
(Extract)

We have had a most severe famine here this last season. History scarcely affords an instance of the like. The number of natives who died merely for want of sustenance is almost incredible; nor have the Europeans been entirely exempted from its effects, for in the months of June and July, the people perished so fast (ff 14v) that the living were unable to bury the dead, so that the heaps of petrified bodies laying exposed to the sun produced an unwholesomeness in the air, to which I imagine may in a great degree be ascribed the sickness which had prevailed amongst the Europeans particularly those of the lower class. The surviving inhabitants are now happily relieved from their distress by a plentifull crop, But the consequences ensuing to the Company from the impoversishment and depopulation of the country will I fear be felt for a long series of years.

D. Anderson to his Brother Francis Anderson, Edinburgh: 10.1.1771
(Extract)

(ff 31v)... The last season was more unhealthy than any of the others which I have passed in Bengal. And a famine prevailed in so severe a degree that history scarce affords a single instance of the like in any age or in any country. The number of natives who died merely for want of sustenance would seem to you incredible. I have myself beheld upwards of 100 dead bodies in the space of a mile. And to this may I imagine the unhealthiness, that subsisted amongst the Europeans be attributed. For the heaps of corpses that lay petrifying in the sun, without doubt produced a contagion in the air extremely pernicious to all who breathed it.

BM: Add Ms 45438: ff 14-15r, 31r-32v: from Calcutta. The letter to Mrs Campbell is the first letter in the letter-book.

D. Anderson to G. Bogle from Patna : 22.9.1778
(Extract)

You will ask me Bogle what is the reason that this district which once paid about 60 lacks is now reduced to little more than 39 ? I will answer your question by asking you another. Is it possible that revenue of a country which annually loses from 15 to 20 lacks of its treasure could continue long at an overstrained rate? I believe I would prove to you also as far as proof can be obtained at this distance of time that the former revenue (tho short of what was raised by Cossim Ally Cawn) was overstrained. I might also justly assign a number of other causes for the decline of the province. I shall at present content myself with mentioning only one of them. Annual settlements made two or three months after the commencement of the season of cultivation. Think what what effects this must produce in a country where the revenue and even the lands are farmed, not by hereditary zemindars but by occasional strangers.

BM: Add Ms 45421: ff 72-5: volume (ff 119, 16.2.1772-12.11.1780) is of correspondence, mostly letters received, with G. Bogle.

John Forbes to D. Anderson: 15.6.1779
(Extract)

(ff 155r) As to my future plans they are confined to one simple one, which is to go home: How soon I can remit money enough to purchase a troop of Dragoons. This will require only £ 2100 above the value of my half pay. I woulf fair hope to be able to effect this matter by the end of next year.

BM: Add Ms 45333: ff 154-5

793k37 (Tracts, Historical and Statistical - on India) by Dr Benjamin Heyne
(Pub 1814, altrediting)
A-V.2

TRACT XXIII.

DESCRIPTION OF THE GLASS WORKS AT MATOD.

THE glass works that I have seen in India are at Matod, among the hills south-west of Chittledroog, and in the ceded districts; but this last is smaller. I confine my observations to the first of these.

The materials used in this manufacture are, 1. Soda. 2. Quartz or compact ironstone. 3. Compact specular iron ore. 4. Copper.

1. The soda is mixed with a notable proportion of common salt. It is obtained from a sandy earth found in many places along the coast on the surface of the ground, and from its use is commonly called washerman's earth. At some places hereabout the salt is extracted from that earth by elixiviation, and the lixivium evaporated by fire, and sold in the bazars under the name of *sobbu*. For the purpose of making glass it is gained in the following manner:—*

Some pits about a foot and a half deep are filled with salt earth, and water is poured upon it. The same portion of water is poured successively upon different portions of salt earth till it is conceived to be sufficiently impregnated with saline matter, which is judged of by its brown colour. This water is then worked into a pultaceous mass with cow dung, and spread upon a straw mat about an inch thick, and dried in the sun. Another layer prepared in the same way is applied the next day, and for twelve successive days it is kept moist by the addition of fresh portions of lixivium of soda. The large cake is then divided into smaller pieces, which, when quite dry, are piled up into a heap and burnt. The fine ashes which are found along with the more solid pieces are kept separate. The latter are reduced to

* I have reason to think that borax exists in some quantity in it; a substance of which the soda of other places on the coast which I have noticed is quite destitute.

powder, stored up, and called *soudu sāram* (essence of soda); because they contain the largest quantity of soda.

2. Quartz (in the language of Canara, bellakallu). What is used here is a little ironshot.

3. Gorykallu. This is an iron ore that comes nearest to the compact brown ironstone of Kirwan (hydrate of iron).

4. Kimmidu kallu (iron glance). Specular iron ore of Kirwan; red oxide of iron, as appears from the experiments of Bucholz; though as the ore in question was attracted by the magnet, I consider it as rather a mixture of black and red oxides of iron than a pure specular iron ore. It is found in sufficient quantities after heavy rains in a nullah near a village called Kadavigada, in the Budela district. The nullah comes from the north side of a hill which probably contains the ore in rocks. This ore is reckoned best when firm and sound. If red ochre appear in the fracture, the specimen is esteemed inferior to the best kind, in the proportion of two to three. And accordingly a greater quantity of it is considered as necessary in the manufacture of glass.

From these few materials the four following kinds of glass are made:—1. Bīza or mother glass. It is a soft, imperfect, porous glass; and is used only as a substratum or basis to the other kinds of glass made here. 2. Red glass. 3. Green glass. 4. Black glass.

Bīza is made of the following ingredients:—

1. The ashes, which remain when the soda is made, and which, as was mentioned before, are kept apart. If these ashes do not contain many grains of salt, five parts of them are taken; but if they are mixed with much salt, three parts are deemed sufficient.

2. Pounded quartz, or bellakallu, one part. These two ingredients are separately pounded and then mixed together, put into clay pots and kept in the heated furnace for eight days. To see whether glass be formed, an iron hook fastened to a long bamboo is dipped into a pot containing the glass materials. If the mass adhering to it be of the consistence of wax, the operation is finished. If not another day's heat is given.

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Red Glass.

It is of a hyacinthine colour, penetrated with large round white spots. It is composed of

Bīza	7 parts.
Soda, or soudu sāram	21
Kimmidu kallu	10
	38

All the ingredients are first separately reduced to an impalpable powder, and then mixed. It requires first three days of slow heat, and then seven days of the strongest fire that can be given.

If more than the stated quantity of kimmidu be taken, the glass acquires a black colour; if less, it assumes a lighter shade of red.

Green Glass.

This glass is composed of the following ingredients:—

Soda, or soudu sāram	21 parts.
Bīza	7
Kimmidu kallu	0¼
Copper filings	0¼
	29½

This glass has a dark emerald green colour with opaque spots.

Black Glass.

This glass is made of the following ingredients:—

Soudu sāram	3 parts.
Bīza	1
	4

Four days moderate heat is enough for obtaining it. The charcoal of the soudu sāram probably gives it the black colour; as it will lose it if the fire be too long continued or too strong. This glass is the least esteemed of all. It is quite opaque and has a close resemblance to enamel.

The common salt contained in the soda separates itself from the other in-

gredients, and is found covering the glass or bīza in a firm crust of one inch or more in thickness. It is very fine and white, and used like sea salt.

The only use to which these different kinds of glass are applied is the manufacture of bracelets, with which the poorest as well as the richest of the Hindoo women (the widows alone excepted) ornament their arms.

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AC8603(6) Vol 6? (1910)
T. D. Pearse
A.V.3.

by Lieutenant-Colonels and Majors, whereas by the Articles of War, I ought not to be commanded by any but Colonels or their superiors."

"The Government here finding the inconvenience of this state of double commissions, have at last been forced to remove General Stuart; and acting under the authority of that order of the Court of Directors which directed that Brevets should be given to keep the command in the hands of their own Officers, they have at once promoted Colonel Lang to be a Lieutenant-General."

"Agreeably to a clause in the Act of Parliament all orders sent to India, are laid before the Secretary of State: therefore the order alluded to, is an order approved by His Majesty's Ministers: consequently, the power to give Brevets was known, and thought to be a proper one, by the superiors of those whose rank so grievously oppresses the Company's Officers, and most so myself, who, having served through the whole war with credit to myself and my employers, am pushed down from the object of every soldier's wishes, and so disgraced, instead of meeting the reward which I have laboured to merit. But this is not the full measure of my grievances, I am about to suffer another of a different nature, as I shall now state."

"In 1768 I came out a Major to Bengal—Horne, a Captain of Artillery, to Madras; to which rank he was restored, having gone home in consequence of having been deprived of his commission. I was made a Lieutenant-Colonel in 1769—Horne, a Major in 1771. After that, he obtained the Brevet rank of Lieutenant-Colonel, and went home again; there he obtained a removal to the Infantry, with orders to rank above Colonel Lang. On his arrival he was appointed accordingly, with rank of Colonel from the 11th October 1772, but if he had remained in the Artillery he would only have been a Lieutenant-Colonel from 1782; and if a Colonel from his arrival, then he would have ranked from the same year, or if he had come on direct in the fleet that was captured, from since time in 1781, consequently, in either case he must have been below me."

"Orders have since arrived, restoring Lang to his rank above Horne; if that had been expressed by taking away the extra rank given solely to put him above Lang, I must have been above him: but the orders remain in force, and so he ranks as Colonel, from a period before he was even a Lieutenant-Colonel, by brevet; and, when he arrives, will except to command me, nor can I help myself, or avoid it, unless you take pity on my case."

"From all that I have written, it appears, that though I have served with credit during the war, I have been continually thrust down by brevetted Officers, who have not served at all, or not till near the close of it; and now I am about to be pushed still lower, by an accidental arrangement concerning the ranks of Horne and Lang, which has been overtured by subsequent orders from home, though the order given in consequence of the arrangement remains in force."

"That the falling lower by the promotion of juniors is deemed intolerable in the King's service, may be gathered from the conduct of McLeod and Humberston, on the Malabar Coast, who retired from the army *whilst on service*, because Mathews was promoted to a Brigadier General, which prevented his being superseded by the brevets of those Lieutenant-Colonels at that time expected, but which had not been received; and by the conduct of Major-General Burgoyne and Lieutenant-Colonel Floyd (*a Colonel by Brevet in India only*) who have now quitted the army in consequence of Colonel Lang's promotion to Lieutenant-General."

"Our feelings, as Company's Officers, are precisely the same; I can at least answer for mine, though I submitted for the sake of continuing to do my duty in my station; but now

stung by the examples or precedents just exhibited, I feel more than over, the indignity of the supersession by local rank."

"I therefore pray you to grant to me superior rank, to support the dignity of the Company's service, and to relieve me from a burthen which King's Officers deem intolerable."

"I am,
&c. &c. &c.
(Signed) T. D. PEARSE."

"MADRAS,
17th September, 1783."

"P.S.—Since I sent off the original, I have learnt that the order, giving power to appoint Company's Officers by brevet, above the King's, was assigned as the cause of Lieutentant-Colonel Crawford's going home; who though only a Colonel by local brevet, could not bear to submit to the thoughts of future supersession, as he termed it."

It is probable that the termination of hostilities, and the return of the Bengal detachment, were the only reasons for non-compliance with Colonel Pearse's solicitation for superior rank, as his claims upon the Government were of no ordinary nature, and the boon but an act of justice to have bestowed upon him.

The mind of Colonel Pearse was not, however, to be altogether borne down by any supposed or real grievances or disappointments; and the following letter, written about this time, shews that the interests of science were not forgotten.

TO THE SECRETARY OF THE ROYAL SOCIETY.

"SIR,

"The small book that accompanies this letter, written in the Persian language, is a copy of a very large one in the same Language, entitled "The Wonders of the Creation." It is in fact a kind of general natural history, extracted by the compiler, from the books of science, and from voyages and travels performed by the Arabians; who, it is well known, had not only a great foreign trade, but extensive settlements in the Islands of the East Indies, where their manners and religion do still prevail. I beg of you to present it to the Society in my name."

"The book opens with an account of the wonders of the heavens and the celestial spheres. The system is the Ptolemaic: to each planet, except Mars and Jupiter, figures are annexed, and blank spaces were left in the book, to be used for the figures of those planets. You will see that the sun and moon are drawn as among us.———Mercury is represented as in the act of writing with paper and pen in his hand, and the ink-pot before him.———Venus is a woman sitting down and playing upon a stringed instrument resembling an Irish harp, but that which occasions this letter, is the figure of Saturn. By inquiry amongst the learned of these parts, Mars ought to be represented as a warrior, and Jupiter as an old man sitting down, with four girls dancing round him. The book says something contrary to this: I never saw the figure, therefore simply relate what was told me."

"The book was written in the fifth or sixth century of the Hegira, and that which I borrowed, and from which my copy was taken, is in the possession of Mr. Palk, in which the figures are all paintings; but the age of that copy I cannot tell."

"It is now time to tell you why I trouble you with this book, though I must first inform you, that I had it copied solely for the sake of the figure of Saturn, and had begun to translate the part that treated of celestial bodies, to send home with a copy of the original to the

illustrious Society about four years ago, but the difficulty of getting the figures drawn, prevented my carrying my design into execution: however, in the year 1780, having got what I wanted, I sat down to do my part. The war with Hyder Ali, however, carried me from home into the Carnatic, and though I have had the part that was intended for the Society with me all the time, yet I really have not had time to translate it, except the small part that ascertains the age of the book and the account of Saturn, in which however there is not any mention of the satellites or ring; and the account of this periodical time, is erroneous, and plainly relates to the seventh planet, *the period of which is about sixty years, and which is very seldom seen, and when seen, deemed ominous to the world in general;* so says the learned Brahmin with whom I conversed. The instant I saw the figure, it struck me as emblematical of Saturn, and as representing him possessed of what, till very lately, we were utterly ignorant of, I mean his satellites and ring. Hitherto only five satellites have been seen by Europeans, he is there represented as having six, and their names, I presume, are expressed by the figures held in the hands; the arms shew that these bodies are movable, but cannot separate from the planet, and are capable of various motions within certain distances; the seventh holds the crown divided into four parts, and this I suppose to mean the four concentrical parts of the ring; the darkness under the arm which holds the ring denotes that the ring does not everywhere touch the body of the planet; the legs folded beneath the body, I imagine to relate to the ring, and to intimate that the ring supports the body of the planet, or, at least, that the body appears to rest upon or within it. I conceive that the long beard and emaciated body, denote age, and represent the slowness of his motion."

"If it be urged that this explanation cannot be just, for the ancients had not instruments capable of shewing them, I answer, it is more than we can prove; and if ever a sixth satellite be discovered, it wi be a strong argument in favour of the contrary opinion. I am much inclined to believe they had better instruments than we have. I must in this letter aim at brevity, therefore shall only say that Alhazan wrote on colours and catoptricks, and the problem of finding the figures of objects reflected from a convex specula, is called Alhazan's to this day. I have not seen Alhazan; if I could get it, I could with the assistance this country would afford me, come at the knowledge of its contents, and perhaps might find telescope; but if not, it does not seem any argument against there having been such instruments; for we know how easily manuscripts are lost, and of such books as those which treat of subjects in which only the learned in particular sciences are concerned, the number of copies will have been few; even now when such numbers of copies of most books are published, do we not find that many are lost, or only to be found in very extensive libraries? Much more easily then might the same thing happen before, when only manuscripts were in use, and when we reflect how few men in any country make use of telescopes, quardents, and such instruments, we may easily conceive that the copies of books treating of such matters would be very few, compared with astronomical tables, which were in greater use on account of their utility in astrology: but these are scarce, and it is difficult for Europeans to get them."

"I shall now adduce something like a proof of there having been telescopes, though perhaps not like our's. First, then, I asked a learned Mussulman with whom I had frequent conversations on those subjects, whether they had any mention of such instruments as we now use; he said 'he did not recollect that there were any, except Alhazan among the Arabs, who had ever, that 'he knew, written on such subjects; nor do I know' added he, 'that he did describe such instruments, but he treats of the principles on which they depend."

"I must here observe, that since Alhazan wrote on colours and reflections, if not on refractions through prisms and lenses; the not finding of any uses to which the specula were applied, will certainly prove that there were not telescopes."

"Let us suppose a treatise on reflection and refraction, and of the places of figures formed by either to be written purely scientifically, without any mention oft elescopes, or any application of the uses of the theorems; that by some accidents, possibly from the revolutions of time, all other books in which telescopes and their uses are described, and all telescopes had perished; if such a treatise were then to be found in any remote period, the finder would not easily discover the use of those theorems, and still less the instruments formed upon the principles therein delivered."

"Alhazan delivered principles—artists might possess the application, perhaps not even committed to writing, but learnt as trades are now learnt, by working and practice."

"A Brahmin, with whom I discoursed, and asked how they made their tables, said that they were formed a long while ago, by means of great pits dug in the earth, in which the celestial bodies were made visible, but what means they used to see them he did not know; he said he could only use their tables, but could not form them—that the sun had formerly delivered the tables to a learned Brahmin, who had continued above sixty years constantly adoring him, as a reward for his labours. This Brahmin agreed that what he said was allegorical, and simply meant that they were formed by a series of observations deligently made: but so little could I make of them from their discourses, that instead of gaining light, I seemed rather to lose them. And though the Mussulman thought of Alhazan as I do, and moreover told me that the observation of the transit of Venus made by our Horrox, which I reduced to the Hegira, was not the first, for that mention is made of one a long period before that in an Arabic book (he quoted the name of it, which I have forgotten, but I have the name in Bengal amongst my papers), yet the want of actual knowledge of the use of telescopes, threw all into doubt. However one day as I was reading an English translation of the "Arabian Nights" I met with mention of these things as common as apples and carpets. Three princes went to seek for curiosities, and the Fairy Purree Bannoo, furnished each under different shapes with what he wanted: to one she gave a small carpet, for an immense price, not from its curious texture, but from its property of transporting him who sat on it to the place to which he wished to go; to the second an apple that would cure disorders by being laid on the sick person; and for the same price she sold to the third, a telescope that was endowed with property of shewing to him that looked through it what he wished to see if he looked through one end, and objects as usual if he looked throught the other, and it is described as a small tube of ivory, having a glass at each end. If then that book was written before telescopes were in use in Europe, and that is ascertainable, then telescopes were things in common use before we had any idea of them; and they are not described as being such as Dolland has since made, they were telescopes, and amongst those who even now mention telescopes occasionally, how few will describe those exquisite ones applied to astronomical observations! That useful inventions perish in time, have we not instances enough? the mummies suffice. Even in our own days have we not seen Dolland perfect telescopes by the addition of three object glasses? And are we not in danger of losing them again from the want of the materials to make one of the kinds of glass used by him? Gunpowder is also thought to be, as I may call it, compared with great antiquity, a modern invention; and yet in 'Gray's Gunnery,' there is a quotation from a Greek author, that gives reason enough to suppose it was applied to guns even in the time of Alexander."

"Much more I could add on the subject, and had written when in Bengal to send to you, but in my present situation I can only add, that the loss of any science is not proof that it

never was known, and all I purpose is to present the figure of Saturn as I found it, and to give you my reasons for explaining the emblem as I have done, which yet remains to be made out by some future discovery of the sixth satellite, the existence of which is not thought to be totally chimerical."

"I shall not scruple to inform you of things which may seem wonderful, which come within my own knowledge. I have the prediction of three comets and an earthquake, which I received long before the events: the earthquake did actually happen, and devasted the extensive regions round Lahore———unfortunately thatpaper is in Bengal———Mr. Hastings has a copy of it, signed by me, with day marked upon the paper, to shew when I received it, which was in June, and I think the earthquake happened in September, or the latter end of August 1779 or 1780."

"But I send to you the copies of the other two predictions one of which was fully verified at Bath, though being on my march, I had not time to look out for it, as I certainly should have done had I been settled."

"The Brahmin has promised me a table of 108 comets, and when I return to Bengal, if he is living, I will endeavour to get them; he says they are of different kinds: some have straight tails, some crooked tails, and some fan tails—some are encircled with a burr, and some without any——again, some are retrograde, some direct, and others cross the heavens. I hardly dare tell you that the books was, as he says, written in the jugg preceding this, and that this began with what we call the Creation."

"When we arrive at some knowledge of the Shanscrit, we may make discoveries of some importance, and either verify the assertions or contradict them. I relate what was told to me; I do not pretend to vouch for any thing, but the man had not any interest in deceiving me. I asked for information after the manner of a disciple, proposed questions arising from the discourse, and making comparison of what he said with our system for further information. He replied, you and the Mussulmans differ from each other and from us: the Mussulman supposes the sun to go round the earth, daily and annually; but the earth turns round its axis daily, according to your system and our's—the Mussulman follow Ptolemy, we the ancient books, and you a system of your own, if not derived from our's.

"Here I must put an end to a letter, which I fear, will prove tedious, more especially as it concerns matters which I relate merely to shew some part of the belief of some of the men of science of the Hindoo tribe, who are not very commfinicative,"

"I am, etc.,
(Signed) T. D. PEARSE."

"MADRAS, *22nd September 1783.*"

The following is a translation of part of the Book that accompanied the preceding letter:—

"The Section concerning the properties of the Sun.

"As the sun is the largest of all the celestial bodies, and is called the great luminary, so the astronomers call it the king of the stars—the Moon, the visier; Mercury, the secretary; Mars, the commander in chief; Jupiter, the judge; Saturn, the treasurer; Venus, the musician servant—the spheres, they call climates; the zodiacal signs, cities; degrees, towns; minutes, parishes; and seconds, houses: and this comparison is a good one, and through the wonderful goodness of the Almighty, it is placed in the fourth sphere, to the end that the productions of value may be preserved in a moderate temperature. For, if it had been placed in the sphere of the fixed stars, the elements would have been

far removed, and the products would have suffered from the excess of cold; and had it been in the first sphere, they would have been burnt up by the violence of its heat. And it is another mark of his kindness, that the sun was endowed with locomotion: for it had stood still, the heat would have been intense in one place, and the cold in another, the detriment of which is well known. But it moves moves over all parts in one day and night, that every part may enjoy a portion of its rays, and in the space of a year, it inclines two ways, once towards the north, and once towards the south, to the end that both extremes may be benefited by it: than praise be the name of God, for He is great!"

"The body of the sun is one hundred and sixty-six times greater than the body of the earth: and the diameter of the body of the sun is forty-one thousand nine hundred and ninety six miles. It remains in each sign, thirty days and a part of a day, according to estimation and daily moves through a degree."

"One of the powers of the sun is, that it makes all the other stars vanish; gives light to the moon; and of the properties of the moon that have been mentioned, all are derived from the influence of the sun."

"Another of its powers is, that when it shines on the seas, and the heat operates on them, vapours arise from them; and these vapours when they reach the air are condensed by the coldness of it and form clouds: the wind transports these clouds to distant places, and produces rain, and so the dead earth becomes animated,'and rivers and springs flow to enliven vegetables and animals till the next year, according to the word of God."

"And it is that God who sends from between the hands of His mercy, the winds to declare glad tidings, that 'when the clouds collect the rain, we will drive them to the dead places, and bring down rain from them, and from that water will be produced all kinds of fruits."

"Its power over minerals is, that the juices are collected within the earth, and when the sun acts on the drops of r[illegible] and the earthy particles, it produces the bodies of the metals, such as gold, silver, copper, tin, iron—and also rubies, emeralds, and other stones—and quicksilver, sulphur, arsenic, salt, and the like, and the benefit of those mineral bodies is well known. And another power of the sun over the earth is, that vegetables and corn and trees grow in such places as the light of the sun can reach them. And it is owing to the power of the sun, that the water-lillies and mezereon appear above the water: according as the sun rises, their stalks rise, and the leaves keep upright; and when the sun has reached the meridian, then it is, that they also are in most perfection, and as the sun declines from the meridian, these also begin to fade; and when the sun sets, they close till the next day. And the power of the sun over animals is, that when the morning light begins to appear they also begin to move, to look about, and become lively; and when the sun is highest, they also do these things most perfectly till the decline; and so the sun falls, their strength abates, and they become as it were weak, till the sun sets, when they retire to their place of rest, cease to move, and are as it were, dead till the sun rises again."

"And another power of the sun is, that in those places where the sun reaches the zenith, as in the countries of the Zangas and Abyssinians, the inhabitants are parched and black, their countenances are ugly, their bodies are dry, and their dispositions are like those of wild beasts: and those people who live where the sun is far from the zenith, such as——and——, have flat faces, are white in colour, and their dispositions are like these of domestic cattle."

"Barahrat tells us that the vertex of the sun remains three thousand years in every sign, and moves round the sphere of the heavens in thirty-six thousand years, and at this time, which is the eighth and fiftieth and six hundredth of the Hegira, it (the vertex) is in Gemini, and that is towards the north; and when the vertex reaches the sign Sagittarius

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which is in the south, the regions of the north will become waste and deserted and the southern quarter which now is waste, will be inhabited, and the parts that now are seas will become dry land, and the dry land that now is, will become sea, and the north will be the south, and the south the north."

Here Colonel Pearse remarks as follows :—

"In this passage the change of obliquity is as clearly mentioned as words can express it, and yet this circumstance also was unknown till lately, and even now is doubted by some, who do not diligently explore the depths of astronomy. I shall shortly trouble the Society with a paper on this subject : time will not admit of it now."

"*Section concerning the Eclipses of the sun.*"

"The cause of eclipses is, that the body of the moon is interposed between the sun, and our point of view, and the body of the moon hides the sun from us, and the rays of light which proceed from the eye, and extend to the body viewed, form a cone ; the apex of which lies at the point of view, and the base of it at the body viewed."

"If then the moon have not any distance in latitude from the sphere of the ecliptic, the whole body of the moon will fall into the cone the whole body of the sun will be taken in. But if the moon have some latitude, then the cone is turned aside from the sun, and according to the degree of latitude some part only falls into it."

"*Division the fifth:—of the Sphere of Mars.*"

"It has two surfaces, the superior surface is turned towards the sphere of Jupiter, and the inferior one towards the sphere of the sun; and the motion which belongs to it, is from the west to the east, and in one year, two months and twenty days it is completed; and the figure of its sphere is like that of the sphere of the moon or Venus, and therefore it is unnecessary to repeat it. The thickness of the sphere of Mars, according to the opinion of Ptolemy, that is to say, the distance between the upper surface and the under one, is twenty thousand and three hundred miles; and the diameter of the body of the sphere is seventy and six thousand and nine hundred and twenty miles."

Section concerning the properties of Mars."

"Astrologers call Mars the lesser evil, because the malign influence of Mars is less than Saturn. Violence, conquest, and rapine are attributed to him. The body of Mars is equal to one-half of the earth nearly, and the diameter is nine thousand, eight hundred and thirty-five miles. And at the time it is direct, it remains forty days in each sign, and moves through forty minutes nearly in each day."

"*Division the sixth :—Concerning the Sphere of Jupiter.*"

"It has also two surfaces, the upper one touches the sphere of Saturn, and the lower one that of Mars, and the motion that belongs to it is from the west to the east, and in eleven years two months and fifteen days, it is completed. And the thickness of the sphere, that is, the distance between the upper and lower surfaces, is twenty thousand three hundred and thirty-two miles."

"*Of the properties of Jupiter.*"

"The astrologers call him the great good, because he brings good, and they attribute to him great charity and felicity ; and his body is equal to eighty-four times and one-third and one quarter of the earth."

"*Division the seventh :—Of the Sphere of Saturn.*"

"It also has two surfaces, the upper one touches the sppere of the fixed stars, and the lower one that of Jupiter, and the motion that belongs to it, is from the west to the east, and in sixty-nine years and five months and six days it is completed ; and Ptolemy says, that the thickness of the sphere is 21,603 miles, and this is the figure."

"*The properties of Saturn.*"

"Astrologers call him the greater evil, because in malignity he is greater than Mars, and they say that from him proceed destruction, and murder, and sorrow, and great grief, and all its accompaniments : God preserve us from him ! And the body of Saturn is one and eighty and one-sixth times greater than the earth ; and they say that the beholding of Saturn produces grief, in the same manner as the sight of Venus does joy. God knows best."

"Prediction of two comets, extracted from a small Almanack, into which I copied them from Mr. Hastings' Almanack before I left Calcutta, which was before January, 1781."

"First—10th January, 1781. One ghurree before day a comet will appear in the form of a flag, *i.e.*, square ; it will be seen fifteen days : it is of the kind called dwudge, or flag ; its period is eighteen years : this will appear a little to the north of the sun."

"Second—March 1781. On the 5th of this month another comet will appear of the kind called vucker, or crooked, from the sphere of its tail : it will appear six ghurrees before sunrise near the planet Saturn, and south of it. On the 25th it will appear in the evening ; its period is 22 years."

We cannot pass this interesting communication without offering some reflections upon the subjects it embraces. The circumstance of the four girls dancing round the figure of Jupiter, as they ought to be according to the Brahmin's statement to Colonel Pearse, is a strong argument in favour of the superior knowledge of the heavenly bodies which the ancient Arabians and Hindus possessed. The four dancing girls evidently represent the four satellites of Jupiter. These *circumjovial* satellites (as they are styled by modern astronomers from the quick of their motions in their orbits) were not known in Europe before the year 1609, and the third and fourth only are visible, and this but rarely and in the clearest atmosphere to the naked eye. But it is truly interesting and curious that the figure of Saturn should be represented with seven arms. At the time Colonel Pearse wrote his letter to the Royal Society, the sixth satellite of Saturn had not been discovered : it was first discovered by Herschel on the 28th August 1789 ; and the seventh satellite, which the seventh arm of the figure, without dispute, must be intended to represent, was not discovered by Herschel until he had completed his grand telescope of 40 feet focal-length, when it was first observed by him on the 17th September 1789. All the satellites of Saturn are so small, and the planet is so remote from the earth, that the best telescopes are necessary for observing them. May not the seventh arm *having hold of the ring* denote a circumstance connected with the orbits of these planets, which is that the planes of their orbits so nearly accord with that of the ring, that the difference is not perceptible? Undoubtedly the ancient astronomers must have possessed the best instruments: probably differing from modern ones, but fully as powerful.

We are not aware that the Royal Society in any of its printed papers have noticed Colonel Pearse's communication, but our imagination, warmly

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1914 Page 280 Interested as it has been in all that relates to the subject of the present memoir, has pictured the possibility that Col Pearse's papers may have met the eye of Herschel, and may have been an additional spur to the indefatigable and wonderful labours of that great man. The thought is to be regretted, as connected with Colonel Pearse's posthumous fame, to let it rest uncommunicated to our readers. We will now proceed with the Memoir.

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Saltpetre
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To the PEOPLE

OF

England, Scotland, and Ireland.

IT has long been an opinion amongst chemists and natural historians, that Saltpetre is a natural production. It has been said to be found in large quantities, on the surface of the earth, in many parts of the East-Indies, and in Persia, where it is reported to impart a coldness to the atmosphere; but some late enquiries made by persons who long resided in those parts, give reason to suspect, that the whole of these accounts are propagated out of policy by the natives of those countries, merely to preserve in their hands the manufacture of so useful an article of trade. If true, no doubt remains but they put it in practice, to all enquiry made by strangers. The Eastern Nations are well known to be inhabited by a jealous, subtle people, who will not permit Europeans to enter into their places of art or manufacture, from which I would infer, that the accounts given by voyagers so often contradict each other as leaves them but little to be depended on. I have been told by some that it

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grows ſpontaneous on the ſurface of the earth about Calcutta and Bengal; by others, that it is made a far up in the country, and ſent to thoſe places as ſhipping ports. This creates doubts, nor can I learn from them, that they, or to their knowledge, any others have gathered or made trial of it. The deſcription they give is, that the earth is of a grey colour, gritty, and ſparkles in the ſun. Thoſe who have attentively conſidered the earth in the Weſt-Indies may be of the ſame opinion, it having nearly that appearance, but is no more than the nature of the loam, ſuppoſed to be the effect of the ſun and air. If my information is right, the greateſt part of the Saltpetre that is brought from India is produced chiefly in and about Patana, from the rubbiſh and offall of that city, and its environs, which is a great diſtance from either Calcutta or Bengal. It is well known the Eaſt-India Company have at Patana factories for collecting of raw ſilk and Saltpetre. From the foregoing I wiſh not to be underſtood that this Salt is no where found in a native ſtate; it is often found adhering to large rocks, and in ſtone caverns, alſo under the arches of bridges, fortifications, vaults, &c. In theſe places it is found in ſo ſmall quantity as not to anſwer the expence of collecting. It is to be found in certain and uſeful quantity in a native ſtate in many plants: On them I ſhall treat more hereafter.

The manufacture of Saltpetre is no longer confined to the Eaſt-Indies, but is carried on with equal advantage in ſeveral countries in Europe; namely, in Germany, France, and Poland, where they do not pretend, that it grows on the ſurface, or in the bowels of the earth, but ingenuouſly confeſs, that they produce it from a combination of

of different ſubſtances. I ſhall give ſeveral proceſſes in the courſe of theſe ſheets made uſe of in thoſe countries with ſucceſs: but before I proceed to this compilation, with hints and remarks, I ſhall obſerve, that to be a Saltpetre-maker, or refiner of that brought from abroad, doth not require a knowledge of chemiſtry, there being no chemical preparation to be performed in either; but being aware of that general opinion, and to anticipate the expert chemiſt who deals largely in the marvellous, and may ſay here is nothing new, and go on with indifference, he cannot ſee the utility of publiſhing it, ſuch haſty concluſions being common, from a ſuperficial view of things we are pretty well acquainted with; but not to tire the reader with a tedious and uſeleſs confutation, ſuch aſſertion is very ſhort of the truth; and I ſhall only reply, it is not particularly deſigned for them or the learned theoriſt; but is calculated for every capacity to work by, in order to eſtabliſh a branch of trade greatly wanted in this kingdom. From this treatiſe they have the advantage in ſmall compaſs of knowing the moſt that hath been written or done uſeful on the ſubject. The Engliſh writers hereon, in general, confine themſelves to wood aſhes only, and a proper acid, but many reaſons concur to point out, that a greater ſupply of materials are wanted in this country.

Crammar, a German chemiſt, of conſiderable note, recommends the following, which, he ſays, is followed with great ſucceſs in many parts of Germany; he orders ſtone lime, or ſtone lime rubbiſh from old buildings, or from whatever elſe it is uſed in; garden mould, wood aſhes, wood ſoot, all ſour or bitter herbs of all kinds, to be mixed together, and moiſtened from time to time with human

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act of turning the wheel of the law. In this city Buddha was worshipped for upwards of a thousand years, after the Brahmins had driven his followers out of Benares. So the two great strongholds of the rival faiths flourished for many centuries within sight one of another.

At length the Brahmins seem to have been goaded out of all their usual theories of toleration, and falling suddenly on their unsuspecting neighbours, sacked and burned the monasteries, overthrew the colleges, and reduced the city to ashes, while such of the terror-stricken inhabitants as escaped the sword fled for their lives. So sudden was their flight, that they left their bread half-baked in their little mud ovens, and there it was found in very recent years, buried beneath the general pile of ruins that the fire had in some measure spared. Amongst these were numerous statues of Buddha and other images, and elaborately carved stones, but so little value was set on these precious relics of antiquity that they were carted away wholesale, and cast into the river Barana to serve as a breakwater to the piers of the bridge!

The multitude of carved stones of unmistakably Buddhist origin, which are built into so many Brahmin houses at Benares, tell their own tale. There are capitals carved with lotus-leaves, shafts of pillars, and more especially broken umbrellas of stone, just like great mushrooms, which were once the most sacred symbol of Buddha's sovereignty. The great round tower, the ruins of which are so conspicuous even as seen from our post on the minaret, was one hundred and ten feet in height, and ninety-three feet in diameter, its top being of ancient brickwork. This, until a very few years ago, was cased with finest stonework, all carved with lotus-leaves and blossoms, with figures seated therein, contemplative Buddhas floating on still waters. Now the carved stones have been removed, and there remains little more than an unsightly heap of rubble.

Descending from our high post of observation our next halt was at a private house belonging to Maun Singh, where a great terrace of stonework acts the part of an astronomical observatory, or Man Mandil as it is called—*Man* meaning measurement, and *Mandil* the Globe. On the terrace are built all manner of huge sundials and other astronomical instruments, of solid masonry; contrivances for finding out the declinations of stars, the meridi-

onal line, and other things, also an enormous *gnomon*, globe, and huge stone buildings like giants' playthings, just like those we saw in the great ruins of the observatory at Delhi. All these things were elaborately explained to us by a very scientific old Hindu, who, in the abstruseness of his calculations, had quite forgotten his raiment! This old man is a very important person in Benares, as is the astronomer or astrologer in every community of Brahmins, for no Hindu will do anything important without consulting the stars, and a regular astrological almanac is published for the convenience of such as cannot conveniently go in person to the astrologer, a process which is at once simpler and more economical. There were formerly some great instruments of brass belonging to this observatory, but these were removed, and are still preserved by the Hindu Princes of Rajpootana.

Once more we plunged into the mazes of the city, into the noisy thronged streets, with their quaint architecture, their intense lights and shadows, their brilliantly coloured figures sprinkled here and there, amid a crowd of which the vast majority were clad and turbaned in dazzling white, and garlanded with flowers, while all the small boys, too young to wear the turban, were adorned with brilliant skull-caps of silk, embroidered with gold and silver.

Now we turn aside into a small dark shop. Thence we were led along dark, winding passages, till we reached a small upper room, where, at the bidding of our guide, one roll after another of priceless *kincob* were spread before our admiring gaze. *Kincob* is that marvellous silk and gold brocade for which the looms of Benares are so justly celebrated. Brocades of every brilliant hue, wrought with richest patterns of gold and silver, the most gorgeous materials you can imagine. What their price per yard was we hardly paused to enquire, so obviously were they far beyond our reach. Not that we coveted them particularly, even as hangings, and no one but a Begum, or a Ranee, or their spouses could wear such stuffs. Their own rich colouring harmonizes all this splendour, so that dress and wearer are all in keeping, but the fair skin is overpowered by it. And nowhere is the perfect Oriental taste in colouring shown more strikingly than in this exquisite manufacture. The one standing miracle is how these natives, who can devise and execute such designs—so perfectly becoming to themselves—can ever be guilty of showing a c ner of toleration for

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Public Despatch to Bengal: 28.4.1841 (No 9)
(Extract)

21. (Reply to 6.3.(4) of 1839: para 91 "The period of Capt H. Drummond's services in making mineral researches in Kumaon and Gurhwal extended six months). Approved.

59. (Reply to 20.5 (14). 1839: paras 19-20; and 21.8 (26). 1839: paras 39: Report on Copper Mines by H. Drummond) We observe that a limited experiment has been authorised in one of these mines for purposes of procuring information which is considered necessary to enable individuals to judge the expediency of investing private capital. We approve of your determination not to sanction any continuous mining operations at the public expence.

IOR: E/4/765: Report on Copper Mines published in Journal ASB:

A.V.(6)

EI Company to Captain Drummond: 9.10.1845

No 3875
Captain Drummond, Bondall, Derbyshire

Sir,
I have laid before the court of directors your letter dated the 23rd August last, recommending that the mining researches in Kumaon and Gurwal, formerly commenced under your superintendence, may be resumed, and that you may be authorised to take out for that purpose a small establishment of miners and mechanics from this country; and I am directed to inform you in reply that the court cannot comply with your request, but that a copy of your letter and of its enclosures will be forwarded to the Government of India.

East India House
9th October 1845

I am &c
James C. Melvill, secretary.

IOR: E/1/283: Misc Letters Out: 30.6 to 31.12.1845. (No 2485-5119)

India Revenue Despatch: 31.3.1841: No 4
(Extract)

(Reply to Pro Mis Dept NWP: 15.1, 26.3, 6.8, 29.10.1838 & 22.4.1839)
2. On the subject of resumptions, and claims to hold lands rent free, it is our intention shortly to address you in a separate despatch.

32. We have perused with much interest, the able report here referred to of the late Capt Herbert, on the mines and metallic productions of Kumaon and Gurhwal. (p 659)

33. We think it very desirable, that the reports of public officers, containing information valuable to the community, especially those relating to the statistics or natural productions of India, should not be confined to mere record on your proceedings, but that when, in the opinion of your Government, reports of this description may be advantageously (p 660) circulated, and when they cannot obtain circulation through the medium of public societies, a suitable number of copies should be printed, under the authority of Government, for that purpose. In all such cases you will reserve fifty copies for transmission to us.

IOR: E/4/765: Despatches to Bengal

Bengal Public Despatch: 5.2.1851(No 4)
(Extract)

39. (Reply to Bengal Public Letter 4.10.(26) 1848:2: "Visit of Lt Briggs to the Sehorah iron mines in the Jubbulpore district, orders issued respecting the transmission to Calcutta of the ore and iron collected by Lt Briggs") We await the result of the examination of the iron at the Presidency.

IOR: E/4/808 ?

Letter from the Governor General: 23.11.1850: No 6: Home Genl Dept

To
The Hon'ble the Court of Directors of the East India Company

Hon'ble Sirs,

I have the honour to forward the accompanying copy of a report on Indian Iron submitted by Major H. Drummond.

2. I have recently appointed several gentlemen to the duty of surveying the Salt Range, with a view to the investigation of the mineral wealth said to be contained in that district. Before they terminate their duty, I propose to request them to examine some (p 864) iron mines in the neighbourhood of Simla, which are said to be of great extent and value. Their report may possibly give encouragement for undertaking some such experimental operations as those suggested by Major Drummond.

I have the honour to be with the greatest respect
Camp Umritsur, Hon'ble Sirs, your most faithful humble servant
the 23rd November 1850. Dalhousie

India Public Desptach: 26.3.1851: No 5

1. We have perused Maj Drummond's Memorandum with much interest, and consider him entitled to great credit for the pains which he has evidently taken to make himself acquainted with the iron districts (p 1026) of India, as well as with those particulars relating to the production of iron in other countries, which bear on the question of the probable success of measures for working the iron ore which India possesses.

2. The Governor General states that it is his intention to depute those gentlemen who are now engaged in the survey of (p 1027) the Salt Range, to "examine some iron mines in the neighbourhood of Simla which are said to be of great extent and value, - whose report may possibly give encouragement for undertaking some such experimental operations as those suggested by Maj Drummond".

3. We shall accordingly await the further information to be (p 1028) expected from the enquiries of these gentlemen assuring you in the meantime that we shall be prepared to give our cordial approval to any measure of an experimental nature which may seem advisable, with a view to testing the quality of the iron of the hills, and the probability of its successfully competing in the Indian market (p 1029) with the iron received from this country.

We are your affectionate friends,

London, 26 March 1851.
(Note: Remarks in pencil against the underlined also in pencil:
1. Very good so far 2. But the quality is well known. 20 to 30,000 people are employed in "scratching" up the ore. I would ask - why not offer to transmit skilled iron workers forthwith? And also request GG's opinion about incorporating "Iron and Mining" Companies. JCW (? M))

IOR: E/4/808: Despatches to Bengal: Laid before the Rev, Jud & Leg Com 25.2.1851, approved 5.3, app Ct 12.3, Bd 19.3.1851; Coll 25 pages)
: /42: Public Letters from Bengal for 1850: Memo dated Almorah 1.11.1850 on pages 839-62.

NOTE: India Public Despatch No. 16 of 1845 (22nd October) "forwarding correspondence with Capt H.Drummond regarding proposed mining operations in Kumaon and Gurhwal" seems to be the origin of the above Memorandum. Drummond's letter dated 25.8.1845 (and enclosure) is not in Misc Letters Recd (E/1/188 for 1843-60). The reply dated 9.10.1845 however is entered at No 3875 in E/1/283 (July-Dec 1845)

IV

Walker on Smallpox vaccination

A.V.7

Vaccination

The casts of India have been long a theme of reprabation. Their effect upon the people is alledged to have made them immoveable and incommunicable. In short that they have been rendered as unwilling to impart as to receive knowledge. Experience must long ere this have proved the falsity of this opinion.

In matters of mere habit (430) and taste they will give the preference to their own modes. These are less the objects of reason than the force of custom, which is every where a second nature.

In affairs of a serious nature, I scarcely ever knew them to reject what was substantially good and necessary. Of this our merchants are sensible.

We have another strong instance of this disposition in the almost universal reception of the practice of vaccination. In the parts of India where I resided it may (431) be asserted that the people evinced much less difficulty on the subject than they have done in England. I never knew half a dozen of Indians who refused it. Two of these were men of rank, who were universally condemned by their own countrymen for their bigotry and low prejudices. It was scarcely a case of cast, as one was a Mahometan* prince and the other a Hindoo** Governor of a Province. On the other hand Princes*** much higher than either of them, Bramans and men of rank and (432) family, hailed vaccination as a boon from heaven. Mothers were known to bring their children from a distance to have the benefit of the operation. The following extract of a letter from a Medical Gentleman may be produced in confirmation of this; this is the only one that I have preserved tho' numerous similar testimonies exist.

National Library of Scotland: Walker of Bowland Papers: (181. d. 11)

* The Nabob of Cambay.

** Ragonath Row Sir Suba of Ahmedabad.

*** The Guicawar Raja and his family.

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About the same period a European woman resisted all the entreaties and arguments that were anxiously made to induce her to have her child vaccinated. (433) It appeared that she had lost two children by the smallpox; but she obstinately replied to those who solicited her to save the one that remained by vaccination. "No ! I shall not give my child a bestial disorder."

Extract of a letter from the Vaccinating Surgeon at Dohud dated 16th September 1805.

"We found the minds of the people much more plaint than possibly could have been expected, and less biased by prejudice or superstition than those more hackneyed in civilization (434). Indeed we met with that kind of confidence which ought to command esteem as it arose from a modest resignation to our judgmenent associated with an opinion of our disinterestedness and humanity.

Royal Society to East India Company

No 169

To

The Chairman and Court of Directors of the East India Company,

Gentlemen,

I have communicated to the Royal Society the valuable pacquet from Fort St George; the extracts of the general letters from your President and council of the same Fort, and from the Governor and council of St Helena; and also, the obliging compliments from yourselves, as conveyed by your secretary.

I have now the honour to present to you Gentlemen, the thanks of the Royal Society of London, for your many and great favours to them, and to the whole astronomical world. I doubt not it will (p) appear, that the observations executed by your favour, in several parts of the East Indies, exceed all that have been ditected by the various potentates of Europe and that you have therefore, a capital share in determining the absolute limits of our solar system. This business is intimately connected with the investigation of the longitude, and, permit me to wish, Gentlemen, that the fruits thereof may be experienced in the safety of your extensive navigation.

A.V. 8

I have the honour to remain, with great truth and respect, Gentlemen your most obedient, and most obliged humble servant

Chas Morton
secretary.

Royal Society,
April 26, 1762.

No 299

Sir

The Royal Society having resumed their meetings with the return of the terms, I did not delsy to communicate to them, the very obliging orders and information of the Court of Directors, contained in your letter of the 20th of July.

The President and the Society are so extremely sensible of the great goodness of the Court of Directors, in the whole progress of this business of the Transit of Venus, for now more than two years; and of the advantage that not only they, but useful science has reaped, from your powerful and generous assistance, in the vast extent of your settlements; (p) that they are utterly at a loss, for means to express it. What they could, they endeavour to do: They unanimously requested Robert Burrow Esquire one of their Body, to present to his brethern also in the direction of the East India Company, their thanks, in the most ample manner: And I am charged officially, to attest the same in writing; and to congratulate the Court; if any advantage has, or may accrue by our meand to your navigation.

That your trade may prosper ! and diffuse knowledge over the Globe ! and repay your labours with the riches thereof ! is the earnest wish of those who are greatly obliged to you, the Royal Society of London. (p)

Permit me to add my own particular compliments to youeself, who have the honour to remain; with great truth and esteem, Sir

Your most obliged, and most obedient humble servant

Cha Morton
secretary.

Royal Society,
November 8, 1762.

IOR: E/1/44: Letters Received by the E.I.Co: 1762

NOTE: E/1/45 (1763): No 52 is from Secretary Royal Society, "soliciting the help of the court in regard to steps proposed to be taken to compare the Chinese and Egyptian languages, as it is conceived that there may be some agreement between the two writings" dated 5.3.1763.

IV

Inoculation
Madras Enquiry
1800

A.I.19

Gentlemen,

I have the honour of forwarding the returns of the sick in the southern division of the army for the month of May, June, and July. I have likewise the honour of informing you that I have inoculated for the small pox 225 persons of different description; and with such success (having (1353) had not one casualty) as has in a great measure done away the prejudices of the natives against this practice; of the above number 212 have been inoculated in the course of the last 20 months, and 86 since the 14th of May last; of the whole 23 only were the children of Europeans, the rest consisted of Moors, Gentoos, Malabars, and Christians; but by much the greatest number of the latter, owing I believe to my having inoculated two Portugese Padries in May and June last, who having the disease favourably have in consequence strongly recommended it to all the people of their persuasion and I have now upwards of 50 patients from villages at the distance of ten, 20, and even 30 miles. I have inoculated some since the 18th and do not propose inoculating any more on account of the unfavourableness of the weather till after the Monsoon when I have no doubt of its becoming very general; as soon as my present patients (1354) are perfectly recovered I will have the honour of giving you a more particular account.

I am etc.
J. Richardson
Head Surgeon
Southern Division

Trichinopoly
25th August, 1800

India Office Records: Madras Military Consultations: P/254/61: pp.1352-4: Letter from Head Surgeon J. Richardson to the Medical Board.

The Board proceed to read and pass resolution on the following proceedings of the Medical Board.

Medical Board: 5.9.1800

We have much pleasure in finding by the enclosed letter from Mr. Richardson head surgeon in the Southern Division that the practice which was several years ago introduced by Mr. Mein a member of this Board for inoculating among the natives for the small pox has lately been followed up with much success.

It deserves particular notice that 86 of these patients were inoculated under the unfavourable circumstances of the hottest season and we conceive it might be of advantage that some public notice were taken of Mr. Richardson's humanity as an encouragement to the other medical gentlemen throughout the service for a continuance of this beneficial practice.

Resolution: 9.9.1800

The Right Hon'ble the Governor-in-Council will direct his approbation of Mr. Head Surgeon Richardson's humane conduct to be expressed in general orders and will authorise his being paid the sum of five hundred Pagodas as a compensation for the expense which he may have incurred during his humane and meritorious attention to the numerous patients whom he had under his care.

India Office Records: Madras Military Consultations: P/254/61: pp.1346-8 (Extract)

To

William Petrie Esq.
President and Members of the Board
of Revenue

Gentlemen,

1. The Governor-in-Council being dewirous of giving every degree of encouragement to the practice of inoculation, among the natives of the peninsula, I am directed to transmit to you the accompanying copies in the Malabar language, of the report, which was lately published under the orders of His Lordship-in-Council on that subject, and to desire that they may be circulated by the Collectors in the Districts under their charge respectively, and that you will instruct to explain to the natives the object intended by his Lordship-in-Council.

2. You will order Gentoo copies of the report to be circulated in those districts, where the Malabar language is not understood.

I have the honour to be etc.

G. Buchan
Secretary to Government

Fort St. George
13th October, 1800

India Office Records: Madras Public Proceedings: P/242/24: pp.3320-1

.....

The season advancing most favourable for inoculating for the small pox we consider this the most proper time to solicit the attention of Government for diffusing amongst the natives a practice which experience has proved to be attended with such salutary effects. As the Medical establishment will not admit of surgeons undertaking long journeys without specifically knowing what they may have to execute we are of opinion that the most eligible mode of acquiring the necessary previous information would be to issue orders to the several collectors to furnish government with correct lists of all the native inhabitants of all casts and description in their different districts who have not had the small pox and particularly to specify the names and place of Residence of all those that wish to submit to inoculation.

The publication which Government has already been pleased to circulate to the natives of Mr. Richardson's success will greatly tend to overcome their prejudice to this practice and when the reports of the collectors are received, and information thereof communicated to this Board, we shall not fail to use every means in our power to render inoculation general throughout the country.

We have the honour to acknowledge (p.2641) the orders of government on the subject of establishing a general dispensary and will as soon as possible submit to Government a plan for conducting such an institution.....

Resolution of the Governor-in-Council 18th November, 1800 - approved and ordered.

India Office Records: Madras Military Consultations: P/254/63: Dated 18.11.1800 from Medical Board to Government Dated 17.11.1800 pp.2638-41.

Sir,

I am directed by the Board to transmit you copy of a letter from the Secretary to Government in the Public Department and Commercial Department conveying the orders of his Lordship-in-Council for affording every degree of encouragement to the practice of inoculation among the Natives of the Peninsula and for which you are directed to circulate, through your districts, the accompanying report in the Gentoo language, on the subject, lately published by the authority of Government.

I am Sir, your
obedient servant

J.B. Travers
Secretary

Fort St. George
27th November, 1800

India Office Records: Madras Board of Revenue Proceedings: P/286/46: Dated 1.12.800: pp9929-30.

Translation of a Gentoo Paper which the undersigned Woodia Brahmins of the Village of Chempanpuram Aggraharam in the Fukally district, have written, respecting their practice of inoculation in the districts dated 21st December, 1800.

Wherever the natural small pox may prevail the Bramin inoculators in the beginning of the month of March, go and examine the nature of the disease, if they find the pustules to be on the surface of the skin and of the favourable kind they then ~~punch~~ prick them with the end of a paddy grain and receive the matter in cotton; which is afterwards taken down to a place appropriated for the purpose of invoking the diety of the small pox, when the ceremony is performed, the matter is squeezed into a skill (still), and grains of rice are put into it to absorb the matter, these grains of rice are technically called the seed.

The person who is to be inoculated by these Bramins must wash himself in cold water taking with him an addah of rice and a Dub and is to proceed to the place where the diety had been invoked, deliver the rice and Dub to her; then the inoculators make incisious with a ~~lament~~ lancet, above his wrists filling the wounds with matter, giving the person to take, inwardly one of the seeds.

The person must bathe himself in cold water seven times a day and his diet be butter milk and rice or rice and sour ~~coufee~~ kanjee for seven days, when a fever will come upon him and ~~on~~ on the third day the pox will appear on his body. Then the following prescription is to be followed. The juice extracted from the leaves of the plants called (in Gentoos) Dandankoo are to be mixed with lamp oil

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India Office Records: Madras Board of Revenue Proceedings: Dated 26.1.1801: Enclosure in letter from Collector Chicacole dated 16.1.1801: Translation of a Gentoo paper on the native practice of inoculation. pp 831-5

and tamarind juice, and this mixture is to be rubbed on the persons head. When the fever will abate a decoction of cloves, nutmeg, coreander seed, commin seed, and sugar is to be given inwardly to carry the whole off. If the patient bathe himself for eleven days once every day the Pox will become fellucid, and then an addah of rice a Dub is to be given, and on the 13th day boiled green gram with mooroongah leaves, and the crust of ginzzellee oil seed with some balls made with rice flour are to be put in a winnowing pan, which after being carried round the persons head three times is to be conveyed out of the village where the god of the village is kept, and then thrown before him, On this day an addah of rice and a Dub is to be given, After these three ceremonies are performed. By the 14th, 15th, and 16th day the poes will fade when cooled, boiled rice with water pumpkin, mooroongas, Gangoorah or some greens, is to be given to the patient. After all the Poes, are fallen off entirely he is to be bathed in warm water, and a quarter of a rupee is then to be given as a present to inoculators. In this case life and death is in the hands of the almighty god. This practice has been in use ever since these two or three ages.

The manner in which the practice of inoculation first originated is as follows. On the side of the river Ganges, the ammauvar, or the diety of the small pox commanded the practice of inoculation to be used. Afterwards the Bramins of the wood country went there and learnt the art and the necessary prayers etc. and afterwards came to this country and practiced it in this manner. The practice after became to be used in the Teckally and Kemidy districts and has since been known both in the Havelly and the Vizianagram districts.

The following an inoculated person must not eat till he finally gets well, for they will not agree with him; Brinjals, Ginzele oil crust, mooroonga leaves, vegetables, platains, coconut, flat rice cakes, fish and flesh, sweetmeats, and great care is to be taken that the person inoculated does not subject himself to Venery nor should there be any, in the house where a patient is.

Signed in Woodiah - Gopunatho Rudry, Ranye Shettoportoy, Chundrancharloo, Balabadra Hootah.

A true copy of the translation - Peter Cherry
Collector.

The Board having received from Government copies of ~~our~~ advert calculated han for encouraging the practice of inoculation in the territories under the Company's authority transmitted translations of them in the Tamul and Talinga languages to (p.5331) the collectors of the several districts with orders to circulate them and explain to the natives the object intended. The extract from the proceedings of the Medical Board on the subject was also furnished to the Collectors with direction for furnishing the medical gentlemen with correct lists of all native inhabitants in their districts who might not have had the small pox, specifying the name and place of residence of those who were willing to submit to the operation.

In reply to these orders Mr. Scott forwarded the addresses noticed in the margin the first of which the Board submitted for the consideration of Government, and as it appeared therefrom, that the attention of Vassa Reddy Veneattadry Naidoo the zemindar of Chintapilly had been previously devoted to the important object of introducing inoculation they suggested, in consideration of the singular attention evinced by this zemindar for the happiness of the inhabitants of the zemindary that his Lordship should address him in approbation of his past conduct and stimulate in his future exertions in the cause of (p.5332) humanity.

The Board also recommended that Mr. Asstt. Surgeon Peat might be allowed what might be deemed an adequate allowance to defray his additional expenses for superintending the sick during the season of the year proper for inoculation.

With their recommendation government were pleased to comply intimation of which was accordingly sent to the Collector and

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India Office Records: Madras Board of Revenue Proceedings: P/ /
Dated
Minute of the Board of Revenue on Inoculation: pp. 5330-39

the letter from his Lordship to Vassareddy was forwarded to him wherein he was informed that a mark of approbation would follow to commemorate the sense government entertained of his humane and singular good conduct; the receipt of this by the zemindar with due respect was reported by the Collector under date 16th February, 1801.

Mr. Scott noticed the alacrity with which Mr. Peat afforded every assistance in his power to the interesting object intended by Government. But as that gentleman was removed from Guntoor and having been previously much occupied, as he had not been able to proceed in the proposed plan of inoculating the inhabitants, the (p.5333) stated the necessity of postponing the practice thereof until another season, this was accordingly reported to Government.

On the 30th March the Collector forwarded copies of letters and enclosures received from Vassareddy Vencatadry Naidoo relative to the success of a native doctor named Nagalingam deputed by him to inoculate the inhabitants of Jageerdamoody where the small pox had broken out, he also noticed his having desired the doctor to be sent to him and requested sanction for making him a small present. This recommendation the Board sanctioned and Mr. Scott accordingly reported that he had presented him with two gold wrist rings, at the same time describing the mode of inoculation practiced by this man (in the presence) - - - - and that of Mr. Wise the surgeon at the station. From the practice it appeared that, though in Guntoor alone 300 persons of all ages had been inoculated, there had not been a single instance of death in the village or its neighbourhood.

The Collector at the same time transmitted various papers on the subject from which it (p.5334) appeared that the inhabitants of the Guntoor Sircar were so far from being averse to inoculation that they were very anxious the persons who practiced it should be sent to them,

and he suggested that the same person who had succeeded so well in his district might when the proper season returned, be sent into others to endeavour to introduce it into them also. He also noticed the desire of Vassareddy that certain Swartum which he had conferred on his two doctors, Nagalingam and Veerashim should be confirmed to them, and reported that the practice of inoculation had been stopped for the present season. It is the Board's intention to desire Mr. Scott at the proper season to prevail on these persons to proceed in their labours southward to commence in the village in the immediate vicinity of their present practice that it may be gradually extended by the parties having daily proofs of its success as they travel south.

Mr. John Read and Mr. Peter Cherry Collectors in the 4th Division Masulipatam and the 3rd Division Vizagapatam, having by mistake of the orders of the Board, under date 22nd November, 1801 forwarded lists of the (p.5335) inhabitants in their districts who had not had the small pox, those were returned and it was explained to them that they ought to have furnished them to the Medical gentlemen in the districts to whom they were directed to afford every assistance in their power to induce the whole to undergo the operation.

Mr. Cazalit, Assistant Collector at Masulipatam noticed that though inoculation had been introduced into some of the zemindarees people in general were averse to it, and Mr. Cherry Collector of the 3rd Division Vizagapatam stated in his address that it had for some time been practiced in the Northern parts of the Circars by the Woodiah Bramins and forwarded a paper given in by some of them, accounting for its origin, and describing the mode of treatment that ought to be observed. Notwithstanding its being practised by the Bramins the Collector remarked the villages were averse to it and seldom called in the assistance of the inoculators unless they dreaded the ravages of the disease.

As it appeared that it would be advantageous of some of the Woodiah Bramins, whom the Collector (p.5336) noticed as practising inoculation in his district, would be prevailed upon to proceed for the purpose to the Southern districts the Board desired him to endeavour to prevail on some of them so to do, and report what they would consider as an adequate compensation and that ~~our~~ Enaum would ultimately be bestowed upon them, but they observed that his own personal exertions could alone overcome the prejudices they would of course at first feel to the measure.

The Collector replied he had in obedience to the Board's directions sent for the Woodiah Doctors and could report the success of his endeavours to prevail on them to proceed to southward and the terms on which they might agree to undertake the journey.

Mr. Skinner, Collector in the 2nd Division Masulipatam informed the Board he had attended to their instructions on the subject of inoculation but without the desired effect as none of the natives could be prevailed on to submit to the operation. The Board informed him in reply that they did not expect the establishment of this practice so much from a mere (p.5337) circulation of the advt as from his own personal exertions and expressed their opinion that if a few leading people would be induced to submit to the operation others would follow their example and as the attention of the faculty had been particularly enjoined to this important object the practice of inoculation might be established in his district in the ensuing season.

They also informed him they had, to assist his exertions, desired Mr. Cherry to endeavour to prevail on some of the native Wodiar Doctors to proceed to the southern parts of the Circars.

Mr. Branfill, Collector in the 3rd Division Masulipatam having reported that the prejudices of the people were so great

against the practice of inoculation that no persuasions could prevail on them to submit to it, and that, with the hope of inducing others to follow the example, he was endeavouring to persuade some of the more enlightened natives to have their children inoculated. The Board forwarded to him the enclosure in Mr. Cherry's letter given in by the Wodiah Bramins and desired to circulate it generally in expectation that the (p.5338) inhabitants of his district might from respect to the high authority to which the origin of the practice is therein ascribed be prevailed on to undergo the operation, and at the same time expressed their hopes that his exertions joined to those of the medical gentlemen in the district would finally succeed in establishing the measure.

The request of Mr. Hurdis the Collector at Dindigul to have medical assistance afforded him to forward the introduction of inoculation, and for other important purposes was submitted to Government, and the Board recommended, if a medical gentleman for the purpose could not be spared from the establishment, that the Collector's proposal of employing Doctor Rathor might be acceded to.

Major Macleod, Collector at Salem, reported to the Board that he had complied with all their orders on the subject and taken every measure in his power to introduce the practice of inoculation. He also gave it as his opinion that there was a prospect of making an early beginning in his district the beneficial effects of which would very soon be generally known and overcome (p.5339) former prejudices.

The Board observed the Medical Board recommend that Rungadass (of) a native practitioner should be stationed under the head surgeon at Forst St. George and Moresawvery Pilla under the head surgeon at Trichinopoly on a slary of 10 Pagodas monthly. Perhaps a slary of 5 Pagodas each and a gratuity of 10 or 15 Pagodas for every 100 patients they inoculate and recover in the course of the year would be a better mode of reward, but the consideration of this matter rested with Government.

Ordered that a copy of the foregoing Minute be sent to Government.

4th. I have to aknowledge the receipt of your Secretary's letter dated the 6th instant with its accompaniments on the subject of removing the prejudices of (p.6835) the natives against the practice of inoculation.

5th. Having observed from Dr. Anderson's correspondence on this subject - by his having suggested to the Government to procure inoculating Bramins from Bengal - that he supposed the Bramins of this part of India were prejudiced against inoculation, I consulted some of the best informed Bramins at this place, who convinced me that in the religion of the Bramins, there is not the smallest foundation of prejudice against the operation. I could not trace that inoculation was mentioned in any of their books which treat on medicine; but I discovered that they are acquainted with a method of communicating the small pox in food; which they disguise by saying that they communicate it by Muntrums (incantion). On explaining to some of the inhabitants in this place, the certain benefits, ascertained through experience, to result from inoculation, I did not find them by any means averse to the operation; on the contrary eight or ten men of the weaver cast agreed at once to have their children inoculated.

6th. Mr. Stout and Mr. Evans inoculated at this place nineteen children, of which number fifteen had the usual symptoms of the disease and four had no apparent symptoms of infection.....

7th. I was aware that inoculation cannot be made general except by the native doctors and with this view I made a Bramin

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India Office Records: Madras Board of Revenue Proceedings: Dated 25.6.1801: Letter from Collector of Salem William Macleod to Board of Revenue: Bhovany Dated 19.6.1801: (Extract)

doctor attend the European medical gentlemen to see the operation.....

8th. You are pleased to require my opinion of the best mode of removing the prejudice of the natives and of generally introducing inoculation. Every Collector can persuade a few cases to submit to inoculation at, or near his chief place of residence.....

10th. Since the inoculation above noticed, was introduced at this place - upwards of one hundred families came forward of their own accord expressing their wish to have their children inoculated; ~~by~~ a want of that various matter occasioned their desire not to be at that time complied with. This is a proof that their prejudices are already in great degree removed in these districts.

The Board are happy to observe the success that has attended Major Macleod's endeavours to introduce inoculation into his district, agreed to authorise the employment of a native doctor, as a public servant for the purpose of introducing the system and doing away the prejudices that exist against it.

Resolution of the Board

The Board are happy to observe the success that has attended your endeavours to introduce inoculation into your district and they authorise your employing the Bramin Doctor as a public servant for the purpose, by practice of introducing the system and doing away any prejudices that exist against it.

Fort St. George
27th June, 1801

2. The nature of the connexion which subsists between the collectors of the Revenue and the inhabitants of the respective districts furnishes these gentlemen with the means of a more extensive influence over the minds of the inhabitants than can possibly be derived from the casual intercourse of a medical man whose insulated efforts in the cause of science and humanity may reasonably be expected to prove too feeble to surmount the determined aversion to innovation which is the peculiar characteristic of the Hindoo race.

Board of Revenue's Order:

(p.5330) Ordered that letters be addressed to the several collectors agreeably to the orders of government. The Board will here record an abstract of their proceedings since the month of October last, when the first communication for encouraging the practice of inoculation was received from the Governor-in-Council.

Reply from the Collector of Guntoor: Andrew Scott: Dated 21st June, 1801: pp.6911-5:

2nd (p.6912) It will have appeared by the papers forwarded to you from hence, that the prejudices of the natives, so far as regards inoculation for the small pox, are entirely overcome in this circar, ...
(suggests building of hospital etc.)

India Office Records: Madras Board of Revenue Proceedings: Replies on practice of inoculation.

2. I embrace this opportunity of acknowledging receipt of a packet from the Board, communicating the sentiments and orders of the Right Hon'ble the Governor-in-Council, regarding the general adoption of inoculation among the inhabitants of the Company's provinces; and beg leave to express it as my humble opinion (in as far as the subject relates to the districts under my immediate superintendency) that all theoretical doctrines must fail, in removing these rooted prejudices against the customs of Europe, imbibed by the natives from the earliest infancy, and cherished with a blind enthusiasm throughout their maturer years. I would recommend therefore practicable experiment as the surest means of combating their incredulity and surmounting these local barriers to the introduction of so humane and salutary a measure, and for this purpose it appears necessary, that a medical gentleman should be stationed at this place, to instruct such Braminy Doctor, as either by persuasion, or the powerful incentive of pecuniary advantage, I might be enabled to induce to become practitioners, and when the beneficial consequences of inoculation shall have been once satisfactorily demonstrated to them, I cannot but feel sanguine that its operation must be generally diffused.

18th June, 1801

G. Balmain
Collector

India Office Records: Madras Board of Revenue Proceedings: P/ /
Letter from the Collector Cocanada (First Division Masulipatam):
Dated 18th June, 1801: Mb 6891
(Extract)

Para 2 I have had frequent and long conversation with the inhabitants on the subject. They have a far greater dread of the small pox, than any I have yet met with, so much so, (p.14294) that there have been instances of a whole body of villagers ~~disturbing~~ deserting their everything and flying to the jungles or some distant place, whenever it has broken out, near them. They reckon that not above 3 in 20 recover of it, and that about one tenth only of the living inhabitants have had it; with respect to the practice of inoculation they argue very rationally that innovation, ancient custom, would be no obstacle in their way. That as yet they have only heard of the happy effects resulting from it, in other parts of India. Though they believe, which, nothing will fully convince them, the same benefits are to be derived from it here, but the seeing or knowing that some of their own countrymen have so happily recovered of the disease, when a proof of this kind has once been given them they say hundreds and thousands will submit to it.

Para 3 In consequence of the repeated orders of the Board.....(objection of surgeon to rich when there was little chance of natural small pox).....

India Office Records: Proceedings of the Madras Board of Revenue: P/286/73: Dated 14.12.1801: Letter from Collector of Canara John G. Ravenshaw, to Board of Revenue: Dated 29.11.1801: 14293-14303 (Extract)

Medical Board, Bengal to Government: 4.12.1802
(Extract)

To facilitate the general adoption of the practice of vaccination by the natives, I beg leave to suggest that a notification should be published in the Persian, Hindoovy, and Bengalese languages, and also in the Sanscrit, giving:

1. A succint history of the discovery, in which the ~~erroneous~~ curious, and to the Hindoos, very interesting circumstance that this wonderful preventive was originally procured from the body of the cow should be emphatically remarked.
2. An explanation of the important, and essential advantages which vaccination professes over the smallpox inoculation,
3. and lastly, an earnest exhortation to the natives of these provinces to lose no time in availing themselves of this inestimable benefit, scarcely inferior to any that ever was communicated by one nation to another.

J. Fleming,
~~1.12.1802~~ First Member, Medical Board.

Government Decision: 1.12.1802 (?)

That a notification be prepared and published in the Persian, Hindoovy, Bengalese, and Sanscrit languages according to the suggestion of Mr Fleming.

NAI: Proceedings Medical Board: 4.12.1802

Gillman to Superintendent General Of Vaccination: 16.2.1807
(Extract)

I went last year to the Hurdwar fair when I vaccinated a considerable number and furnished a few people of respectability and understanding with fresh scabs and lancets to carry with them to their respective countries and having given them every necessary information on the subject they appeared much pleased and I have reason to conclude they meant to pay attention to my directions. They said the smallpox made sad ravages among them particularly the Sicks(?). If it is the wish of Government I will go again this year with pleasure though the trip is far from being a pleasant one. If I am to go may I request you will give me information as early as you conveniently can that I may have time to prepare.

J. Gillman,
Barellie. Sub=Supdt of Vac Inoculation,

Government Decision: 5.3.1807

I am directed to acknowledge the receipt of a letter from the secretary to the Medical Board dated the 3rd instant with its enclosure and to inform you the hon'ble the Governor General in council is pleased to permit Mr Gillman to proceed to Hurdwar for the purpose of diffusing the benefits of vaccine inoculation.

The usual allowance for travelling charges will be granted to Mr Gillman from Barellie to that place.

NAI: Proceedings Medical Board: 3.3.1807, and 30.3.1807.

Proceedings of 3.3.1807 also has extract from a letter from Col Close, Resident at Poona(dated 23.12.1806) giving an account of the reception to vaccination by the Peshwa by getting his young wife vaccinated, etc.

Enquiry into Indigenous Spirits: Appointment of Committee: 30.8.1816

To The Arrack Committee

Gentlemen,

Government having had before them the accompanying papers on the subject of the ~~distillations~~ deleterious effect of spirits manufactured in the city of Calcutta and its neighbourhood by the process in use among the natives, and (p 50) deeming it of the highest importance to ascertain as speedily as ~~possible~~ practicable whether and to what degree there really be in the spirits so distilled, a quality noxious beyond that which attends all new made spirits, and particularly whether for the purpose of adding to the intoxicating power there be Datura employed as one of the ingredients of the mash whence the native arrack is distilled, the Right Hon'ble the Governor General in Council has been pleased to appoint you a committee for the purose of duly investigating those points, and reporting the result of your enquiries for the information of Government.

2. His lordship in council (p 51) is not aware that any particular observations in respect to the mode in which your enquiries are to be conducted can be requisite.

3. The Medical Board will however be informed of your appointment and requested to offer any suggestion whence your proceedings may be rendered more precise and conclusive.

4. You will observe from the accompanying documents that Mr Luxmoore has given his attention to the analysis of the native spirits.

5. His lordship in council would not of course be understood to question the accuracy or ability in which the experiments of that gentleman have been conducted, (p 52) but your committee will be sufficiently aware of the nicety required in conducting such experiments particularly those performed on animals, and his lordship in council has not therefore deemed the report of Dr Luxmore sufficient to found on it any public procedure of the nature which may eventually become requisite.

6. Your committee will request the attendance of Dr Luxmoore, and will no doubt be able by a free and full personal communication with that gentleman to determine the stress to be laid on his experiments.

7. In conclusion I am directed to inform you that (p 53) with a view of facilitating your enquiries, you will be furnished on application at the Government House with four bottles of country spirits which the Right Hon'ble the Governor General's head European servant purchased by his lordship's orders at four separate bazars and sealed up immediately on his return.

8. These you will try by such tests as may be best calculated to detect the existence of Datura or other unwholesome substances in the liquor.

Council Chambers
30 August 1816

I am &c, H. Mackenzie,
Acting Secretary to Govt.

Revenue Letter from Bengal: 4.7.1819 (paras 130-6)

131. The result of that report appears conclusively to have shewn, that the spirits in question contain no ingredient calculated to give it a deleterious quality (p 2) beyond that which in a certain degree is inherent in all spirituous liquors, and to afford indeed the strongest grounds for belief that they are even less injurious to health than spirits manufactured according to the European process.

IOR: Board's Collections No 15227 (Vol 611): Dft 194 for 1820-1

NOTE: Reference to an earlier report submitted by chief secretary (Mr Fitzmaurice ?) on 8.4.1813:pp 95-9: "The smell and taste are in the highest degree disagreeable to Europeans. .. The price of the two sorts of rum is the same when the strength of the liquor (p 99) is the same. It seems therefore quite incredible that they

as much more agreeable to them".

should examine the process of the native distilleries, when they can obtain intoxicating liquor of equal strength and expense a liquor in every respect

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Report of the Arrack Committee: AD 1816-7
(Extract)

The distillation of the natives is performed with the same simplicity of contrivance which (p 105) distinguishes all their manufactures. The whole apparatus used by them for this process consists of an earthen jar, two earthen pots and a hollow bamboo. The jar constitutes the body of the still and one of the pots its receiver. The other pot is inverted over the mouth of the jar which forms the body of the still and serves the purpose of a still head. The hollow bamboo which is the tube or worm (?) of the still has one of its ends inserted into the inverted pot and the other into the pot which is the receiver of the distilled spirit. The whole machine is luted together with clay. On the application of heat to the bottom of the (p 106) jar forming the body of the still the spirit is elevated in the form of vapour through the still head or inverted pot, and is conveyed through the bamboo tube to the pot which is the receiver of the still. In this course the vapour is condensed into spirit by the affusion of cold water on the external surface of the tube and the receiver. It is not easy to conceive so important a process more inartificially conducted, and surely no implements could be employed less calculated to impart any noxious or deleterious quality to the spirit which is distilled.

..The mixture and preparation of their materials for distillation forms a process equally simple. A ferment, or substance capable of exciting fermentation, is the first requisite; and this is prepared by the admixure of some steamed rice and a quantity of substances called Bakur Balls. The materials/which the mass /of that is to be fermented is composed, are precisely those used in the manufacture of rum. They are no other than fagging or molasses and pure water. These are added to the ferment, whereby standing two or three days, it has acquired sufficient power to excite them into action. The mass thus (p 108) mixed, remains in the fermenting jar for about ten days, in the course of which time it attains the requisite degree of fermentation, and being in the state fitted for distillation, it is placed in the still above described, and the quantity of spirit which it is calculated to yield is disengaged from it by the operation of heat.

.. The use of the ferment prepared from steamed rice and Bakur balls is not required in every process of distillation. After the first process, the lees (?) or residuum remaining in the still when the spirit has (p 109) been distilled from it, serves as a ferment for successive processes; The lees of the preceding distillation are thus used as ferment for the mass intended for the distillation which is to follow, and they continue to be employed for this purpose according to some accounts through a repetition of processes occupying a period of three months. According to other accounts, through three or four successive processes only, and by some statements as far as the seventh process. The lees or residuum appear at length after the number of processes which has been thus variously represented to lose their power of exciting the degree of fermentation which is required in (p 110) the new mass, and the distillers are obliged to have recourse to their original ferment which they accordingly compose of new steamed rice and Bakur balls in the same manner as at the commencement of their operation.

We believe that the whole mystery of the profession of a distiller of native spirits is faithfully laid open in the three preceding paragraphs. Its intricacies are not great nor its manipulations numerous or complicated.

.. The Datura is mentioned as one of these ingredients (@), and the proportion in which it is employed is that of half a chattack or about an ounce in a mass of twenty one seers and nine

IOR: Board's Collections No 15227 (Vol 611): 393 pp in all.

@ 6/in mixture in 2 barrels

chattacks, or about forty three English pounds. (p 118) As each Bakur ball is found to weigh nearly fifteen grains, this proportion would give about the fiftieth part of a grain of Datura to each ball, and estimating the average number of balls employed in the manufacture of a given quantity of spirits, they may perhaps be calculated as imparting the influence of about the fiftieth part of a grain of Datura to each gallon of spirits. This impregnation by a substance of which doses of fifteen or twenty grains have frequently been administered with perfect safety in medicine cannot be supposed even to influence the quality of the native spirits, and far less to impart to them (p 119) any power that can be regarded deleterious.

.. Different natives have stated that the ingredients in these substances are no less than 126 in number, and their composition may perhaps somewhat vary in different places. Amidst such a variety, no reasonable expectation can be entertained of detecting each ingredient, and pointing out its particular nature and effects (p 120) by any operation in our power.

(Reply from Beerbhoom about Bakur balls: Extract)

Q: How many balls, and in what manner are they used to a certain quantity of Pucky Sherab?
A: One seer of rice boiled into bhaut to be thrown upon a mat mixed with two pills of the Bakur and being put into an earthen pot shut up by the mouth to be kept in a room for eighteen days and after that period by dissolving the same in two (p 343) seers of hot water will produce the pucky sheraub: that part of the bhaut which still remains is called Meatah. (list of ingredients used in Beerbhoom : p 345-8)

Bengal Government to Arrack Committee: 5.4.1817
(Extract)

2. The investigation conducted by you appears to his lordship in council to demonstrate in the most satisfactory manner that the Arrack distilled by the natives contains no (p 384) ingredient calculated to give it a deleterious quality beyond that which to a certain degree is inherent in all spirituous liquors, and to afford the strongest grounds for belief that it is even less injurious to health than spirits manufactured according to the European process.

3. The confidence with which an opposite opinion was maintained, the large pretensions with which experiments professing a scientific accuracy were urged in its support, and the great importance of the question at issue to the health of the community, rendered it imperative upon Government no longer to let the matter rest on arguments from casual (p 388) information, however apparently worthy of credit, or firm general reasoning, however justly deduced.

4. It was accordingly the object of Government in the appointment of your committee, that the ~~result~~ subject should be so fully investigated, .. as to leave no room for future doubts. .. These expectations you have fulfilled to their fullest extent. ..

6. Your report, as already intimated, appears in the judgement of Government incontrovertibly to have shewn, that the assertions which had been so confidently advanced in regard to the comparative wholesomeness of native spirits were entirely without foundation, and conclusively to have demonstrated the fallacy and inaccuracy of those experiments by which they were sustained.

9. .. The further enquiries which you have instituted in regard to the spirits manufactured according to the European process entitle your committee to a (p 392) renewed expression of the acknowledgements of Government for the benefit to be derived from your labours.

Revenue Letter from Bengal: 4.7.1819 (paras 130-6)

131. The result of that report appears conclusively to have shewn, that the spirits in question contain no ingredient calculated to

Mineral Productions* (in the Kumaon and Garhwal region)
(Extract)

Copper Mines:

33. In reducing the ore to fragments the Dhunpoor miners employ the punchukkee or water-mill. When water is present no better plan (I mean consistent with the economy here contemplated) can be devised. When water is not to be had in sufficient abundance a simple arrangement of stampers might be preferable to the method of doing it by the hammer.

A.D.12

34. It is however in the roasting and smelting operations that the greatest room for improvement is to be found and the greatest prospect of advantage from a change, as the immediate effect of this would be to raise the value of the metal produced. For the present open hearths and air-bags, I would substitute a system of reverberatory furnaces of different draughts for the two different processes of roasting and smelting. An excellent material for (p 628) constructing them is at hand in the rock I have called Potstone.

NAI: Home: Misc Records: Vol 437 A: pp 662: 'Report of the Mineralogical Survey of the Himalaya Mountains', 1826, by J. D. Herbert, and J. Manson. The report is in five sections, the fifth section (p 580-662) being 'Mineral Productions', and consists of 52 paras. Account of the production of iron starts at para 40; the prevailing method is termed lazy etc. Most of the document is very dim.

Inoculation in China*:
(Extract)

Preventive inoculation against the smallpox, which was practised in China from the eleventh century, apparently came from India. A pledget of cotton-wool, impregnated with the contents of a fresh pock from a case of smallpox, was introduced into the nostril of the person to be inoculated, or alternatively the powder from a dry pock was used. Inoculation of cow-pox as a preventive measure against smallpox, first practised by Edward Jenner in 1796, had by 1805 already been introduced into China by an English surgeon.

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* The Healers: The Doctor, Then and Now --by Kurt Pollak; G 1963; Doctors in India p.29-35; in China p.35-

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E 1968.

History of Mankind: The Foundations of the Mpdern World
by Luigi Pareti, P. Brezzi, L. Petech (UNESCO) Vol IV.
A.D. 1300-1775: Pub 1969: pp 1133, Index, Pls.

Indian Science and Scholarship: (p 814-5)

The major Indian contributions to science and scholarship likewise were made before our period, but some work of considerable merit still went on. Competent studies in lexicography, grammar, and logic continued up to the beginning of the eighteenth century. Important Sanskrit dictionaries were produced in the fourteenth century, and Sanskrit grammers of scholarly value until 1700. Grammers and dictionaries of Tamil, Telugu, Kanarese, and other vernacular languages appeared throughout the period. Indian astronomy and mathematics were expounded in Sanskrit works during the early part of our period, while Sanskrit treatises on mathematics were translated into various vernaculars. The significant astronomical tables of Makaranda came out about 1478, and astronomical works by Ganesha as late as 1520, but the traditional system of Hindu mathematics and astronomy changed little and was essentially unaffected by Arabic and Persian writings. Descriptive works of genuine significance in biology- on plants and horses, elephants, and other animals- were written until the seventeenth century. Despite several works on nosology, including that of plant diseases, Hindu medicine in many particulars remained similar to that of the ancient Greeks and showed no marked advance. The celebrated medical treatises by Tisata in the fourteenth century, Bhava Mishra in the sixteenth, and Lolimbaraja in the seventeenth were essentially expositions or expansions of earlier classics. A great Indian dictionary of materia medica, the Madanavino-danighantu by Madanapala, was completed about 1374. Indian anatomy suffered, as did anatomy almost everywhere, from the absence of dissection.

Science in the Islamic World: (p 903-4)

..The Ottoman experience was not wholly untypical of other Islamic centres. India under the Moguls, for example, rewarded physicians and astronomers and built well-equipped observatories, yet produced little basically new.

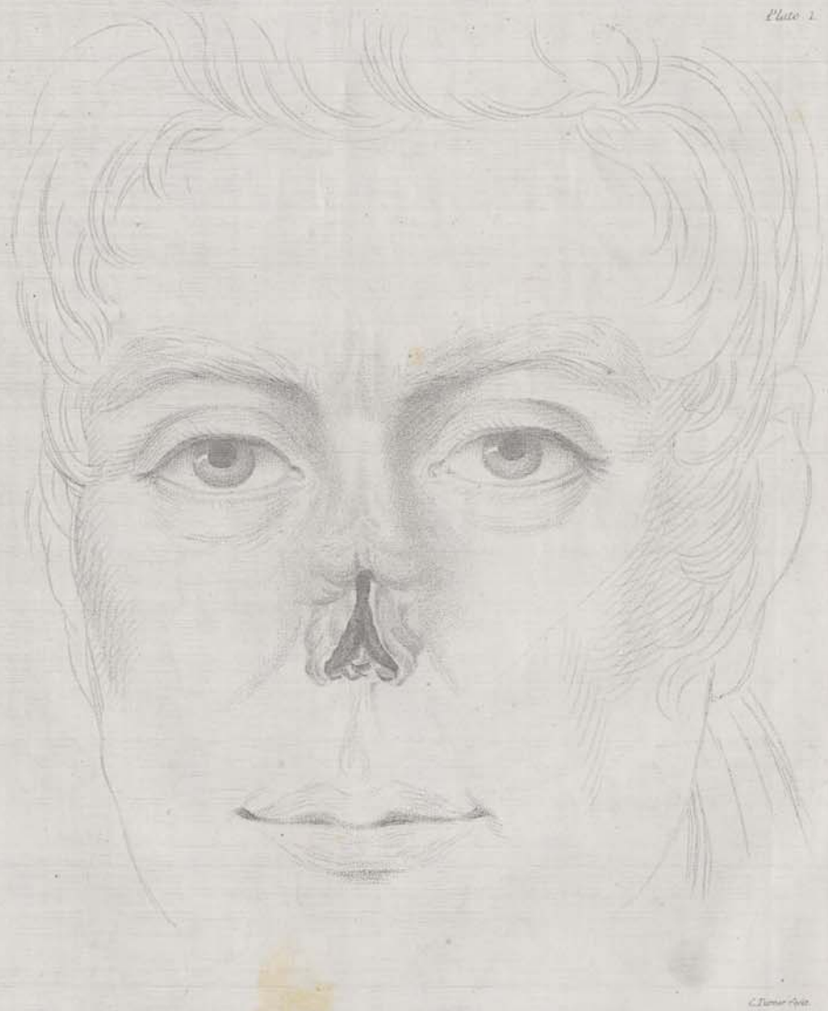
Science in India and China: (p 904-6)

..India, too, in addition to skilful workers in textiles and other decorative arts, had highly competent shipwrights. When contacts between India and the West became frequent, Indian craftsmen built western-type vessels for westerners while retaining their own traditional type for compatriot traders.

Machine and Reasearch in Metallurgy: (p 932=7)

Quality steel had been produced in India and imported by Arabs and Persians into Europe since the early middle ages. Europe made its own steel but only in small quantities, and it was expensive.

Science and Technology and Society 1300-1775 on pages 789-988.



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AN ACCOUNT

OF

TWO SUCCESSFUL OPERATIONS

FOR

RESTORING A LOST NOSE

FROM THE

INTEGUMENTS OF THE FOREHEAD,

IN THE CASES OF

TWO OFFICERS OF HIS MAJESTY'S ARMY:

TO WHICH ARE PREFIXED,

HISTORICAL AND PHYSIOLOGICAL REMARKS

ON THE

NASAL OPERATION;

INCLUDING

DESCRIPTIONS OF THE INDIAN AND ITALIAN METHODS.

BY J. C. CARPUE, (FRS)

MEMBER OF THE ROYAL COLLEGE OF SURGEONS OF LONDON, AND FORMERLY SURGEON TO THE YORK HOSPITAL, CHELSEA.

WITH ENGRAVINGS, BY CHARLES TURNER,

ILLUSTRATING THE DIFFERENT STAGES OF THE CURE.

LONDON:

Printed for LONGMAN, HURST, REES, ORME and BROWN, Paternoster Row; and sold by S. HIGHLEY, Fleet Street; and CALLOW, Crown Court, Soho.

1816.

" and learned, to believe in the possibility of applying the mus-
" culous flesh of the arm to the restoration of the nose!"* It is with equal ignorance of the writings of Taliacotius and the other authorities on this subject, that so many pens have successively ventured upon the question. Taliacotius was not the author of the doctrine of adhesion, nor did he contemplate the adhesion of parts between which total separation had taken place, nor did he propose to unite either the flesh or the integuments of one man, with the flesh or the integuments of another.

INDIAN METHOD.

It was in this manner that the nasal operation had become forgotten or despised, in at least the west of Europe; when, at the close of the last century, it was once more heard of in England, from a quarter whence mankind will yet, perhaps, derive many lights, as well in science, as in learning and in arts. A periodical publication, for the year 1794, contains the following communication from a correspondent in India, which is accompanied by a portrait of the person mentioned, explanatory of the operation: " Cowasjee, a Mahratta, of the
" caste of husbandmen, was a bullock-driver with the English
" army,

* " Vide Dionis, p. 64.

† " Qua de causa vehementer miror, quid hiscè viris, alioquin doctis et eruditis, in men-
" tem venerit, ut ex carne musculosa nares rescarciri posse crediderint!" Taliacotius, De Curtorum Chirurgia, lib. I, c. xix.

Extracts Pp 36-55, 60-63

" army, in the war of 1792, and was made a prisoner by
" Tippoo, who cut off his nose, and one of his hands. In this
" state, he joined the Bombay army near Seringapatam, and is
" now a pensioner of the Honourable East-India Company.
" For above twelve months, he was wholly without a nose; when
" he had a new one put on, by a Mahratta surgeon, a Kumar,
" near Poona. This operation is not uncommon in India, and has
" been practised from time immemorial. Two of the medical
" gentlemen, Mr. Thomas Cruso, and Mr. James Findlay, of
" Bombay, have seen it performed as follows: A thin plate
" of wax is fitted to the stump of the nose, so as to make a
" nose of good appearance; it is then flattened, and laid on the
" forehead. A line is drawn round the wax, which is then of
" no further use; and the operator then dissects off as much
" skin as it covered, leaving undivided a small slip between the
" eyes. This slip preserves the circulation, till an union has
" taken place between the new and old parts. The cicatrix of
" the stump of the nose is next pared off; and, immediately
" behind this raw part, an incision is made through the skin,
" which passes round both alæ, and goes along the upper lip.
" The skin is now brought down from the forehead; and, being
" twisted half round, its edge is inserted into this incision; so
" that a nose is formed with a double hold, above, and with its
" alæ and septum below, fixed in the incision. A little Terra
" Japonica is softened with water, and, being spread on slips of
" cloth, five or six of these are placed over each other, to secure
" the joining. No other dressing than this cement is used for
" four

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" four days; it is then removed, and cloths, dipped in *ghee* (a " kind of butter), are supplied. The connecting slip of skin is " divided about the twenty-fifth day; when a little more " dissecting is necessary to improve the appearance of the new " nose. For five or six days after the operation, the patient is " made to lie on his back; and, on the tenth day, bits of soft " cloth are put into the nostrils, to keep them sufficiently open. " This operation is always successful. The artificial nose is se- " cure, and looks nearly as well as the natural one; nor is the " scar on the forehead very observable, after a length of time."* The same account was subsequently engraved under a detached portrait of Cowasjee, in which, as in the former, the new nose and cicatrix are marked. This portrait is engraved by Mr. W. Nutter, from a painting by Mr. James Wales, of Bombay; and published in London in the year 1793.

Pennant, in his View of Hindoostan, printed in 1798, gives a second description of this practice: " I must by no " means omit," says this popular writer, " one branch of " European surgery which has of late been practised with great " success by a Poonah artist, who has lately revived the " Taliacotian art, differing only in the material; for he does " not apply to the ' brawny parts of porters, &c. &c.' to " restore the mutilated patient. I am not master of the process; " but I am told it is by cutting the skin and muscles of the " forehead

* Gentleman's Magazine, 1794.

" forehead on three sides, and drawing it over the deficient part. " If the bridge of the nose is injured, I presume that must " be supplied by some ingenious invention. The Hircarrah, or " Madras Gazette, of August 5th, 1794, informs us, that Cowasjee, " two years before, fell under the displeasure of Tippoo Sultan, " who instantly ordered the nasal amputation. The sufferer " applied to the great restorer of Hindoostan noses, and a new " one, equal to all the uses of its predecessor, immediately rose " in its place. It can sneeze smartly, distinguish good from bad " smells, bear the most provoking lug, or being well blown, " without danger of falling into the handkerchief. It will " last the life of the wearer; nor, like the Taliacotian, need he " fear,

" That when the date of Nock is out,
" The drop of sympathetic snout."

" This art is practised by the Koomas, a caste of Hindoos. " Some religious ceremonies are first performed. Betel and " arrack are put into the patient's hands, and he is then " laid on his back, his arms stretched along his sides, on the " ground, and he is ordered, on no pretence whatever, to use his " arms during the operation; and they impress him with this " idea, that it cannot be successful unless he complies strictly " with this injunction."*

On undertaking the first of the two cases to be hereafter narrated, I was induced to make such personal inquiries as were

* Pennant's View of Hindoostan, 2 vols. 4to. 1798, Vol. II, page 237.

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were within my reach in this country, concerning the Indian method. I did myself the honour to write to Sir Charles Mallet, who had resided many years in India, and who obligingly confirmed to me the report, that this had been a common operation in India, from time immemorial; adding, that it had always been performed by the caste of potters or brickmakers, and, that though not invariably, it was usually successful.

Mr. James Stuart Hall, a gentleman who was many years in India, assured me, that he had seen the operation performed, and that it was of tedious length. From Dr. Barry, of the India service, I learned, that he also had seen the operation; that it occupied an hour and a half, and was performed with an old razor, the edge of which, being continually blunted in dissection, was every moment re-set. Tow was introduced to support the nose, but no attempt to form nostrils, by adding a septum, was made.

I am obligingly informed by Major Heitland, of the India service, that in India, several years ago, in the time of Hyder Ali, Mr. Lucas, an English surgeon, was, in several instances, successful in the operation, which he copied from the Hindoo practitioners.

Boyer mentions, that the late M. Chopart once employed, in a manner, as it seems, similar to the Indian, a portion of the integuments of the neck, to fill up a void space, left by the operation for a cancerous lip. The union took place, and a tolerably well-formed lip was procured.* Mr. Lynn performed this

* Lectures on Inflammation, p. 230.

this operation successfully, some three years since; and it has been repeated, also with success, very lately, by my friend and late pupil, Mr. Sutcliffe, of Rochdale. Do the Indian artists, like the Italian, undertake equally the restitution of the nose, ears, and lips?

I have heard, that about the year 1803, the nasal operation, by the Indian method, was performed in London, without success. The patient, I am told, is still alive, in India.*

I can add no more to the history of the Indian method; † but what has appeared is sufficient to arrest the reader's attention, both as it offers so great an improvement on the Taliacotian practice, and as it illustrates the history of the operation in general. It cannot be otherwise, than that this discovery of its existence in the distant regions of India, should awaken our curiosity more earnestly than before, as to the place and date of its original use. Mr. Pennant, in the passage quoted, has evidently taken a very hasty view of the matter, where he calls the operation "a branch of *European* surgery;" where he speaks of it as "practised of late," and as a "late" revival; where he denominates it "the Taliacotian art;" where he attributes its revival to "a Poonah artist;" and where he intimates that there is but one "restorer of noses" in Hindostan. He himself soon after tells us, that the art is practised

 by

* If the Gentleman who performed the operation is still living, and will favour the Author with an account of the cause of its failure, he will much oblige him.

† The Author will be very thankful for any communication on this subject, from persons resident in India, or who have resided in that country.

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by a whole cast; and that its exercise is accompanied by fixed religious ceremonies. Do not these things savour of antiquity, and proclaim something very different from "a late revival of "the Taliacotian art," and the adoption of "a branch of "European surgery?" Assuredly, the Hindoos owe no part of their skill in this operation, either to Europe in general, or to Taliacotius in particular. With the exception of Mr. Pennant, all the names I have cited concur in deriving the Indian practice from "time immemorial."

It will be observed, that the whole of the foregoing accounts are agreed upon these points, that the performance of the operation is confined to a particular cast of Hindoos, and that this cast is said to be the Koomas, or potters, or brickmakers. The combination appears, at first sight, to be singular; but an explanation is not difficult, and may not be unacceptable. Most of the Hindoo casts, though fixed within positive limits, as to professions, trades, or other occupations, are yet allowed a certain range, a certain variety of pursuit, among which the individual is free to make his choice. The casts are known to be divided into subcasts; and there are degraded casts, making branches of the pure casts, with respect to whom a still greater laxity is allowed: "The professon of *astrology*, and the task of making "almanacs," says a late writer on India, "belong to *de*-"*graded Brahmins;* and the occupations of teaching military "exercises, and *physic*, as well as the trades of *potters*, "weavers, braziers, fishermen, and workers in shells, belong "also to the descendants [meaning the outcasts] of Brah-"mins."

"mins."* Thus, astrology, medicine, and *pottery* are among the several pursuits allowed to one and the same cast.

That *astrology* and *medicine* should be thrown into the same lot, excites no surprise. In Persia, and all the eastern countries, the art of healing is consigned to the professors of these two sciences conjointly;† and the same prevails, or has prevailed, in many other parts of the world. It is hence that our ancient almanacs contained instructions concerning the health of the body; and, at this day, "Francis Moore," though he calls himself "physician," is plainly an astrologer. The adjuncts

 of

* Mrs. Graham's Letters on India.

† Chardin gives a clear view of the respective principles by which the two professions are governed, in the treating of their patients: "The physicians," says he, "endeavour "to adapt their remedies to the phenomena of the disease, while the astrologers, on their "side, maintain, that attention is to be paid to the phenomena of the planetary system, in "order to determine the most proper time for taking medecines." The professions, in the mean time, are not to be understood as further distinguishable, than as the one consists in physicians who combine astrology with their medicines, and the other in physicians who rely upon their medicines only. The English physician, described by Chaucer, is no other than the astrologer of Chardin:

"With us there was a doctor of physik,
"In al the worldè was there non hym lyk,
"To speak of physik and of surgerye;
"For he was groundit in astronomy.
"He kept his pacient a ful gret del,
"In hours by his magyk-naturel;
"Wel couth he fortunen the ascendent
"Of his ymagys for his pacient.
* * * * * * * * *
"Full ready had he his apothecaryes,
"To send him his droggis and letewaryes [electuaries]."

CANTERBURY TALES.

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of pottery, weaving, &c., in the same cast with the former, appear to evince, that the Indian institutions are less restrictive on the particular genius or disposition of individuals, than may have been commonly supposed.

ORIGIN OF THE ART.

A due attention to the little evidence within our reach, will go far to fix us in the opinion, that the nasal operation is of the highest antiquity in the warm climates of the East; that its practice, in all the southern parts of Asia, from India to Persia and Arabia, has existed from very early times; that Greece shared it with Asia; that it afterward passed into Calabria, and from Calabria into other parts of Italy, and that in Italy it languished, and died: partly through its approach to severer climates, partly, perhaps, through the practice of a more complicated, tedious, and painful method; partly through the low state of surgery in Europe; and partly through the senseless incredulity and ridiculous misconcptions, arising out of that low state of surgery, with which it was met both by practitioners and people.

That the nasal operation was not first known in Italy is proved, in a great degree, by this, that with the more industry we trace its beginning, the further and further off we see it recede from us. Some would give the invention to the first Branca, the Sicilian. Gabriel Barri claims it for Vincent Vianeus, or Boiani, of Tropea. Cortesi ascribes it to Peter Boiani, his descendant.

descendant. Multitudes resolutely fix it on Taliacotius; but, Cortesi, and, after him, M. Eloy, will have Peter Boiani to have been the instructor of Taliacotius. All unite in refusiug an earlier date to this art than the sixteenth, or, at furthest, the fifteenth century. If we look for the grounds of the conclusion, we shall find them to be no better, than that at this period, the invention of printing, and revival of letters, gave an impulse to the reading and writing of books.

But Taliacotius was neither the inventor of the art, nor does it appear to be true, that he learned it of either of the Boianis. Taliacotius is himself careful to mention all that he could collect concerning the previous practice of the operation; and it is worthy of remark, that as far as I have been able to discover, little is to be added to what he has brought forward concerning its ancient history in Italy. He speaks of Branca, and of a reported existence of the art in Calabria; but, of the Boianis, at least by name, he appears to have known nothing. His own account of the art, and of his share in the cultivation of it, is to be found in his epistle-dedicatory to the Duke of Mantua: "Very "little," he observes, "is left us by ancient writers, on the "supplying of deficient parts of the body. The restoration of "lips, ears, and noses, is said to have been formerly practised in "Calabria; but the art, if it could be called an art, was rather "pursued at random, than according to any fixed method. On "my part, beside the other services which I have rendered to "medicine in general, I have placed this particular branch upon "the basis of uniform rules, and have reduced the method of prac-"tice into writing." In other passages, indeed, he may be thought to

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to have assumed for himself somewhat too large a share of originality in the art. In the nineteenth chapter of his first book, he writes as if he alone had taken the integuments, for the restoration of a lip or nose, from other parts than the immediate vicinities. There is, surely, some inconsistence in this portion of his language, (as well as in that in which he so greatly undervalues the ancient state of the art,) both with what he presently afterward tells us of Branca, and with what he had read in Celsus, Calentius, Benedictus, and the rest: "Branca, a Sicilian," says Taliacotius, "practiced the art "with distinguished skill, though no one has ever explained "his method." The truth appears to be, that Taliacotius's only instructors were books, tradition, and his own reflections and experiments; that upon these foundations he formed a method for repeating what had been done before; and that he performed the further service of putting that method into writing, and making it public. Former practitioners had been famous for the art; but their method, and, in most instances, themselves, had afterward passed into oblivion:

"They had no poet, and they died."

Sir Charles Bernard, it is to be acknowledged, in his contribution to Wotton's Ancient and Modern Learning, appears willing to stop at Branca, as the earliest restorer of a deficient nose; but he can have had no other reason for this, than what may be thought a too circumscribed construction of ancient testimonies: "As for those operations," says Sir Charles, "which "the Greeks called κολοβώματα, or *curtorum chirurgia*, they "amounted

"amounted to no more than cutting the hare-lip, or the like; "for that they knew and practised." (What the Greeks called κολοβώματα, the Romans called *curta*.)

Celsus, a native either of Rome, or of Verona, was born in the reign of Augustus; that is, before, or not much later than the birth of Christ. This writer teaches the art of supplying *curt* or deficient parts *by incision*, by dissecting the integuments from the muscles, by leading them to the deficient part, and by joining them thereto; and adds, that *sometimes* the skin of *other parts* was applied to the deficient part. He speaks of deficient parts generally, without naming either nose, ears, or lips.*

Galen, a native of the city of Pergamos, in Asia Minor, was born toward the middle of the second century. He tells us, that the Greeks gave the name of κολοβώματα to those of whom either the lips, ears, or nose, was deficient: "Now, the method of curing "a deficient lip," says this illustrious physician, "is, first, to "dissect the skin; then, to bring it in contact with the skin of "the lips; then, to take away the callus; after which, what re-"mains is to sew the two together, and to agglutinate them."† Further on, "If the lips, ears, or nose, are deficient," says Galen, "additions may be made to them by incisions; the "edges of the raw skins being brought together, and agglutinated."‡ He speaks also of supplying deficiences of other parts;

* Celsus, vii, 9. "Many things," says Boerhaave, "which are to be found in Celsus, "pass, at the present day, for new."

† Galen, 14, Met. Med. 16.

‡ Idem, 18.

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parts, and even inquires, whether, if a finger, or any similar part, were wanting, it would be wholly impossible to supply it?

Paulus Ægineta, of whom it is disputed, whether he flourished in the fourth, fifth, sixth, or seventh century, was born in the Greek island of Ægina. Paulus follows Galen, but with great brevity: he directs, for the treatment of deficient lips and noses, that the integuments be dissected from the part below; and, then, the callosity of the deficient lip or nose being dissected away, and the edges of the two integuments being brought into contact, to stitch and conglutinate the parts. This is the sense of the whole of Paulus's short chapter on Κολοβώματα, of which the following is the old French translation of M. Tollet, in 1540: "Curtes en lebvres et narines "sont curées en ceste sorte. Nous couppons le cuir vers la partie "inférieure. Puis, après les labies de la plaie conjoinctes, "premièrement la callosité ostée, nous cousons et congluti-"nons."*

We have now seen that the nasal operation, and all the physiological *facts* upon which it depends, were known in Europe at least as early as the date of the Christian era; that the *fact* of adhesion was known to Hippocrates, and that where our history fails us, is simply the point beyond which we have no records. We have now, also, before us, the greater part, if not the whole of the information which was possessed by Taliacotius; and, beside satisfying ourselves that this eminent person was not

* La Chirurgie de Paul Ægineta, par M. Tollet, à Lyon, 1540. Lib. vi, chap. 26.

not (what he never pretended to be) the inventor of the art, we may venture to judge in what degree he advanced it.*

That the art has subsisted from the most ancient periods in India, and other southern parts of Asia, and was at no time carried thither from Europe, is probable from further evidence than the simplicity of the Indian method, as compared with the Italian; the ordinary recourse which is had to it in India; its practice by a particular cast, and its junction with religious observances: it is probable, likewise, from the frequent occasions for it, from the favourableness of the climate, from the temperance of the people, and from the plainness of the road by which Nature leads to the invention. The adhesion of divided parts, however little understood, till lately, in France or England, was one of the first spectacles presented to mankind. If we fancy that we are entitled to refuse to the Orientals the reputation of science, this makes no alteration in the case; for no depth of science, but involuntary observation, was all that was wanted here. The operation of the hare-lip could not fail to suggest the supply of small

 deficiencies

* None of the ancient writers were ignorant of the process of adhesion, as effected by bringing the lips of wounds into contact, or *healing by the first intention*; but the bringing foreign parts to adhere, seems to have been practiced only by the restorers of noses, lips, and ears, and not scientifically examined before Taliacotius; who proposes the questions, "In what manner, and by what means, is the new nose nourished?" and "Does it live and "feel?" He apprehends, that its nourishment must depend, either upon the formation of a new set of vessels in the new nose, or upon the inosculation of the vessels previously existing in it, with those of the part with which it is brought into contact; and he gives the preference to the latter theory. Chirurgia Curtorum, lib. 1, Cap. xxv.

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deficiences of the nostrils; and this would lead to greater reparations. The taking the integuments from other parts was an enlargement of the plan, and the result of research, or at least of reflection.

In addition to the facility afforded to the nasal operation by the climates of the south of Asia, there is also to be remembered the extraordinary demand for its practice; a circumstance which cannot but have combined with the former, both to give it birth, and to keep it in use; and a circumstance, also, which prevailed, as we may believe, even more forcibly in remote ages, than in the present. Even the demand, however, of the present age, were enough! I shall have occasion, in another place, to mention the frequence of the amputation of the nose in India, and the accompanying popular persuasion, that one way or other, the sufferers may recover their loss. A direct example is exhibited in the case of Cowasjee, under Tippoo Sultan. Instances have recently occurred, attended with other cruelties, in the island of Ceylon, under Scindeah Rajah. But an example, upon the grand scale of eastern barbarity, which will at once suffice to strike the reader's imagination with the full force of the fact, presents itself in Father Guiseppe's Account of Nepaul, printed in the second volume of the Asiatic Researches. The city of Kirtipoor, in Nepaul, being besieged by the Ghoorka army, was betrayed by one of its nobles. The inhabitants might still have stood on their defence; but, on the promise of amnesty, they surrendered themselves prisoners. Two days afterward, Pritwinarayan, the king of Ghoorka, their conqueror, ordered the

the principal persons of the town to be put to death, and the lips and noses of every one, even the infants who were not found in their mothers' arms, to be cut off; directing, at the same time, that the lips and noses should be preserved, that he might ascertain the number of souls; and that the name of the town should be changed into *Nascatapoor*, which signifies (such relationships have the languages), *Nose-cut-Town*: "The order," says Guiseppe, "was carried into execution with every mark of horror "and cruelty, none escaping but those who could play upon "wind-instruments; although, Father Michael Angelo, who, "without knowing that such an inhuman scene was exhibited, "had gone to the house of Suruparatna [the officer fulfilling the "order], and 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 so many living people with their teeth and "noses resembling the skulls of the dead." This event occurred in the year 1769, or 1770; and, after perusing this, no solitary instance in its kind, shall we remain in doubt, that the nasal operation was in early request in countries where tyrants are so ready to wound, and Nature is so willing to heal?

But, if we are now to account for the existence of the art in Calabria, at a time when it was unknown in the rest of Europe, and even in the rest of Italy, it will, perhaps, be agreed, that we have only to call to mind the geographical situation of Calabria, its neighbourhood to Greece, and to the frontiers of Arabia, and the rest of Asia; and the degree in which it resembles those

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those countries in its climate, in the living and manners of its inhabitants, and how much it anciently resembled them, in its laws and punishments. It may deserve, nevertheless, to be further remarked, that even the political circumstances of Calabria, in times not very remote from those of the Brancas and Boianis, were favourable to the introduction into that country of every art, and, among the rest, of every medical art, which was practised in the East.

Through a great part of the middle ages, Italy and other countries of the south of Europe, were overrun by the arms of the Arabs. Francis II of Naples, the most enlightened monarch of his age, and whose policy required a counterpoise to papal domination, always maintained a strict friendship with these active Mohammedans, and carried on with them, even after he had expelled them from his kingdom, an extensive intercourse in literature and the arts. It was from Arabia that surgery was restored in Italy, as it was from Italy that it was carried into France. The connection of the Arabs with India has always been intimate.

The foregoing are some of the facts and considerations which present themselves on a hasty survey of the question. If weight is due to all of them, or to those of chief importance, we shall hardly think, as has been thought heretofore, that in tracing the art eastward to Italy in general, or even to Calabria in particular, we have found the seat of its birth; but we shall venture to place it among the acquirements of the whole eastern and ancient world, the rays of whose light have successively, from

from age to age, penetrated the forests and recesses of Europe. It is probable, nevertheless, that while the general principles of the art were early and widely spread, the particular methods had their origin in particular and unconnected inventors. The express rejection, by Taliacotius, of the integuments of the forehead, for the material of the new nose, as being alien to the part, and not to be commodiously joined with it,* forms a total separation from the Indian method; while his choice of those of the arm was in exact conformity with the Calabrian.

An additional remark suggests itself from this view of the history of the nasal operation. It has been insinuated, by those who would derive its birth from Taliacotius, that it had its origin in some of the consequences of Lues Venerea; which disease is said to have been first known in Europe after the siege of Naples, in 1494. But the year 1442, the date assigned, in the Dominican manuscript, to the age of Branca, precedes the date of the siege of Naples by half a century, as does the age of Celsus by almost fifteen hundred years. Again, something more than a whole century elapsed, between the siege of Naples and the appearance of the work of Taliacotius. Beside, the branch of surgery, which is the subject of that work, has no peculiar reference to the nose, but equally includes the ears and lips.

PHYSIOLOGICAL PRINCIPLES.

In concluding this sketch of the history of the nasal operation, it will be acceptable to add some account of the physiological

* See above, page 12.

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gical principles upon which the branch of surgery to which it belongs proceeds, and from which it derives its success.

ADHESION OF WOUNDED SURFACES.

I. The first of these principles consists in that aptitude for adhesion which is found to subsist in all, or nearly all, the living parts of animal bodies; and the natural end of which is their restoration to the pristine state, after accidental division or separation. Such is the adhesion of the two extremities of a fractured bone; and such, in the case of a simple cut finger, is the adhesion of the two sides or edges of the divided parts.

The adhesion of the divided parts of a living Bone is effected by the pouring out of osseous matter from the arteries. Sometimes, from the state of the patient's health, or other cause, this does not happen, in which case, a callus forms, and prevents the desired union; but, the callus being removed, osseous matter may still be produced. A gentleman having fractured the tibia, the usual method of reduction was resorted to without success. Six months after the accident, he applied for my assistance. Knowing the pain and inconvenience experienced by the patient, from sawing away part of the ends of the bones, I made an incision through the integuments, and cut or scraped away the callus which had grown upon the extremities of the fracture. Then I brought the parts into contact, and applied splints and bandages. Osserous matter was secreted, a perfect union took place, and the

the gentleman was enabled to walk as well as before the accident.

The adhesion of divided Muscles and Integuments, is the express subject of our present inquiry. Of those adhesions, some extreme cases, in part old, and in part new, have already appeared in these pages. In modern surgery, the general fact is universally admitted; and the only subject of doubt is, the adhesion of parts which have been *entirely* separated; or, in other words, in one of which circulation has been wholly interrupted. Professor Thomson thinks, that we should "in no case despair "of adhesion, so long as the least degree of circulation remains "in both, or even in one of the parts, divided;"* and adds, "we must learn, from experience, in what circumstances re-"union may be attempted with probability of success." Dr. William Balfour, of Edinburgh, without regarding the continuance of the circulation, would attempt to procure adhesion between any divided parts, "unless such parts were of a "magnitude that the apposition of the wounded surfaces would "not restrain hæmorrhagy."† (*)

Dr. Balfour has recently made public two cases of adhesion, which have occurred in his practice, accompanied with some interesting remarks. In the first case, which was that of his son, a child of four years and a half old, be procured the adhesion of the points of three fingers of one hand, which had

* Lectures on Inflammation, page 243.

† Observations on Adhesion, with Two Cases, &c. Edinburgh, 8vo. 1814, page 13.

(*) pages 56-59 missing in the text in our possession. Since the narrative begins from page 60 again and goes at page 63.

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was obtained.—I have been informed by Mr. Abernethy, that an instance of union between a finger and its end, which had been cut off, occurred not very long ago at St. Bartholomew's Hospital.

I have before me a letter from Dr. William Ruddiman, in which are related some extraordinary facts, as connected with adhesion of divided parts of the nose in India, his acquaintance with which arose from his residence in that country: "One of our senior surgeons on the Madras establishment in "the year 1780," says Dr. Ruddiman, "was with Colonel "Baillie's unfortunate detachment, which was cut off by Hyder "Ali. The surgeon above mentioned, whose name was Wil-"liam Raine, had his nose completely cut off by a sabre, all "but hanging by a bit of skin. He, poor fellow! did nothing "more to it, than put it carefully up in its proper place, and "only bandaged it with a shred or two of his handkerchief; "and, strange to tell, it did well, and we, Madras gentlemen, "knew him well, many years after he came out of prison. "I remember," continues Dr. Ruddiman, "an instance in "one of our native troopers, when I was in the field, under "General Coote, against Hyder, in 1781. This man had his "nose completely cut through by a sabre, from the termination "of the bony part; to the degree, that when he came for chi-"rurgical aid, it was literally hanging down on his mouth, and "he was bleeding exceedingly. I did nothing more than wash "it clean with luke warm water, put it carefully and steadily in "its proper place, give it a few stitches with a ligature, support "it

"it on the outside with little bolsters of lint on the sides, and "hollow dossils inside, and dress it simply as occasion required; "and, in a few weeks, the trooper's nose was as firm, as "handsome, and as sound as ever."

In neither of the foregoing examples, however, was there that perfect separation of the parts, which is described by Fioravanti, Garengeot, and others. The integuments were never wholly cut asunder. Dr. Ruddiman, in the mean time, subjoins an observation which, though under circumstances less conclusive than the foregoing, relates to examples of total separation: "Among the natives in towns and "villages," says my correspondent, "it is usual for male-"factors, viz. in cases of petty theft and other minor "crimes, to be sentenced to have their noses cut off in the "*bazar*, or market-place, by the common *chuckler*, or execu-"tioner; on which occasion, the executioner always makes a "point of throwing the amputated nose into the fire; because, "say they, were the offender to have possession of his nose, he "would have nothing more to do, than, the moment it is cut "off, put it into its proper place, well secured; where it would "unite, and be as good as ever again. This I have never seen "done; but I have often heard it asserted as a fact by the natives. "The recovery in India," adds Dr. Ruddiman, as a general remark upon these facts, "of wounds of the most desperate "description, many of which would be looked upon, in England, "as incurable, is surprizing; and I can only attribute it to the "warmth of the climate, and to the very abstemious regimen "to

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"to which the natives most rigidly adhere, chiefly boiled rice, "with its water and decoction, and a very little salt, just "barely to give it the slightest zest."

To these new examples of adhesion, it is proper that I should add a testimony of the opposite kind. Captain ———, a nephew of Sir Charles Malet, but whose name I have not the honour to recollect, has assured me, that he was present, a very few years ago in Syracuse, when a Turk lifted his scymetar against a Syracusan, and cut off his nose. A surgeon of the city was at hand, and immediately replaced the nose; but though every circumstance of expedition, climate, and season, was in favour of the experiment, it did not succeed.

Of the possibility of uniting the integuments of one man with the integuments of another, in other words, of the success of an animal graft, where the original circulation in the graft was not maintained till the new adhesion had taken place, an example is contained in a letter from my experienced friend and fellow pupil, Mr. Sawrey. Mr. Sawrey was some time ago applied to by a Swedish gentleman, now resident in London, who, "when "a boy, exchanged a piece of the skin of his arm with a school-"fellow, as a mark of indelible affection. The piece which was "transplanted united with the skin of the arm, both in him and "his friend, as he informed me; and, certainly, marks of its "having done so remained in him at that time."

The adhesion of divided Tendons is now known to be easily procured. It was formerly the practice, in ruptures of the Tendon Achilles, to hold the parts together by stitches; but all which is at

at present thought necessary, is to bring them into contact, and leave them to the natural process of adhesion.

The union of divided Arteries, is a known act of nature: "In "many inflammations of the eye," says Mr. John Hunter, "we "find an artery, or arteries, passing from the tunica conjunctiva "to the cornea, and ramifying on the part. These have often "been cut across, to prevent the influx of blood; the two ends "are seen to shrink; but in a little time they are again perceived "to unite, and the circulation to be carried on as before."*—This union, however, must be understood of small arteriesonly.

The medical reader will, I trust, be interested in the following case of taking up the carotid artery, which my professional avocations have hitherto prevented me from publishing.

On the 3d of October, 1803, Mr. G. a shoemaker, residing in Little Coram Street, Tavistock Square, being engaged in a quarrel with his wife, went behind her, and with a square shoemaker's knife, stabbed her in the side of the neck. A violent hæmorrhage followed; but a female lodger in the house, who had formerly been an hospital nurse, happened to pass the room-door at the moment, and immediately flew to the woman's assistance. Having a cloth already in her hand, she applied it to the wound, and kept it there with the strongest pressure. Dr. Cairns, formerly a surgeon in the navy, and now practising as a physician at the Cape of Good Hope, instantly attended. This gentleman used every effort to tie the jugular vein, and left common carotid artery,

* Hunter's Treatise on the Blood, &c.—4to. Edition, p. 193.

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Dr Carpue on Plastic Surgery in India

(Extracts)

It was in this manner that the nasal operation had become forgotten or despised, in at least the west of Europe,; when, at the close of the last century, it was once more heard of in England, from a quarter whence mankind will yet, perhaps, derive many lights, as well in science, as in learning and in arts. @

That the art has subsisted from the most ancient periods in India, and other southern parts of Asia, and was at no time carried thither from Europe, is probable from further evidence than the simplicity of the Indian method, as compared with the Italian@@; the ordinary recourse which is had to it in India; its practice by a particular cast, and its junction with religious observances: it is probable, likewise, from the frequent occasions for it, from the favourableness of the climate, from the temperance of the people, and from the plainness of the road by which Nature leads to the invention. The adhesion of divided parts, however little understood, till lately, in France or England, was one of the first spectacles presented to mankind. If we fancy that we are entitled to refuse to the Orientals the reputation of science, this makes no alteration in the case; for no depth of science, but involuntary observation, was all that was wanted here. The operation of the hare-lip could not fail to suggest the supply of small deficiencies of the nostrils; and this would lead to greater reparations. The taking the integuments from other parts was an enlargement of the plan, and the result of research, or at least of reflection. @@@

I have proposed the question, whether the Indian operators, like the ancient ones in Europe, practised the restoration of the lips and ears, as well as that of the nose. The following letter, addressed to me .., gives a decided answer as to the lips; ..."I beg to inform you, that the same people who put on the nose said, they were also in the habit of putting on lips; and wanted to perform that operation on the eldest son of our native ambassador at the Paishwah's court, who had lost part of his upper lip: but to this he would not agree, although they told him they had frequently done it with success."

@ An account of the Indian method follows here.

@@ Ie, the method of Taliacotius .

@@@ After some further reflections on the origin of the practice Dr Carpue than goes to give a detailed description of his own method.
The last paragraph above is from an appendix to his work.
The work is dated 1816.

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In a conversation that I had some time ago with Captain Irvine of this presidency who had come to Bombay on some business from Poona where he is stationed, my curiosity was much raised by the account he gave me of a practice that is not uncommon among the Gentoos of putting new noseson people who have had them cut off. He told me that he first came to the knowledge of this from a sepoy who had his nose cut off by Tippoo during the last war. In consequence of it he had become an invalid in the Company's pay which he received every month from Captain Irvine. One day he came to Captain Irvine and begged his permission to go for a certain time to some distance that he might get a new nose, for he said that his wife could not bring herself to like him in his present situation. Captain Irvine thought at first that he wished to impose on him, but the man assured him that he was speaking only the truth and that he would shew him one of his friends who some time before had received a new nose. He accordingly brought him and Captain Irvine had reason to believe the story for he saw a nose which altho' not actually so perfect as if it had been formed by nature was yet sufficiently agreeable to the eye. Captain Irvine learned at the same time from Mr Findlaythe Company's surgeon with the Resident that the sepoy had some (ff 9v) time before been with him to beg to have a new nose put on but Mr Findlay had assured him that such a practice was not known among the Europeans. Captain Irvine gave the sepoy leave of absence and in some weeks afterwards he came back to Poonah with a pretty good nose. It was somewhat too roundand uniform but such as would not be taken notice of for being disagreeable. All the gentlemen in the Company's service at Poona were witnesses of this change. When Captain Irvine came to Bombay which was soon after the operation, the sepoy still wore plugs, I believe of cotton, in his new nose. There was a discharge from some slight ulceration within it, nor had the part acquired entirely the natural heat of the body. It appeared otherwise to be well joined and healthy and the man had acquired great security in his late acquisition.

Captain Irvine was informed that the operator cut a part from the skin of the forehead above the nose after he had beaten

it for some time so as to make it swell and become insensible. In order to take away the skin of a proper form and no more than was necessary he first applied a piece of paper along the cuatrice of the patient's nose and having cut it into the form of a nose according to his taste, he applied the paper on the forehead and from thence cut out just as much skin as it covered. He then put the skin in a proper situation on the old nose and secured it there by a paste. I suppose he cut off a little from the edge of the (ff 10r) cuatrice of the old nose before fixing the skin on it but of this Captain Irvine could give me no information.

As I wished much to be further acquained with this curious subject I wrote to my friend Mr Findlay concerning it and I cannot do better than send you a copy of his own words in answer.

" On the second instant I was favoured with your last letter wherein you express a strong desire of having some facts collected respecting the custom in this country of putting noses on those who have lost them. It affords me pleasure to inform you that we have ascertained in the most satisfactory manner that individuals or rather families of a certain cast of people in Hindostan have from time immemorial been acquainted with and practise the art of putting on noses, and I have ample grounds to believe that the operation is in general successful. I have at this moment before me two Mahrattas pensioners of the Bombay Government, whom I saw on their arrival here from Syringaputtam in May or June 1792 without noses. These two men have now their faces decorated with noses of a natural size and tolerable shape which are firmly united and receive nourishment from the stumps of their original noses. These two factswhich have fallen under the observation of all the gentlemen of this Residency as well as my own afford sufficient testimony on this subject; (ff 10v) but the following proof may be deemed still more satisfactory.

" Through Sir Charles Malet's obliging influence Mr Cruso and I were permitted to see the operation performed on the 26 ultimo by a man of the Koomar cast (a class of Hindoos chiefly employed in making the common earthenware of this country) who, with an old razor borrrowed on the occasion, dissected with much composure a portion of the frontal integuments from the pericranium of the patient and grafted it, a new operation to us in surgery, on the stump of the original nose. He there retained it,by a cement without the aid of stitches sticking plaster, or bandages. The patient is at present in good health and high spirits. An adhesion

has taken place seemingly in every part; when it is perfected and cuatrized I shall give you a particular history of the operation and subsequent treatment. Poona 12 December 1793."

The above is all the information that I have yet procured concerning the restoration of noses. It must be understood only of the soft and not the bony part of the nose; so much of it I suppose as a knife can readily remove; for this has been a common punishment with the despots by whom this country has been ruled. The cement, by which the old and new parts are kept together till they unite, appears to be a desideratum in our surgery. I cannot discover (ff 11r) wherefore the skin is not taken from a more ignoble and a less conspicuous part than the forehead. I should suppose that a piece of skin would but ill supply the place of the septum and the other cautilages of the nose, its muscles, membrane &c; but so far as appearance is concerned, and this must be acknowledged to be a consideration of great moment, it makes an excellent substitute.

Altho' this operation of the Gentoos is supported by the analogy of some well known facts there are people I doubt not who will call in question the truth of this relation. I beg leave to repeat that two of the Company's surgeons Mr Findlay and Mr Cruso both men of eminence in their profession have actually seen the operation performed and the sepoys who are mentioned above are known to all the gentlemen of the Residency at Poona. You are very welcome Sir to make ~~this~~ use of my name in any way you may chuse to mention this singular operation for I am perfectly assured of the un uestionable honour as well as of the good sense of those from whom I have received the accounts.

H. Scott

Bombay Jany 1, 1794.

Extracts reffering to Indian scientific knowledge
as given in the Encyclopaedia Britannica 1968

A.V.15

ALGEBRA (History of)

... Concerning the development of algebra in the Orient, in India, China and Japan there is still a good deal of dispute, partly with a nationalistic flavour. The very beginnings of algebra in all these countries seem to have been influenced by the Babylonian and Greek schools. Among the Hindu algebraists one should mention especially Brahmagupta (about A.D. 630), whose works on indeterminate equations in many ways goes beyond Diophantus. Somewhat later (about A.D. 1150) are the outstanding works of Bhaskara, the Lilavati and Vija-ganita. Here one finds rules for dealing with negative quantities: a dot over a number was used to indicate minus. It was realised that square roots of positive numbers have two roots, and Bhaskara also mentions that there are no roots of negative numbers. Unknowns were denoted by the names of various colours. Powers and roots were indicated by the initial letters or first syllables in the corresponding words, giving a close approach to algebraic symbolism.

With the ascendancy of Mohammedanism the Arab world became the centre for mathematical studies....

ASTRONOMY (History of)

(There does not appear to be any reference to India)

Binomial (Historical Note)

... The Indians and Arabs used the expansions of $(a + b)^2$ and $(a + b)^3$ for root extractions...

GEOMETRY (History)

(There does not appear to be any reference in the 1910-11 edition or in the present edition)

Mathematics (History of)

...Probably around A.D. 400, Hindu Astronomy began under western influence. This led to two important modifications of the Hellenistic methods; the replacement of the chord function by the sine function in trignometry, and the substitution of the decimal for the sexagesimal place value notation.

...The "algebra" of al-Khwarizmi (9th century, Baghdad) continued the near eastern tradition rooted in ancient Mesopotamia, while his astronomy combined Indian and Greek components...

(A somewhat expanded repetition of the above follows in a subsequent para. There does not appear to be any reference to India in the 1910-11 edition)

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Extract from "A History of Astronomy"

(page 165)... In the first flourish of the Baghdad Caliphate in the eighth century, ancient science made its entry. Primary knowledge was borrowed from the Nestorian Christians, who had found in Persia a refuge from the persecutions of the Byzantine church and had founded schools there. What was borrowed from India was more important. After the conquests of Alexander and of the later Macedonians rulers of Bactria, Greek science had grown an offshoot in India. Under the Gupta dynasty in Hindustan (about A.D. 400-650) there arose a literature of mathematical and astronomical writings, called "Siddhantas", proceeding from different authors, amongst whom Brahmagupta is the best known. In these works one meets the Greek world picture: the spherical earth and the epicyclic orbits of the planets, less detailed in comparison to Ptolemy and without the equant. Sometimes even a rotation of the earth is mentioned.

From India this influence now turned back to the west. It is mentioned that in 773 there appeared, before the Caliph Al Mansur, a man from India who was acquainted with the stars and could calculate eclipses. Whereupon the Caliph ordered the translation of the Indian books...

(page 166end)... Caliph Al Mamun, in order to check the ancient statement on the size of the earth, ordered his astronomers to measure a degree of latitude in the plain of Palmyra-- the Arabian world had no objections to assuming the sphericity of the earth, since the Koran was silent on this question....

A History of Astronomy by A. Pannekoek (English edition 1961)

References to Indian Science in "Augustine to Galileo"

(Vol I, page 49) ... In the field of mathematics the Arabs transmitted to western christendom a body of most valuable knowledge which had never been available to the Greeks, though here the Arabs were not making an original contribution but simply making more widely known the developments in mathematical thought which had taken place among the Hindus. Unlike the Greeks, the Hindus had developed not so much geometry as arithmetic and algebra. The Hindu mathematicians, of whom Aryabhata (b 476 A.D.), Bramagupta (b 598 A.D.) and later Bhaskara (b 1114) were the most important, had developed a system of numerals in which the value of a digit was shown by its position. They knew the use of zero, they could extract square and cube roots, they understood fractions, problems of interest, the summation of arithmetical and geometrical series, the solution of determinate and indeterminate equations of the first and second degrees, permutations and combinations (page 50) and other operations of simple a-rithmetic and algebra. They also developed the trignometrical technique for expressing the motions of heavenly bodies and introduced trignometrical tables of sines. The most important mathematical idea which the Arabs learnt from the Hindus was their system of numerals, and the adoption of this system in Christendom was one of the great advances in European science. The great merit of this system, which is the basis of the modern system, was that it contained the symbol for zero and that any number could be represented simply by arranging digits in order, the value of a digit being shown by its distance from zero or from the first digit on the left. It had very great advantage over the cumbrous Roman system. In the system which the Arabs learnt from the Hindus...

(vol I, page 214) ... Steel making was well understood in medieval christendom, though the best steel came from Damascus, where it was made by a process apparently developed originally by the Hindus. Later, excellent steel was made at Toledo....

(vol I, page 4)...It was the Greeks who invented science as we now know (page 5) it. In ancient Babylonia, Assyria, and Egypt, and in ancient India and China, technology had developed on a scale of sometimes astonishing effectiveness, but so far as we know it was unaccompanied by any conception of scientific explanation...

Augustine to Galileo: Science in the Middle Ages:
A.D. 400- 1650 by A.C.Crombie (2nd edition, 1961)
(Crombie is lecturer, history of science, university of Oxford. He is also editor of the journal "History of Science")

Science and Civilisation in China vol I,(1953):J.Needham

(p 19) ...Francis Bacon wrote:
It is well to observe the force and virtue and consequence of discoveries. These are to be seen no where more conspicuously than in these three which were unknown to the ancients, and of which the origin, though recent, is obscure and/glorious; namely /in printing, gunpowder and the magnet. ...

During the following centuries, Europeans acquired a much greater knowledge of China than was available when Bacon wrote. But those who should have known better failed to give the acknowledgement that was due. Thus J.B.Bury in our own time, in his history of the Idea of Progress, when describing the Renaissance controversies between the supporters of the 'Ancients' and those of the 'Moderns', shows that the latter were generally considered to have had the best of it, precisely because of the three great inventions which Bacon described, Yet no where in his book is there even a footnote pointing out that none of the three was of European origin.

Encyclopaedia Britannica: ~~1968~~ (1968)

Printing: as western civilisation knows it began about the middle of the 15th century in Germany. (further states printing to be known in China, Japan and Korea around the 6th century but claims European printing to be of indigenous origin)

Gun-powder: There is some evidence that the Chinese possessed black-powder in ancient times, but the evidence is not conclusive. ... Among the many claimants of the honour of discovering black-powder are Chinese, Hindus, Greeks, Arabs, English (R. Bacon) and Germans (B.Schwartz)

Magnetism: According to G.A.L.Sarton, the first clear mention in any literature of a magnetic needle for indicating direction appears to have been made by Shen Kua (1030-43), a chinese mathematician and instrument maker, who mentioned only its use on land. Soon after 1100 the chinese Chu Yu reported that in the period 1086-99 the compass was used for navigation by "foreign" sailors going between Canton and Sumatra. (the first European use of the compass is stated to be by some English man who lived during 1157-1217)

(SUPERIORITY OF SWEDISH AND RUSSIAN OVER ENGLISH IRON)
cir 1786

Question: What are the countries from which we generally import iron?
Answer : Principally from Russia, Sweden next, a little from Danish Norway and a small quantity from Spain. None imported from any other country. The Swedish ore ground iron is the best; some of the fabricks of Russia is the next; the common fabricks from Russia and Sweden are nearly on equality.
Question: With which sort of/iron would you rank /foreign the English mill iron?
Answer : With the most inferior sorts of foreign irons.

British Museum : Add Ms 38347: Proceedings of Committee: 11.8.1786

Madras, 22 September 1783.

To
Secretary of the Royal Society

Sir

The small book, that accompanies this letter, written in the Persian language, is a copy of part of a very large one, in the same language, entitled "the wonders of the creation:" and it is in fact a kind of general natural history, extracted by the compiler from books of science, and of voyages and travels, performed by the Arabians, who it is well known had, not only a great foreign trade, but extensive settlements in the islands of the East Indies, where yet their manners and religion do still prevail. I beg you to present it to the society in my name.

The book opens with an account of the wonders of the heavens, and the celestial spheres; the system is the Ptolemaic. To each except mars and jupiter, figures are annexed, and blank spaces were left in the book I used, for the figures of those planets. (p 2) You will see that, the sun and moon are drwn as amongst us, mercury is represented as in the act of writing, with paper and pen in his hands, and the inkpot before him; venus is a woman sitting down, and playing upon a stringed instrument, resembling an Irish harp. And that, which occasions this letter, is the figure of saturn. By enquiry amongst the learned of these parts, mars ought to be represented as a warrior, and jupiter as an old man sitting down, with four girls dancing round him: tho the book says something contrary to this. I never saw the figure, therefore simply relate what was told me.

The book was written in fifth or sixth century of the Hijera, and that which I borrowed, and from which my copy was taken, is in the possession of Mr Palk, in which the figures are all paintings, but the age of that copy I can not tell, being at a great distance.

It is now time to tell you, why I trouble you with the book: tho I must first inform you that, I had it copied, solely for the sake of the figure of saturn, and had begun to (p 3) translate the part that treated of the celestial bodies to send home, with a copy of the original, to the illustrious society, about four years ago: but the difficulty of getting the figures drawn prevented the carrying my design into execution. However in the year 1780, having got what I wanted, I sat down to do my part, but the war with Hyder Allee carried me from home, into the Carnatic; and tho I have had the part that was intended for the society, with me, the whole time, yet I really had not time to translate it, except the small part that ascertain the age of the book, and the account of saturn; in which there is not, however, any mention of the satellites, or ring or anything else; and the account of his periodic time is erroneous, and plainly relates to the seventh planet, the period of which is about sixty years and which is very seldom seen, and when seen is deemed ominous to the world in general, so says the learned Bramin with whom I talked. The instant I saw the figure it struck me as emblematical of saturn, and as representing him (p 4) possessed of what till very lately we were ignorant. I mean his satellites and ring.

Royal Society, London: Archives Papers: AP5/22

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Hitherto only five satellites have been seen by Europeans; he is here represented as having six, and their names I presume are expressed by the figures held in the hands: the arms shew that these bodies are moveable, but can not separate from the planet, and are capable of various motions within certain distances. The seventh holds the crown which is divided into four parts and this I suppose to mean the four concentric parts of the ring. The darkness, under the arm which holds the ring, denotes that the ring does not every where touch the body, and that there is a passage between it, and the body of the planet. The legs folded beneath the body I imagine to relate also to the ring, and to intimate that, the ring supports the body of the planet, or at least, that the body appearsx to rest upon, or within it: I conceive that the long beard, and emaciated body denote age, and represent the slowing of his motions.

(p 5) If it be urged that this explanation can not be put, for that the ancients had not instruments capable of showing them, I answer it is more than we can prove, and if ever a sixth satellite be discovered, it will be a strong argument in favour of the contrary opinion. I am much inclined to believe they had better instruments than we have. I must in this letter aim at brevity, therefore shall only say, that Alhazin wrote on colours, and (catoptricks), and the problem for finding the figures of object, reflected from convex, specula, is called Alhazim to this day. I have not seen Alhazin; if I could get it, I could with the assistance of this country would afford me, come at the knowledge of its contents, and perhaps might find telescopes. But if not, it does not seem any argument against there having been such instruments. For we know how early manuscripts are lost and of such books, treat of subjects, in which only as those which the learned, in particular sciences, are concerned, the (p 6) number of copies will have been few. Even now (when) (such) number of copies of such books are published, do we not find that many are lost, or only to be found in very extensive libraries? Much more easily then might the same thing disappear, before, when only manuscripts were in use. And when we reflect how few men in any country make use of telescopes, and quadrants and such like instruments, we may easily conceive, that the copies of books treating of such matters would be very few, compared with astronomical tables, which were in greater use, on account of their utility in astrology: and those are scarce, and it is difficult for Europeans to get them.

I shall now address some thing approaching to a proof of there having been telescopes, tho perhaps not like ours. First then, I asked a learned mussulman with whom I had frequent conversations on these subjects, whether they had any mention of such instruments as we use; he said he did not recollect that there were any, except Alhazin, amongst the Arabs, who ever that he knew had written on such subjects. (p 7) Nor do I know added he, that he did describe such instruments, but he treats of the principles on which they depend.

I must now observe, that since Alhazin wrote on colours, and reflections; and not on refractions thro prisms and lenses, the not finding any mention of the uses, to which the specula were applied, will certainly not prove that there were not telescopes.

Let us suppose a treatise, on reflection and refraction and the places of figures formed by either, to be written purely scientifically, without any mention of telescopes, or any application of the uses of the theorems. That by some accident, (possibly from the revolutions of time) all other treatises on the subject, or books in which telescopes, and their uses are described, and all telescopes had perished. If such treatise were then to be found, in some very remote period, the finder would not easily discover the use of the theorems, and still less the instruments formed on the principles, therein delivered. Alhazin delivered principles. Artists might possess the application, perhaps not even committed to writing, but learned, as trades are now learnt, (p 8) by working and practice.

A Bramin with whom, I discoursed, and asked how they made their tables, said that they were formed a long while ago, by means of great pits, dug into the earth, in which the celestial bodies were made visible. But what means they used to see them he did not know. He said he could only use those tables, not form them; that the sun had formerly delivered the tables to a learned Bramin, who had continued above sixty years constantly adoring him, as a reward for his labours. This Bramin agreed, that what he said was allegorical, and simply meant that they were formed by a series of observations, diligently made. So little could I make from these discourses, that instead of gaining lights I seemed rather to lose them: and tho the mussulman thought of Alhazin as I do, (and moreover told me that the observation of the transit of venus, made by our horrox, which I reduced to the Hijera, was not the first; for that mention is made of one a long period before that, in an Arabic book: he quoted the name, which I (p 9) have forgotten but have in Bengal, amongst my papers) yet the want of actual knowledge of the use of telescopes threw all into doubt. However one day as I was reading an English translation of the Arabian Nights, I met with mention of them as things of very common use, and compared with things as common as apples, and carpets. Three princes went to seek for curiosities, and the fairee Purree Baunoo furnished each, under different shapes, with what he wanted; to one she sold a small carpet for an immense price, not from its curious texture, but its property of transporting him, that sat on it, to the place to which he wished to go: to the second an apple, that would cure disorders by being laid on a sick person: and for the same price, she sold to the third a telescope, that was endowed with the property of shewing to him that looked thro it, what he wished to see; if he looked thro one end; and objects as usual if he looked thro the other: and it is described as a small tube of ivory, having a glass at each end.

(p 10) If then that book were written before telescopes were in use in Europe, and that is ascertainable, then telescopes were things in common use, before we had any ideas of them: and tho they are not described as being such as Dolland has since made, they were telescopes, and amongst those who even now mention telescopes occasionally, how few will describe those exquisite ones, that are applied to astronomical purposes. That useful invention perish, in time, have we not instances enough. The mummies suffice; tho even in our own days have we not seen Dolland perfect telescopes, by the addition of these object glasses, and are we not in danger of losing them again, from the want of the materials to make one of the kinds of glass used by him? Gun powder is also thought to be, as I may call it, compared with great antiquity, a modern

invention; and yet in Gray's Gunnery, there is a quotation from a Greek author, that gives reason enough to suppose, it was applied to guns, even in the time of Alexander.

(p 11) Much more I could add on this subject, and had written in Bengal, to send you, but in my present situation I can only add, that the loss of any science is not a proof that it never was known, and all I propose, is to present the figure of saturn as I found it, and to give you my reason for explaining the emblem as I have done: which yet remains to be made out , by some future discovery, of the sixth satellite, the existence of which is not thought to be totally chimerical.

I shall not scruple to inform you of things that may seem wonderfull, which come within my own knowledge. I have the prediction of three comets and an earthquake, which I received long before the events. The earthquake did actually happen, and desolated the extensive regions, round Lahore. Unfortunately that paper is in Bengal. Mr Hastings has a copy of it signed by me, with the day marked on the paper, to shew when I received it, which was June and I think the earthquake happened in September, or the latter end of August 1779 or 1780. (p 12) But I send you the copies of the other two predictions, one of which was fully verified at Bath, tho I, being on my march, had not time to look for it , as I certainly should have done, had I been settled.

The Bramin has promised to me a copy of the tables of one hundred and eight comets; and when I return to Bengal, if he is living, I will endeavour to get them. He says they are of different kinds, some have ~~shark~~/tails,/strait some crooked tails, some fan tails, some are encircled with a burr, and some are without any. Again some are retrograde, some deriot? and others cross the heavens: I hardly dare to tell you, that the book was, as he says, written in the jugg preceding this, and that this began, with what we call the creation.

direct?

When we are arrived at some knowledge of the Shanscrit, we may make discoveries of much importance, and either verify the assertions or contradict them. I relate simply what was told to me, I do not take upon me to vouch any thing, but that the man had not any interest in deceiving me; I asked for information, after the manner of a disciple; proposed questions arising from the discourse, and (p 13) making comparison of what he said, with our system, for further information, He replied, you and the mussulmans differ, from each other and from us: the mussulmans suppose the sun to go round the earth, daily, and annually: but the earth turns round its axis daily, according to your system, and to ours; Mussulmans follow Ptolomy, we the ancient books, and you a system of your own, if not derived from ours.

Here I must put an end to a letter, which I fear, will prove tedious, more especially as it concerns matters, which militates with systems, that men do not wish to(spake); and which I relate merely to shew some part of the belief, of some of the men of science of the Hindoo tribe, who are not very communicative.

Madras, 22 september 1783. T. D. Pearse

Col Thomas Deane Pearse (1738-89) was in India from 1768 and died in Bengal. He is mentioned in the British D.N.B.

HINTS CONCERNING SOME OF THE ADVANTAGES DERIVABLE FROM

AN EXAMINATION OF THE ASTRONOMICAL OBSERVATORY AT BENARES

Observation of the ancient monuments have the same relation to history and the arts, that experiments have to natural philosophy; without the last, philosophy is little better than a dream, and exclusive of the former, conjecture is vague and indeterminate.

To establish an intercourse with the learned of different nations, and to unite their collective force in surmounting the difficulties of art, and extending the boundaries of knowledge, were the primary motives of the first institutors of the royal societies of London and Paris; they knew that science would become the easier as its generality increased, and were conscious of the vast advantages that would arise from the auxiliary support of antiquity in the investigation of truth: Convinced of the veracity of this principle, the antiquarians of Europe were at immense expences in collecting medals, and taking the draughts and dimensions of the Greek, Roman, Palmyrean and Egyptian antiquities; and though much greater advantages may be expected from those collections hereafter, when more generally known, yet even the improvements derived from them already in the (ff 263v) single article of architecture have more than compensated the expence, and may fully be considered as a national advantage, whether we respect their utility, duration, conveniency or elegance.

Not-withstanding the prejudices of the Europeans of last century in favour of their own abilities, some of the first members of the royal society were sufficiently enlightened to consider the East Indies and China &c, as new worlds of science that yet remained undiscovered. They wrote out lists of queries; furnished new heads of enquiry, and seemed extremely desirous of possessing the literary treasures of these unexplored regions of knowledge of which they had formed such sanguine expectations. They failed in these endeavours; it is true, by employing improper means, but the attempt will ever be a monument of the wisdom and public spirit of the employees; and had they not too hastily concluded that to be lost, which nothing but the prejudices of ignorance and obstinacy, had prevented being found; we might at this time (be) in possession of the most finished productions of Asia, as well as of Europe; the sciences might, in consequence, have been carried to a much higher degree of perfection with us than they are at present; and the elegance and superiority of the Asiatic models might have prevented that neglect and depravity of Geometry, and that inundation of Algebraic barbarism which has ever since the time of Descartes, both vitiated taste, and overrun the publications, of most of the philosphical societies in Europe.

(ff 264r) But notwithstanding that the ruins and repositories of Greece and Rome have been ransacked and

British Museum: Warren Hastings Papers: Add Ms 29233

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scrutinised for antiquities, those former prejudices are still in force, and the East Indies are almost entirely neglected; for though the country teems with curiosities of almost every kind, yet excepting the late translation of the code of Gentoo laws, Europe has received less information from her sons in those matters, than if she had dispatched none to the East but Huns and barbarians; and yet there is a reason to believe that was the "Parent of the Sciences" (notwithstanding that epithet is usually applied to Egypt) for the Chinese on the one side, and the Babylonians on the other, we know had astronomical observations, and yet Egypt with all her boasted antiquity had none.

In all the Grecian, Roman and Egyptian remains there does not appear to be the least vestige of an Observatory: The Pyramids are said indeed to have been placed north and south for some astronomical purpose, and we are told that Delhazelles examined the largest of them about a century ago and found it so; but this I very much doubt; for if he examined one, it must have been great want of curiosity not to examine more; and even if he was capable of making the examination, (which is dubious) neither France nor England could at that time have furnished him with an instrument sufficiently exact; besides, it is not certain, nor even very probable that the builders (ff264v) of the Pyramid took any uncommon pains to place a building in the plane of the meridian that seems only designed for a funeral monument: And yet from this single and doubtful observation have philosophers concluded that the earth has not altered its axis! It was not indeed supposed till very lately that there was any practical mode of determining the matter; but fortunately for astronomy there is a large Quadrant existing at Benares, which from the intent of its construction must necessarily have been placed in the plane of the meridian when the observatory was erected; and as this Quadrant is an immoveable structure of solid massy stones, and consequently not liable to vary its azimuth, or bend like European quadrants the transits and altitudes of a number of stars may be taken with it, by a proper contrivance; and its position with respect to the meridian and equator &c found out with the greatest exactness; from whence many useful conclusions may be drawn, and this very curious and difficult affair perhaps determined.

It is well known that the problems of finding the precession of the equinoxes, and the mutation of the earth's axis, have been considered by some of the most learned mathematicians, and yet they are not agreed concerning it: Some great authors (ff 265r) as Newton, Simpson, Walmsley and Sylvabelle, supposed the action of the sun and moon to bring the equator out of its place, and to make it revolve round the old axis in a different position; while others as D'Alembert, Euler, La Grange and Trifius, suppose the result to be a new equator and a new axis. This last seems indeed to be partly the case, for we cannot otherwise account for equitorial productions being found in Russia and Siberia; nor how those of the frozen zone should be found in the torrid: The matter however is still very doubtful, and requires the aid of observations; for in my opinion even those that have treated the subject best, have omitted some parts that are very essential; for some of them have made a wrong estimation of the quantity of the solar force and all of them have assumed the rigidity of the protuberant parts of the earth's equator, in their calculations;

which is evidently contrary to fact; because we know tha-t near 5/6 th of the whole equator is covered with water; and there are not even signs of shallows any where in it, to speak of, except in the short distance between Madagascar and Sumatra: This must make so great a diferrence in the result that it scarcely seems possible to determine the matter alone by theory: The fact however is certain, that the best mathematicians differ greatly in their conclusions; but if the earth (ff 265v) acquires a new axis the meridians will consequently be changed; and if the Quadrant at Benares was placed in the plane of the meridian when the building was erected, it cannot be in the plane of the meridian now; and therefore if the quantity of its deviation from that plane, be carefully and accurately determined it may answer many useful purposes in astronomy, and likewise be serviceable when the theory is perfect to point out the time when the Observatory was built, exclusive of its use in the mutation and precession.

It is also probable that some useful information may be had from the Observatory at Benares, respecting the obliquity of the ecliptic; for though the ancient observations sufficiently point out a diminution, yet these observations are some of them incompatible, a-nd there is a difference with astronomers of more than one fourth part of the whole annual decrease. This I presume may be determined from some fixt sights that are upon one of the instruments, and which perhaps may be directed to some particular star, or remarkable circle in the heavens.

I am likewise informed that the instruments are divided, but have not been told the particulars; if they have sub-divisions and numbers, they may (ff 266r) instruct us in the ancient characters; and perhaps the dimensions of the instruments may give us information respecting the antique measures of the Hindoos; indeed every possible observation ought to be made and every particular dimension taken with the utmost accuracy, for it is with experimental observations a-s with given situations in geometry where the positions of a few points is sufficient to determine a multitude of lines of different species; and as a number of important conclusions may be drawn from a collection of accurate experiences and well attested facts, so every opportunity of making such ought to be embraced and attended to, if it was on no other account but to give an additional value to observations that might be made in future: For it is worthy of remark that knowledge does not increase in proportion to the number of experiments but in a much higher degree; and that a single observation which proves little or nothing when alone may have a very great effect in conjunction with others; thus, for example, a single point in geometry determines nothing; and two, only give the position of a line; yet if a couple of additional points be added; not only six right lines are thereby determined, but also the (ff 266v) magnitude and position of 4 circles and a parabola; and if we add two points more (which singly would only give a line) we shall thereby determine 15 right lines; 20 circles; 15 parabolas, and 6 ellipses or hyperbolas; from where might be drawn an infinity of other conclusions of different kinds; and though the enquiry at first, might only respect some particular case(as right lines for instance in the example before us) yet from the same data all the rest are deducible; and by similar reasoning, observations made at Benares with only an astronomical view, ~~might be applied to~~

might be applicable to commerce, to history, chronology, and most kinds of subjects.

There seems reason to conjecture that the sciences took their rise in India, and were carried there to a high degree of perfection before they were transplanted in other countries: This transplantation might be more or less partial according to the inclination or abilities of those that came into India for instruction; and by the intermixture of these with their own different tenets, we may perhaps account for that confused jumble of truth and fiction that we meet with in what are called the placits of the philosophers. If the Indians knew the theory of comets and (ff296r) had reduced them to calculation, the Chaldeans from thence might have easily learnt that "comets were only planets moving in very eccentric orbits ", without being able either to calculate their places or to find their distance. To tell us that Pythagoras had the same idea, is only an additional confirmation; we know that he went to India to be instructed; but the capacity of the learner determines his degree of proficiency, and if Pythagoras on his return had so little knowledge in geometry as to consider the for(ty) seventh (?) of Euclid as a great discovery, he certainly was entirely incapable of acquiring the Indian method of calculation, through his deficiency of preparatory knowledge; and therefore could only get such general notions and principles of things as he was capable of understanding; as the system of the universe, the idea of comets; the plurality of worlds and the doctrine of transmigration: This also accounts for the contradictory opinions of ancient authors concerning the invention of the sciences, and whether the Chaldeans were capable or incapable of predicting the returns of comets and foretelling eclipses, as a-uthors dispute; for each teacher, or head of sect that drew his knowledge from the Indian sources, might conceal his instructors to be reckoned an inventor, and the art itself would be estimated according to the capacity or proficiency of the promulgator, or his followers; thus Berosus the Chaldean is considered by Vitruvius as the (ff 267v) inventor of concave sun dials, though probably the invention had come from the Bramins; as there is now a similar instrument at Benares: Another reason why the sciences were perfected in India is the Indians having been much longer civilised than any other nation, and we know that when people are civilised they begin to study the arts: That they have been much longer civilised, is plain from their state at present, for notwithstanding the slowness of its revolution they have evidently gone through almost the whole political circle of legislative degradation; and are nearly arrived to that despicable state of feeble insignificance, which separates the barbarity of a state of nature, from that of a state of society; and which has all the miseries of both, without any of the advantages of the former.

As it probable that many of the observations made by Indian astronomers are recorded in manuscript which a more general intercourse with the natives may discover, it becomes the more necessary on that account to make a particular examination of the instruments at Benares, even to enable us to use such observations, if they should chance to be found hereafter; this will appear indispensably requisite, when we consider that the Chinese (ff 268r) have their measures of a degree different from ours and that 23 39' 18" of our divisions make just 24 in China: Now it would have been impossible

for us to have made use of these observations had not a comparison between the Chinese instruments and ours enabled Father Gaubil to give us the ratio between them; and as the observatory at Benares is probably the only one existing in India, so no opportunity of examination ought to be neglected, lest the instruments should be defaced by accident or barbarism, and observation be thus rendered useless that might perhaps have been accumulating for ages; at least this advantage will arise from it, that we shall know what mode of angular sub-divisions they really did follow, and from thence probably be enabled to determine whether the astronomers of India had any communication with the Chinese or Arabian &c.

In the Newtonian chronology it is supposed that Chiron made a sphere, and formed the constellation into such figures, respecting the argonautic expedition, as we now have upon our Globes; as Aries for the Golden Fleece; Taurus for the brazen footed bull; Gemini for the two Argonauts, castor and Pollux &c; this chronology (ff268v) is partly founded on a supposition that Chiron's sphere was made for the use of the Argonauts and that the equinoctial colure at that time passed through the middle of the constellation Aries: This hypothesis however, has met with great contradictions, for it is positively asserted that the Hindoos have similar constellations, and figured almost exactly in the same manner as those that are attributed to Chiron. Now either Chiron received his sphere from the Indians, and the improbability of the colures position whence he received it will render the time of the Argonautic expedition doubtful; or else the Indians had their astronomy from the Greeks and therefore may have some of their other productions; at least it implies a communication, and it is probable that not only the true system of the world but many parts of the Grecian literature might be derived from the Bramins: Indeed there are many reasons to believe that the true system extended over many other nations before it was heard of in Greece, for it would have been useless to have multiplied astronomical observations on a false hypothesis and we know that the Babylonian astronomers had a series of near 2000 years observations at the time of Alexander the Great: As to the orbs and epycycles of (ff 269r) Ptolemy they are but of modern date, in comparison with the ancient Pythagorean system; and the ignorance of the later Greeks and Romans is evident from the ridiculous explications of ancient monuments (plainly relating to the true system) given by some of the old mythologists, examples of which made be seen in Boulangir, Costaud and others, and I have lately met with a similar instance in the Imag Deorum of V. Contari, respecting the copy of an ancient Persian monument, in which Apollo dragging a bullock by the horns, apparently has a relation to the doctrine of mutual attraction; and where the figure of the sun in a circular plain intersecting a cone, evidently points out both the centre of force and the form of the earth's orbit; in the same manner that Bullialdus has done in his treatise on the philosaic astronomy.

It would appear from this explanation that the figure of an ox was a symbol with the Persians to represent the moon;.perhaps it may also be the same in India, where we know both the moon and the cows are objects of superstitious veneration: There likewise seems to be a familiarity between the East Indians and the Jews; for the Jews "worshipped a calf"; "baked cakes to the

queen of heaven" and "blew the trumpet in the new moon", and there (ff 269v) is one of their idolatrous customs mentioned in the 7th chapter of Acts and the 5th Chapter of Amos, that has a very evident reference to the Hindoo custom of dragging their wooden about; and the Jews are threatened to be carried away "beyond Babylon" for using it; that is, I suppose the place they got it from; for they could not be carried far beyond Babylon without approaching very near the East Indies: However an examination into the Hindoo monuments might give some light into obscure passages of scripture, and as such infinite pains has been spent upon it as a matter of faith, it might not be amiss to take a little more with it, on the footing of a history.

It is usual to speak slightingly of Indian astronomers, and to affirm that the utmost of their learning consists in foretelling an eclipse: But to calculate an eclipse is no trifling matter even in our astronomy, and if the Bramins have such ~~extraordinary~~ short and easy modes of computation as to make that business a trifle, to gain their methods is certainly an object worthy of enquiry, and the more so as our modes of calculation are excessively tedious and intricate: It is also reported that the Bramins have rules for computing the returns of places of comets. Now this is a matter of astonishingly difficult and so complicated (ff 270r) with every principle of mechanics and philosophy, that if they can possibly do it there requires (in my opinion) no other proof of their having formerly carried astronomy to the highest degree of perfection.

It is also generally reported that the Bramins calculate their eclipses, not by astronomical tables as we do, but by rules; now these rules, are either as exact as our methods, or not; if they are not, perhaps there may be some particular modes of applying the Chaldean "saros" of 223 lunation, or the "neros" of 600 years, which may be of use in making a near estimate of the times when eclipses may happen: If they be as exact as ours, or but nearly so, it is a proof that they must have carried algebraic computation to a very extraordinary pitch, and have well understood the doctrine of "continued fractions", in order to have found these periodical approximations; this I am the more confirmed in because I have heard that the Bramins have different rules for computing eclipses and that those rules are more or less complex according to the requisite degrees of exactness; which entirely agrees with the approximation deduced from algebraic formulae, and implies an intimate (ff270v) acquaintance with the Newtonian doctrine of series. This at first sight may seem improbable, but will appear entirely consistent when we recollect that the Bramins have Arabic treatises among them, and that the Arabs are well known to have carried Algebra to a high degree of perfection: We are even told that they had a compleat method of resolving cubic equations, and were likewise possessed of the 13 books of Diophantus, the 7 last are lost; in the 6 that remain he has carried the subject almost as far as we have, and therefore it is not impossible for the Bramins to have understood Algebra better than we do.

I have hitherto supposed the Observatory to be ancient, but most of the aforesaid advantages will obtain, even if it be so modern as the reign of Akbar: There will likewise be a greater probability of meeting with the ~~original~~

original observations, and more certainly respecting the manner they were taken, as to the system itself which the modern Bramins may now either follow or pretend to follow, it can have no effect upon the observations, for observations are of no sect or party but that of truth, whether the Observatory be Ptolemaics or Copernicans, and if they should happen to be numerous (ff 271r) and to be made with great care, they may be of essential service to modern astronomy whether the earth be supposed moveable or immoveable.

I am far from attributing any superior excellence to the present race of Bramins, especially those of the districts about Calcutta, but I am of opinion that a great deal of knowledge may be found in their books and that some curious and useful matters may be learnt from among themselves: Of the skill and abilities of the ancient Bramins I have not the least doubt, though it is a matter of difficulty how long their successors might have retained that knowledge: I am even of opinion that the intent of the first Indian legislature in the institution of the cast of the Bramins was something similar to that of the late society of the Jesuits, and the "Chaldean Astronomers", the Persian Magi, the "Sooth Sayers of Babylon", the "wise men of the East" and all the "astrologers, stargazers, and magicians" that the prophets of the Bible seem to be afraid of, and yet affect to ridicule, were nothing more than either the Bramins themselves or some of their disciples that were infected with the rage of governing, and giving advice, and travelled about (ff 271v) to every court and kingdom like the Jesuits, making use of their knowledge in the sciences as a recommendation to matters of more importance: It would be too long to enumerate reasons for this opinion from history; I shall therefore only just hint that the sun-dial of Ahaz mentioned in scripture seems to have been made by the Bramins of Hindoostan; for the shadow of a sun-dial made for the latitude of Jerusalem could not possibly have gone back, as that of the dial of Ahaz did, and consequently the dial was made for some place between the tropics, and its style must have also been a Gnomon; but we know that a dial made for any particular latitude will also serve for another if it is properly drawn and situated, and as the Jews were too ignorant to place it themselves, some Bramin might have done it, (for we know that Ahaz followed almost every particular of the Gentoo worship and also encouraged their customs and arts) and Isaih ofcourse have taken the opportunity to retail its usual property, as a miracle: That the shadow of a sun dial made for the latitude of Jerusalem can not possibly go back is evident from this principle, that whenever the latitude (ff 272r) of the place ~~and~~ and the declination of the sun are of the same name, and the latitude less than the declination; the foot of the Gnomon will fall without the convex part of the hyperbola described by the shadow; and consequently a tangent may be drawn from that point to the curve, which shews when the shadow goes back; but that the Gnomon fall wholly within conic section in all other cases; and from this principle I discovered in my way to India a method of working azimuths at sea between the tropics that may be done with 1/20th part of the trouble of the usual methods, and gives the variation of the compass much more exact.

From the accounts given in the Bible of idolatories of Ahaz and several other of the Israelitish kings, it

seems probable that the Gentoo religion had extended itself over most of the kingdoms between India and the Mediteranean; the Jews were continually running into it and made "carved and molten images", worshipped in "Groves under green trees" and made their sons and daughters "pass through the fire" in the same manner as the Fakeers and Bramins do at present; in short the worship ~~the worship~~ of fire seems to have been a principal part of the Jewish (ff 272v) idolatory as it was then all over India and is now on the coast of Malabar. But whether the making of "their children pass through the fire" was actually sacrificing them, or not, I can not determine; I think it was; but it is worth enquiry what the customs of the fire worshippers on the coast of Malabar are in that respect, and how far those customs extend, and whether there are yet any remains of them among the priests at Benares, as I think there must.

Out knowledge respecting India is so exceedingly confined that it is impossible to conjecture with any degree of probability how (long) the Bramins retained their superiority in literature; it is said that the Ptolomaick system was introduced by one of their conquerors called Bickerammjeet about years ago, and that in consequence of his order, the true system of the world was entirely exploded. But part of this story seems more plausible than true for it does not appear likely that men who were strongly convinced of the truth of a system should so easily discard, without ever resuming it, for another that had no other recommendation but the sanction of (ff273r) imperial stupidity. It is more probable that the ancient system kept its ground long after, in private, though the Bramins might ~~have~~ pretend to be obsequious to the mandates of authority in public: This at least, is the case now in the catholic parts of Europe, for by the Pope's decree, to believe in the copernican system is heresy, and to profess it publicly, is damnation, and yet it is publicly denied and privately believed by every person of knowledge. How far an increase of ignorance may have been favourable to Ptolomy's system in India can only be known by a more intimate acquaintance with the writings of the Bramins; however as this change of system aforesaid, was not at such a vast distance of time, it is to be hoped that the decrease of true knowledge was but slow, and if so, probably some of their best productions may have escaped the ravages of time, and come down to us without much loss or depravation.

Astronomy is a subject that requires a larger stock of mathematical knowledge than is usually imagined, and therefore on the renewal of learning previous to the building of the Observatory at Benares, supposing it modern, (ff 273v) there must have been some proficiency made in the sciences; this proficiency must either have been derived from the works of the ancient Bramins, or else introduced from some other country; if it was derived from the Bramins, their books must be still in existence, and therefore might be procured without much difficulty; if from any other nation, it would be of consequence to know with certainty its situation, because we should not only know where to direct our enquiries but that nation it is reasonable to suppose would have made collection of all the learning of the adjacent and neighbouring countries, and would in particular have procured, and yet might retain, the works of the principal Arabian mathematicians; but the Arabian mathematicians

we know were possessed of most of the works of the Greeks (for it is from straglling Arabic manuscripts picked up by chance, that we derive the little we know of Grecian mathematics) and therefore to determine the source of these, will be perhaps to discover those excellent works (ff 274r) of Archimedes, Euclid, Diophantus and Apollonius &c that have been so long lost and deplored by European mathematicians.

But supposing after all that this Observatory (contrary to every rule of probability) was built for ostentation and not for use; that there is nothing in its construction worth remarking; no observations on record to be met with, nor any appearance of utility to be derived either from its situation, its form, or position of the instruments, yet even in that case the expence will not be entirely lost; for a number of observations may be made respecting the geography, metreology and astronomy &c of India that will more than compensate the trouble. The surveys of India are known to be remarkably defective, and there is great reason to believe that not a single place in India has had its longitude properly determined except Pondicherry. The lattitudes are nearly in the same predicament, and indeed most of the English maps are made up of ideal chains of mountains and imaginary woods, taken piecemeal by pretended surveyors, and put together at random without either longitude or (ff 274v) latitude by people who were only solicitous to have a fine drawing, without any regard to exactness or to use; by these means the countries are horribly distorted in their positions and geography is so little benefitted by such maps that they are a nuisance rather than an advantage, and there is no other proper method of correcting such surveys but by determining the positions of some of the most material points by astronomical observations; this would assist in putting the different surveys properly together, and as the longitude of Benares and others that might be deduced from it, would contribute in part to that purpose, a journey thither of course would be so far useful.

The opportunity of making observations of the dip, and variation of the compass might have then utility not only in correcting the surveys, but in discovering the theory of magnetism: That the theory has not yet been discovered is in my opinion owing to a want of observations: It is not easy to know conclusions by induction without a sufficiency of facts, and yet I do not know that in the whole space from India to the frozen ocean, nor from Persia to Kamchatta there has yet been made a single observation, except that (?) at Tobolski by De La Chappe - - - - -, (ff 275r) and therefore a journey to Benares would also be useful in this matter.

The nature of the refraction and its variation with respect to the heat, moisture and density of the air, would also be a very proper object of enquiry at Benares: The tables made by Cassini, Newton and (?) De Lasaille, are all of them different, and with respect to Benares, are adapted to very extreme latitudes: There is also reason to believe that the results at Benares would be very different from any of them and not only elucidate the general principles of refraction, but also be of service in the practice of navigation, especially about the tropics; if any ancient observations

should be discovered, the refraction would be absolutely necessary, and even if they should not, it would have its use; for the climates of England and India are different, to depend upon reasoning from analogy only; especially when there are so many causes of variation and so few ~~few~~ of them well determined.

If the observer was furnished with a proper instrument, it would also be advisable to find the moon's horizontal parallax (ff 275v) in the manner first hinted by Digges and afterwards employed by Maskelyne at St Helena: This would in some respect answer the purpose of measuring a degree of the meridian, especially as the errors might be reduced to very small limits by a repetition of the observations; and this method has an advantage over that of measuring a degree, for it is not liable to be affected by the uncertain attraction of mountains.

With respect to the other observations respecting meteorology, aerometry, astronomy and electricity &c which a journey to Benares would give an opportunity of making, it would be endless to enumerate the particulars: It is sufficient to observe that they would all be of service to philosophy, and not take any extraordinary time to execute. But if it was thought proper to send a person who was well acquainted with the theory and practice of astronomy &c with a small collection of good instruments to take the latitudes and longitudes of most of the particular towns and places in the Company's territories and dependencies, he might not only collect materials for making (ff 276r) a proper survey of those parts and acquire information respecting the ancient and modern state of the country &c but would also have an opportunity of making the best collection of astronomical and physical observations that has yet been offered to the public; and if it was thought that umbrage might be taken at such a procedure by the natives, it might easily pass under the notion of measuring degrees of the meridian, or of longitude &c, to avoid suspicion.

(ff276v) Mr Burrows

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12 June 1783

Honourable Sir

The favourable attention you were pleased to show to the hints concerning the Observatory at Benares which I had the honour to lay before you by means of Colonel Watson, emboldens me to inform you of the motives by which I was induced to come to India: And as I flatter myself that they are such as will not only meet with your approbation, but also deserve your encouragement, I hope you will excuse the liberty I have taken in being rather diffusive. I am well aware of the multiplicity of business annexed to the station of Governor General, and should be sorry to take up any part of that time which is usefully employed, and so valuable to the public, (ff 376v) had I nothing in view but my own private advantage; however, I hope that my intention will deserve a much more favourable construction, especially from a gentleman whose extensive views and extraordinary qualifications enable him so well to judge of their tendency.

When I first applied to the study of mathematics, I commenced with the works of the moderns, and while I made myself perfect in their rules, I insensibly fell into many of their prejudices: I found however that their modes of computation in general were rather a kind of reasoning without ideas, than any of those evident methods of deduction which I had been taught to expect; and I did not find that to increase in the knowledge of deducing results was to increase at all in perspicuity: I (ff 377r) therefore endeavoured to discover some preferable mode of investigation which might have all the advantages of the algebraical computation and all the evidence of geometry, and I luckily hit upon one, which I afterwards found to be a part of the ancient analysis: This induced me to look into the works of Archimedes, and to peruse the Conics of Apollonius, with his treatise De Sectione Rationis (?); where I was agreeably surprised to find that brevity and clearness of investigation, and that methodical superiority in the construction and demonstration of propositions &c, which I had hoped for, and expected in vain from the writings of most of the moderns.

After having perused those two excellent treatises of Apollonius, and compared the elegant superiority of his works with the tedious immethodical confusion of the modern mathematicians, (ff 377v) I enquired with avidity for any other works of the great geometrician: I found that Pappus Alexandrinus had enumerated the heads of 13 different treatises that were considered by the ancients as an introduction to the mathematics, (of which Euclid's elements was the first) and that 7 of those were by Apollonius; but unfortunately I found that the two which I had already perused were all that had been saved from the general wreck of the sciences of Greece, and that the rest were supposed to be irrecoverably lost. I had seen enough however in what remained, to convince me, that if the elegance and perspicuity of the ancients, could be combined with the certainty and expedition of the moderns, mathematical knowledge might be greatly

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improved and expedited; and I saw no surer method of obviating those ill effects (ff 378r) of the sciences alledged by some learned philosophical authors, than to shorten the time of their attainment. As to the advantages of such an union of the methods; I foresaw they would be innumerable; and therefore I addressed myself with alacrity to restore several of those books that were supposed to have perished; one of them I published about 5 years ago, and several of the rest I have by me, partly sketched out and partly finished; and in the opinion of some very good judges, I have no reason to consider myself as unsucessful.

The books enumerated by Pappus are as follows.

	Books	
1. Euclid's Elements	15	
2. Euclid's Data	1	
3. Apollonius on Proportional Section	2	
4. Apollonius on Section of Space	2	
5. Apollonius on Determinate Section	2	
6. Apollonius on Circular Tangencies	2	(ff 378v)
7. Euclid's Prisms	3	
8. Apollonius on Plane Loci	2	
9. Apollonius on Inclinations	2	
10. Apollonius on Conic Sections	8	
11. Aristaeus on Solid Loci	5	
12, Euclid on Superficial Loci	2	
13. Eratosthens on Mean Proportionals	2	

It appears from the foregoing list, which is placed in the order they were taught by the ancients, how very superficial the modern methods of education are in comparison to those in use formerly; and if such was their introduction to science; what must their science itself have been ? That the ancients knew the use of the curves of the higher orders in the solution of problems, is evident from Pappus; who informs us that such solutions were usually called linear ones; and from him we are also informed that the ancients were acquainted with several rules (ff 379r) that are supposed to be peculiar to the mathematicians of our time; particularly the doctrine of maxima and minima; the general principles of Isoperimetricals, and Centrobarycal speculations of Guldinus.

Of all the aforesaid treatises, we have only Euclid's Elements and the four first books of Apollonius's Conics in the original Greek: The treatise on Proportional Section was translated by Dr Halley from an Arabic manuscript that appeared to have been written about the time of the Caliph Almaimon, and was discovered by chance among the dust and cobwebs of an old neglected library that had formerly belonged to Mr Selden: The 5th, 6th and 7th books of Apollonius's Conics were accidently met with in an Arabic version by the celebrated Golius, in his travels to the East; but the 8th book and all the rest of those treatises, are supposed to (ff 379v) be entirely lost: There have been several attempts made however to restore some of them, but very few with any degree of success.

While I considered the recovery of any of those productions as hopeless, I conceived that nothing remained but to endeavour to make the best use of those that were left, and to reinvent anew what were supposed to have perished: I flattered myself that I had imbibed so much of the spirit of the ancient geometry as to be able to

predict with some degree of certainty in what manner the old geometicians would treat such subjects as extended beyond those in the enumeration of Pappus; and as these treatises were only considered as preparatory, I drew the general outline of several works to which they appeared subservient: I also took the opportunity while (ff 380r) my invention was acute, and improved by practice, to sketch out a plan for the general improvement of mathematical knowledge; not only in geometrical and mechanical subjects and but also in the modern algebra, which I found had been unnecessarily confined in the principles, and thereby rendered incapable of being applicable to morality, politics, or any of those subjects which suppose quantity to be possessed at the same time of many different attributes. These plans and sketches I intended to fill up at my leisure, and flattered myself with the pleasing expectations of the progress I should make and the service I should do to literature by my labours.--- But services of this kind can only be indulged by persons of independent circumstances; for I found that to make great improvements, would require great application (ff 380v) and leisure; and that a person who has a large family to maintain, and very little money, can but very ill afford to employ his time in England on matters of speculation. I was convinced however that unless my plan was carried into execution by myself it never would be executed at all, by others; and therefore as I looked upon it as of some consequence to the world, and was by this time convinced of the probability of the existence of several of those manuscripts supposed to be lost; I concluded that the best method of answering every purpose would be to go to the East Indies for a few years, and while I made myself master of the necessary languages; to endeavour to acquire a sufficiency of money: Afterwards to go through Arabia, Persia and Tartary, or any other parts where there was a probability of meeting with those works (ff 381r) I have mentioned, or any other valuable productions; and having made a collection of every thing curious and useful, and carried on a series of astronomical and other observations, to return to England, and employ the remainder of my life in publishing such things as I might meet with; and finishing such of my own productions as should not be precluded by those I might chance to discover.

These were some of the motives that induced me to leave my friends, my family, and a maintenance, not ungenteel, to come to India. That my scheme would appear perfectly ridiculous to the generality of the world, I have not the least doubt, but I am convinced of its propriety in my own mind; and it is not to (ff 381v) them that I explain my reasons. If I am so happy as to find that it has the honour of meeting with your approbation, I shall be little solicitous about the opinion of any other person; and if you should be pleased to contribute any assistance towards it, I shall always consider it as the greatest obligation conferred upon;

Honourable Sir
Your most obedient
and most humble servant
(Reuben Burrow)

(The Hon'ble Warren Hastings)

British Museum: Add Ms 29159
Mr Reuben Burrow has several of his articles in the earlier issues of the Asiatic Researches. He is given a 1¼ page mention in the British National Biography where his publications are also listed. He was born on 30.12.1747 and died at Buxor (India) on 7.6.1792.

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Calcutta, 12, April 1784

Honourable Sir,

In the list of mathematical manuscripts I had the pleasure to receive, I find that several of the books discovered are entirely new; and the rest will be exceedingly valuable in correcting the very imperfect editions that the Europeans are possessed of. I have sub-joined a catalogue of such pieces as are still wanted, and have been sought for in vain by antiquarians; but it is very probable that many other excellent works both by Greek and Arabian mathematicians may still be existing, whose titles we are entirely unacquainted with; and the best mode of exa(mi)nation would be by inspecting the diagrams and other mathematical figures, which to m a judge of the subject would be a readier method than by the names of the authors or titles of the books; only it requi(res) (par)ticular acquaintance with the method (of the) ancients and such of their works as are (alre)ady published.

I am happy to find that the list transmitted contains almost as many pieces as the Europeans have hitherto been able to discover; and humbly beg leave to return my sincerest thanks for the favours I have the honour to receive; and shall be extremely glad if I can be of the least service in facilitating a business which must be of the utmost importance to science in general and are of the greatest favours that can possibly be conferred on mathematicians.

I am
Honourable Sir
Your most obliged
and most obedient humble servant

Reuben Burrow

The Hon'ble Warren Hastings

Governor General

British Museum: Add Ms 29163: ff 113r.

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(COLONEL T D PEARSE ON BENARES OBSERVATORY)

(PAGE 314)... After having completed this arduous duty, Col Pearse began his return to Fort William and visited Benares with Sir Robert Barker in March 1771. There he had an opportunity of examining the observatory, of which he gives the following interesting description in a letter to General Desaguliers:

"The pricipal curiosity here is the observatory, built by Mawn Sing, the son of Jysing, about 200 years ago; there is an exceedingly good musal arch cut upon a fine plaister of chunam, so fine and smooth, that it has the appearance of marble; and though it is certainly very old, it still is perfect, but the index is wanting; that is aloss which could very easily be supplied by a person who has a taste for these studies; for the centres are left in the wall.

"There are two ring dials; the large one is curious; the radius of the stone arch is 9 feet 8 inches; the gnomon is 4 feet 6 inches thick, (p 315) and its slant side about 40 feet long: there are steps in the gnomon by which you ascend/the top of it. By the measure of the /to two gnomons, I find they stand in latitude 25 20' N. There are likewise two small inclined dials, in which the gnomon is perpendicular to the plane of the stone on which the degrees are marked. Lastly there is an instrument which I do not understand, the following is a description of it:-

"a, b are circular walls; a is 24 inches thick, and near 16 feet radius; b is concentric with a, 18 inches thick, and between 12 and 13 feet radius. c is a cylinder of stone, its centre is the centre of the walls . b and c are of equal height, viz, 4 feet 2 inches;.the outward wall is 8 feet 4 inches. The tops of these walls are horizontal, and are very nicely divided into degrees, and sub-divided into arches of 6'. At the cardinal points on the top of the wall a there are two iron pins, from which I conjecture there has been an instrument to fix upon the wall, though I do not know for what purpose or of what kind.

" Lastly the second, for I had forgotten an instrument for taking the declension of the sun, etc, which consists of a circle of iron, covered with brass, an axis of the same materials, and an index with sights. This axis, which is a diameter of a circle, and consequently in the plane of it, moves on pivots fixed in the walls, which support it and is parallel to the axis of the earth. The divisions are very much inferior to those on the stone."

Bengal: Past and Present : Vol 2 (July-Oct 1908). A Memoir of Colonel T. D. Pearse. "Leaves from the Editor's Note Book" introduces it in the following passage:
"In the present issue of Bengal: Past and Present I have commenced a republication of the Memoir of Col Thomas Deane Pearse, which originally appeared in the now exceedingly scarce The British Indian Military Repository. This periodical was edited by Capt Samuel Parlby of the Bengal artillery, and the volumes in which the Memorial appeared, are dated 1822-3.
In Bengal Past and Present it is printed on vol 2 (p 305-23, 459-96); vol 3 (p 65-99, 284-307); vol 4(p 519-32); vol 5 (p 244-60); vol 6 (p 33-46); and vol 7 (p 101-30).
Col Pearse died in India on 15.6.1789 aged 47 years.

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BORAX @

It being the design of this society to encourage the discovery or production of whatever is usefull and necessary in our arts, manufactures and commerce, especially when they are imported from countries which do not take our own productions in return, Borax may perhaps be thought an article worthy of their attention.

Borax is brought to us from the East Indies, either from the inland parts of the Mogull's dominions, or the neighbouring countries of Persia. It is brought from thence coarse and foul, and is purified at Venice, Amsterdam, and London. It is of great use in the vitrifications, in the fusion of ores, and metalls, and absolutely necessary in soldering them. Like other salts it is a mixed or compound body containing a large proportion of vitrifiable earth, and considerable portion of water, some of that inflamable spirit necessary to the production of metalls and small quantity of the same acid spirit found in allum, vitrioll and sulphur. ... It is said there is some secret in the operation and I fear our accounts of it are very imperfect.

... If this is thought worthy of the attention of this society, the following advertisement is humbly submitted to them:-

"Whereas Borax is imported from East India at a great expence and has of late years been considerably advanced in its price, a premium of £ 25 is offered to any one who on or before shall produce 10 lb of Borax made in England, having the same properties, and capable of the same uses as that which is imported from East India, with satisfactory proofs its being made in England from English materials."

ACCOUNT OF MAKING SALTPETRE AT PATNA IN THE EAST INDIES @@

In the neighbourhood of Patna, where the East India Company have a factory, saltpetre is made in very great quantities. The houses there are all built of earth and straw which being thus exposed to the air and sun, generates a salt cream, which is scrapped off from the sides of the houses by boys and women, and being thus collected is carried to the manufactory, where it is dissolved in tubs, and drained off by an aperture at the bottom of the tub, and then boiled down and crystallised as in the French process referred to by Lord Parker. The drier the season the more saltpetre is generated; and for the same water is produced more plentifully as the place is distant from the sea.

It is no wonder that by this method of collecting saltpetre the sides of the houses are usually scrapped away in a short time.

EGYPTIAN OVENS FOR THE PRODUCING OF FOWLS @@@

I beg leave to submit to the consideration of your society, whether the introduction of the use of Egyptian ovens for the producing of fowl might not be of publick utility. Eggs may be preserved in oyl the whole year round, and in consequence by this method fowl may be raised at such seasons of the year when they neither lay nor sett. If this intimation may be of any use it will be a pleasure to, etc,

(P. Elers)

Royal Society of Arts: Gaurd Books (L754-)
@ Vol 1/84 : 1 page, undated, about 1760,
@@ Vol 2/5 : by Dr Morton (N) dated 27.4.1757
@@@ Vol 6/59 : dated 30.6.1769 from Oxfordshire.

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OPERATION OF INOCULATION OF THE SMALLPOX AS
PERFORMED IN BENGALL

(ff 271v) ... Here ffollows one account of the operation of inoculation of the smallpox as performed here in Bengall taken from the concurring accounts of severall Bhamans and physicians of this part of India.

The operation of innoculation called by the natives (Tikah) has been known in the kingdom of Bengall as near as I can learn, about 150 years and according to the Bhamanian records was first performed by one Dununtary a physician of Champanager a small town by the syde of the Ganges about half way to Cossimbazar whose memory is now holden in great esteem as being thought the author of this operation, which secret say they he had immediately of God in a dream.

Their method of performing this operation is by taking a little of the pus (when the smallpox are come to maturity and are of a good kind) and dipping these in the point of a pretty large sharp needle. Therewith make severall punctures in the hollow under the delloid muscle or sometimes in the forhead, after which they cover the part with a little paste made of boiled rice.

When they want the operation of the inocculated matter to be quick they give the patient a small bolus made of a little of the pus, and boiled rice immediately after the operation which is repeated the two following days at noon.

(ff 272r) The place where the puncture were made commonly festures and comes to a small supperation, and if not the operation has no effect and the person is still liable to have the smallpox but on the contrary if the punctures do suporate and no feaver or eruption insues, then they are no longer subject to the injection.

The punctures blacken and dry up with the other pustles.

The feaver insues later or sooner, according to the age and strength of the person inoculated, but commonly the third or fourth days. They keep the patient under the coolest regimen they can think off before the feaver comes on and frequently use cold bathing.

If the eruption is suppressed they also use frequent cold bathing. At the same time they give warm medicine inwardly, but if they prove of the confluent kind, they use no cold bathing, but the patient very cooll and give coolling medicine.

I can not say any thing of the success of this opperation or of their method of cure in this disease, but I intend to inform myself perfectly when the time of this distemper returns which is in April and May.

I am, yours affectt. and very humble servant
Sei sub) Ro: Coult

Calcutta, Ffebry 10,1731.

Add Ms: 4432 (British Museum: Royal Society Papers)
No 71 addressed to Doctor Oliver Coult on "an account of the diseases of Bengal". Ff 269-72.
The inoculation for smallpox started in England cir 1720.

NOte on Scientific and Technological Material

Dr Helenus Scott, who arrived in Bombay around 1780 and lived there till about 1810, appears to have had an interest in science and technology much prior to 1790, the date of his first letter to Sir Joseph Banks amongst the Bank Papers in the British Museum. His earlier contact is with the Royal Society of Arts (founded in 1754 to encourage agriculture, manufactures, education etc) which offered him one of its medals for his communication relating to the Indian mode of making "fossile alkali". From its inception the Society offered premiums, cash prizes, medals etc in every field of innovation. This practice may have been of its own creation or may be of earlier British or European origin.

Regarding the reference to joining of limbs and putting on noses the following from En.Britannica is of relevance:

"PLASTIC SURGERY (1968, CGN) ... As early as or earlier than 800 B.C. the Hindoos restored missing facial features. For instance, the caste of potters advanced the tissues of one or both cheeks towards the middle of the face for the reconstruction of the nose; the need for this arose from the practice of slicing of the nose as punishment for various offences. Some discussion of the same general type of surgery as used by the Hindus was contained in Celsus' description of plastic procedures in his De Medicina (1st century A.D.). Galen (2nd century A.D.)also was acquainted with these procedures. Thereafter, it was not until the middle of the 15th century and the work of Branca in Sicily that further development of plastic surgery occurred. Instead of using facial tissues for reconstructing the nose, Aranea substituted the use of skin and fat from the arm. In 1597 Gasfon Tagliacozzi prepared a systematic treatise on plastic surgery. Then its development ceased again until the 19th century."

Wootz got examined by Sir J.Banks and two articles relating to them were published in the Royal Society Transactions in vol 85 (for 1795, pp 322-46) and vol 95 (for 1805, pp 163-75). These are technical pieces but even in 1805 the opinion was:

"Those who have devoted sufficient attention to the affinities of iron and earth for carbon will be surprised to find that, on this particular subject, the rude fabricators of steel in Hindostan have got the start of our more polished countrymen in the manufacture of steel. ... Notwithstanding the many ~~impurities~~ imperfections with which wootz is loaded, it certainly possesses the radical principles of good steel, and impresses us with a high opinion of the ore from which it is formed. The possession of this ore for the fabrication of steel and bar iron, might to this country be an object of the highest importance. At present it is a subject of regret, that such a source of wealth can not be annexed to its capital and talent. Were such an event possible; then our East India Company might, in their own dominions, supply their stores with a valuable article, and at a much inferior price to any they send from this country."

Caute, the cement for joining limbs, was said, according to a note in the letter perhaps by Banks himself, to be "terre Japonica", and commenting on it Dr Scott wrote back in 1799 "The caute as you observe is nothing but terre Japonica. It has no healing quality besides what any other substance possesses which sticks to the skin and enables parts to unite by the first intention (? perhaps another word).

The sixth satellite of saturn, referred to in Col Pearse's long note, was discovered in Europe in 1789. Col Pearse letter on Benares observatory should be read along with Barker's article. (Dharampal, Sept 69)

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Bombay, January 7, 1790.

Sir,

I had the pleasure of receiving a letter from you by the Ponsborne dated December 1788.

I have according to your wish endeavoured to inform myself respecting the methods used by the natives of the country for cleaning cotton. Captain Dundas will bring you the only instrument they have for the purpose.

...(ff 5r) I have for several years past been attentive to the methods used by the natives of this country for dying their cotton cloths and I think I have discovered the singular circumstance by which they are enabled to give that permanency to the colour which ~~they are exhibit~~ is so much admired. I am unable to give any theory of the operation of the chief substance they use and without which they can do nothing. It seems in all cases when a cloth is wetted (ff 5v) with an infusion of it and axsolution of alum and then put into a vegetable colour to deposite something which has a strong attraction at the same time for the cloth and the colouring principle and which renders them ever afterwards inseparable. It seems to have the same effect on animal dyes if I be not mistaken on some trials that I have had made with cochineal. The natives have many methods of altering the colour of vegetables or heightening their splendour simply by the addition of acids or of alum or of water in which of iron had been infused or the recent excrement of some animal while it still retains much of the volatile alkali &c. But I know that to render these colours durable on the cloth (after separating a number of circumstances that only in appearance conduce to that end) they have no other method than the one I have mentioned. If this appears to you a matter of consequence as the cotton manufacturers are now in so flourishing a condition in England I shall at some future ~~date~~ period communicate more particularly their method to you. It is extremely difficult to learn the arts of the Indians for the same cast ~~any thing injurious to its interests~~ from father to son exercises the same trade and the punishment of being excluded the cast on doing any thing injurious to its interests is so dreadful that it is often impossible to find an inducement to (ff 6r) make them communicate any thing. They in general care nothing for money if they have enough to buy their food and a little is sufficient for that purpose. As their knowledge of the arts is never communicated by writing nor printing nor their experience ~~rendered in general~~ reduced to general laws by theory the difficulty of information is again increased.

The theory you have sent me of a gentleman whose name you do not mention regarding the caves and atatues of this country appear to me very ingenious....

(ff 7v)About 13 years ago on digging on the Esplanade of the Fort of Tannah in Salsette the workmen came to a stone box which contained plates of copper joined three and three by aring the same metal. ...

British Museum: Add Ms 33979: ff 1-13 : Scott to Sir J,Banks.

(ff 8r) Those plates are made of good malleable copper and worked with considerable art.... From all this we may conclude that at so distant a period of 700 years cppper was not a scarce article among the Indians as in this instance they use it so plentifully, and that it was not a new one for it is here a pure metal and worked with skill. ...

(ff 9r) I am much obliged to you for the advice you have given me about the alkali. ...

(ff 11v) The people of this country from the pliable and human disposition of their minds increased by their climate and especially by their singular religion have always been able to assuage the fury of their conquerors and while they have remained a distinct body from those by whom they have been subdued, they have retained thro all the revolutions of their government and from perhaps ages very remote a considerable degree of civilisation. I often think that their arts improved by the practice of so many years might afford matter of entertainment and instruction to the most enlightened philosopher of Europe. But seldom I believe have they been viewed by those whose knowledge and temper of mind and circumstances have enabled to make such enquiries with advantage. If I find it agreeable to you I shall now and then give you my observations on some of those objects of science. I do not flatter myself that I am well qualified for such an undertaking which require an intimate knowledge of natural philosophy and chemistry and the arts depending on them. But I hope to meet with your indulgence. I might also plead in (ff 12r) excuse of my errors that my time is entirely occupied with the fatiguing duties of my profession.

I have sent you in the box that contains the machines for cleaning cotton a piece of the cinnabar of this country which is made in masses sometime of 100 lb weight at a single sublimation. I have very frequently tried to make cinnabar by the methods recommended in Europe but I have never been able to procure any so far as the Indian at one operation. I should be glad to be informed if you wish to know the Indian method of making it. ... I find too that they make corrosive sublimate in this country but I never have been able to see the process.

I shall at an after period give you an account of the methods of preparing the lime or as it is called chunam of this country for buildings, terraces, acqeducts, works below the surface of water and for the bottoms of ships where it answers the purposes of copper. ...

(ff 12v) ... For works below the surface of water I think the Indians have an excellent method of preparing their chunam. In a few hours it acquires great solidity and especially the part of it that binds together the large stones which face the walls; for most trouble is taken with the chunam for that purpose. One of the chief ingedients is a kind of unrefined sugar which appears by Mr Bergman's experiments to contain more of the disengaged saccharine acid than refined. With this and some other substances the chunam is carefully mixed for a length of time and is occasionally wetted with a solution of the

sugar in water. Does the great hardness that the lime so soon acquires below the surface of water depend on its attraction for the saccharine acid? ... As far as I can learn no one has yet practiced a method similar to that used in this country. ...

(H. Scott)

Sir Joseph Banks, Bart
President Royal Society.

Bombay, February 7, 1792.

Sir

I wrote you a few lines in much haste by the Raymond which sailed from hence about a month ago. I had not yet had leisure to do much in the subject I propose to myself, but I hope to be able to send you my first attempt in a short time hence. I can not however defer any longer making you acquainted with the most useful substances that the Indians employ in their arts. You will afterwards see these uses more particularly mentioned when I describe their methods of preparing lime; of fixing colours, or of producing them.

This astringent substance is the drupa of a tree which grows very plentifully in the neighbourhood of this island, tho I have not hitherto had the good fortune to see it in flower. From a long acquaintance with it I am well persuaded that it would make a cheap and good substitute for galls in dying and in other arts. In fixing some colours it has hidden powers which galls do not possess as I have experienced in the dyes of this country.

Your chemists will see at once the general nature of this substance and your artists will find how far, by such an agent, they can produce the effects to which they have been accustomed; but it is only future experience that can discover those properties by which it may differ from every other (ff 135v) astringent substance.

This drupa with vitriolated iron, makes a very fine black and I have frequently made writing ink with it that was good in every respect. This letter will give you a specimen of it. ...

(ff 136r) ...I have been at the expence of sending 3 tons of it at once. ...

(H. Scott)

Sir Joseph Banks,
President Royal Society

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Bombay, January 19, 1792.

Sir

I had the favour of your letter of the 17th March 1791 by the Essex the last ship that arrived here from Europe. I was greatly flattered to find that what I had done was acceptable to you and that you give me encouragement to mve(?) into the subject which I proposed to you. The arts of India certainly afford the most interesting objects of enquiry. I have been always of that opinion and in the course of my stay in (ff 127v) this country I have made many observations that in my opinion are worthy of being known. I hope by the Essex which will sail in about six weeks hence I may be able to begin the subject. Indeed it is a field in which there are so many beautiful objects that one is distracted with the variety and at a loss to determine which is most worthy of his attention.

I think at present that I shall conduct myself in this enquiry in the following order, or in one somewhat similar.

First Their knowledge of medicine and surgery:
In medicine I shall not be able to praise their science very much. It is one of those arts which is too delicate in its nature to bear war and oppression (ff 128r) and the revolutions of governments. The effects of surgical operation are more obvious, more easily acquired and lost by no means so readily. Here I should have much to praise. They practice with great success the operation of depressing the chrystalline lens when become opake and from time immemorial they have cut for the stone at the same place which they now do in Europe. These are curious facts and I believe unknown before to us.

Secondly Their art of dying in which I have lately gotten much knowledge. Here I shall venture to recommend some substances as highly worthy of becoming articles in commerce and of being employed by our artists in Europe.

Thirdly Their method of using lime in buildings &c in which also some new substances must be recommended.

Fourthly Their methods of making soap, sun powder, indigo, ink, cinnabar, vitriol and iron and copper, alum &c &c .

I shall at the same time send you plentiful specimens of all the agents in their arts and think myself sufficiently repaid if you think I have contributed any thing to the interests of science. Should any thing that I transmit to you appear to be worthy of being printed I can have no objection to it. I need not beg of you to let nothing appear which you in the least disapprove of. (ff 129r) I am very sensible of the honour you do me in offering the Philosophical Transactions for this purpose. ...

(ff 129v) I have lately observed that the natives make immense quantities and at a very low rate of a good fossile (ff 130r) alkali by burning sea-weeds. This appears to me also a valuable salt. I shall send you specimens of it. I think it would not cost here above 2-10 £ or 3 £ a ton.

Sir I am with most esteem your obliged servant

(H. Scott)

Sir Joseph Banks

British Museum Add MS 33979 ff 127-30

Centre for Policy Studies Dharampal Archives CPS-EA-05 www.cpsindia.org

Bombay, January 8, 1794.

Sir

... (ff 233v) ... You will think the paper on putting on noses on those who have lost them an extraordinary one. I hope to send you by the later ships some of the Indian cement for uniting animal parts.

I enclose in one of the boxes a specimen of a kind of steel which is called wootz and is in high esteem among the Indians. It appears to admit of a harder temper than any thing we are acquainted with. I should be happy to have your opinion of its quality and composition. It is employed here for covering that part of gun-locks which the flint strikes, for cutting iron on a lathe, for chissels for cutting stones, for files and saws and for every (ff 234 r) purpose where excessive hardness is necessary. You must carefully observe that it can not bear any thing, beyond a very slight red heat, which makes its working very tedious to the blacksmiths. It has a still greater inconvenience. It can not be welded with iron nor steel. It is only joined to them by screws and other contrivances. The blacksmiths who work in wootz generally consider it as a separate art and do not work in iron. When the heat is a little raised above a slight red heat part of the mass seems to run and the whole is lost; as if the substance consisted of metals of different degrees of fusibility. ...

British Museum: Add Ms 33979: ff 233-6. from Dr H. Scott to Sir Joseph Banks, president, Royal Society, London.

Bombay, January 19, 1796.

Dear Sir

I sent on some days ago by Captain Villet two boxes. One contains the god Gunnes, the other I find contains 183 lb of wootz (or butt) and 9 pieces of brass containing many figures from the Hindoo mythology. You may keep for your own trials one cwt of the wootz and give the remainder to Dr Johnson.

In the little packet that contains this letter I send you a few of our newspapers where you will find some little essays that may afford you amusement. They sertainly are (ff 14v) not fit for the eyes of a critic. But we ought to meet with great indulgence separated as we are from the aids of science. You will also find the seeds that in my last letter I commend so highly as an agreeable and nutritous vegetable. In this packet too you will find a piece of Caute (?) the cement for noses. I hope soon to write you more fully on some subject that appear interesting to me. In the meantime believe me to be with much esteem your obedient and humble servant

(H. Scott)

Sir Joseph Banks, Bart, President Royal Society.

(P.S.) I have sent home this year nearly 80 tons of fossile alkali and only await for Mr Dundas regulations of duties to send a great quantity.

(FF 15r) ... Caute proved to be a piece of terre Japonica.

British Museum: Add Ms 35262: ff 14-5.

A later letter from Scott dated 28.1.1799 (ff 20-1) says: (ff 21r) the caute as you observe (ff 21r) is nothing but terre Japonica. It has no healing quality besides what any substance [illegible] possesses. The stuff and cement [illegible] system

first mention(?)

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Bombay

August 15, 1801

Sir

I received your interseting letter of the 23rd December last and as far as I am able at present I shall answer the different questions that you propose.

The natives of Malabar have made iron from time immemorial. I send you in a box about one or two cwt of their iron after one fusion. ... I also send you a specimen of their ore. I can not pretend to say to what extent we might procure iron in Malabar for it has hitherto been made there only for their own purposes. ... I send you a sketch of (ff 305v) a Malabar smelting furnace taken on the spot by my friend Major Walker now one of the commissioners for that province, which will give you an idea of their method. It combines together the air and blast furnace and is found to be very sufficient for their purposes. ... Manufacturers of iron by the expenditure of fuel would do no injury there to other arts. ... Some of the Malabar blacksmiths work admirably in iron. I have seen for instance a pair of pistols made by them which were not inferior in beauty nor probably in any other respect to the best that are manufactured in London.

(ff 306r) Copper as far as I know is not manufactured in India...

(ff 307v) You are not unacquainted with the general use that is made of the cannabis in this country for intoxication. I am assured that its effects are less injurious and still more agreeable than opium. Those who get into a long habit of taking it can never again (ff 308r) relinquish it. The common way of using it is to mix it with tobacco and to smoke them together. At times they bruise the leaves and drink their juice. Would it not be worthwhile to ascertain the effects of the cannabis as a remedy for disease, for opium with all its excellent qualities has also its disadvantages. ...

(ff 308v) I have now I think mantioned all the heads of your letter but I beg leave to draw your attention for a moment to Dammer a substance in universal use thro the whole eastern world and of the greatest utility. It has often appeared to me very extraordinary that this unrivalled vegetable product should never have been brought into general use in Europe for on many occasions you have no sufficient substitute for it, We have kept our eyes in this country on diamonds and pepper and pearls while we have neglected the substances that would have improved our manufactures or created new arts among us. I take notice of Dammer at present as you seem particularly desirous of getting substitutes in this country for the materials which are brought from the northern nations for our navy. Dammer dissolved in oil by heat is employed for covering the bottom of ships, or in such as are coppered, (ff 309r) for paving the seams of those parts

British Museum: Add Ms 33980: Letter from Dr Helenus Scott to Sir Joseph Banks, President of (British) Royal Society 1778-1820.

that are above the copper. For those purposes it answers admirably well in this country as it does not soften by the heat of the sun. It is employed for covering wooden vessels for retaining water, or for channels that conduct it, for securing ammunition chests or powder barrels from wet and for many purposes of a similar kind. Altho it is sometimes used as a varnish for terraces and other works made of lime, yet it does not last long for such purposes for the lime assisted by moisture decomposes it. It would be endless to specify the uses for which dammer is daily employed in this country. In order to apply it, it must as I have said be dissolved in oil by heat and applied while still liquid and hot. On cooling it becomes hard. I send you two specimens of dammer. The whitish kind is by far the most esteemed tho the other sort is employed for many purposes. There can be no doubt but that you would find dammer in this way an excellent substitute for pitch and tar and for many purposes much superior to them.

(ff 309v) Mr Philips in his rope work here has lately tarred our hemp and made it into rope that is supposed to be equal to any thing of the kind in Europe. He wants nothing but encouragement to do it on an extensive scale.

I may observe to you that I have lately learnt that there is a glutinous vegetable substance the produce of this country which has been employed (I fancy by the natives) as we employ tar, for securing the ropes from the effects of the weather. Mr Philips has seen ropes thus prepared. He says they are excellent.

Perhaps this may be a real improvement, for the tarring of hemp certainly weakens it while it preserves it from moisture. On this subject you need not doubt but that I shall make further enquiry....

(ff 310r) The box contains the specimens of hemp and dammer, ...

(H. Scott)

(ff 310v)

The Right Hon'ble Sir Joseph Banks,
President Royal Society.

An Essay on the Sacred Isles in the West

The Sacred Isles in the West, of which Sweta-Dwipa, or the White Island, is the principal, and the most famous, are, in fact the holy land of the Hindus. There the fundamental and mysterious transactions of the history of their religion, in its rise and progress, took place. The White Island, the holy land in the West, is so intimately connected with their religion and mythology, that they cannot be separated: and, ofcourse, divines in India are necessarily acquainted with it, as distant Musselmans with Arabia.

This I concieve to be a most favourable circumstance; as, in the present case, the learned have little more to do than to ascertain whether the White Island be England, and the Sacred Isles of the Hindus, the British Isles. After having maturely considered the subject, I think they are. ... Should the learned, after a due investigation of the subject and of the proofs I have adduced in support of my opinion, dissent from it, and assign another situation for the White Island, and the Sacred Isles, I have (p.247) not the least objection to it: for, admitting my position to be right, I am conscious that Britain cannot receive any additional lustre from it. ...

A.V.18

Captain Francis Wilford: Asiatic Researches, Vol. 8(1808), pp. 245-375; Vol. 9

Bihomial Theorem : Enc. Brit. 11th edition (1910-11), Vol. 3. (p. 951-2)

..The Binomial theorem is a celebrated theorem, originally due to Sir Issac Newton ... The original form of the theorem was first given in a letter, dated the 13th of June 1676 from Sir Issac Newton to Henry Oldenburg ... although Newton had discovered it some years previously.

Edward Jenner (1749-1823): Vaccine first tried on a boy on 14.5.1796. Next trials in 1798. (Enc.Brit, 10th edition, born in Glos.)

14874 (II)

Alexander. by Dalrymple (1790s)

the *plough* in the fields in *England*; and there is ſcarce a doubt, but that they would in either way, ſucceed fully as well, as by *planting* in *holes*.

Should political motives prevent the importation of *Eaſt-India ſugars* into *England*, it is even then of infinite import to the *Company's Territories*, to have the *qualities* of their *ſugars improved*, ſo as to render unneceſſary the importation of thoſe of *China*, and *Batavia*, large ſums being annually thrown into thoſe *Places* for this *Commodity*, while we at the ſame time poſſeſs every advantage for making this neceſſary article, of the beſt quality, to the full in as high a degree as either the *Chineſe* or *Dutch*; beſides our own wants, we have every reaſon to imagine, that we might ſoon be able to ſupply the *Malabar Coaſt*, *Perſia* and *Arabia* with *ſugars*, whereas at preſent they are chiefly ſupplied from *China* and *Batavia*.

A. Va. 1

The *Hindoo ſugar mill* of the *Rajahmundry Circar*, is worked by a ſingle pair of *buffaloes*, or *oxen*, (*vide* Plate xiii. Vol. II.) going round with the *lever* A, which is fixed on the *top* B, of the *right hand roller*, the *two rollers* CC have *endleſs-ſcrew heads*, which are formed of four *ſpiral grooves* and *four ſpiral ridges* DD cut in oppoſite directions, which turn them into one another when the *mill* is *working*; theſe *rollers* and *their heads* are of *one piece*, and made of the *toughest* and *hardeſt wood* that can be got, and which will *not impart* any *bad taſte* to the *juice*; they generally employ either the *coloured part* of the *wood* of *mimoſa odoratiſſima*, (*deichena-carra* of the *Hindoos*,) it is of a *chocolate colour*, remarkably *hard*, *tough* and *durable*; or that of *mimoſa nilotica*, (*toomy-carra* of the *natives*,) it is alſo of a *browniſh colour*, very *tough* and very *durable*, tho' *leſs hard* than the former: They are ſupported in the thick ſtrong *wooden frame* EFGH, and their diſtance from each other is regulated by means of the *wedges* aa, which paſs through mortoiſes

MISCELLANEOUS 270.

toiſes in the frame planks, and a *groove* made in a *bit* of *ſome ſort* of *hard wood*, bb, which preſs upon the *axis* of *one* of the *rollers*; the *axis* of the *other* preſſes againſt the left-hand ſide of the *hole* in the *frame boards*. The *cane juice* runs down the *rollers* and through the *hole*, in the *lower frame board*, into the *wooden conductor*, I, which carries it into an earthern pot, K, the *two long pointed ſtakes* or *piles*, LL, are drove into the *earth*, which keeps the *mill ſteady*, and is all the fixing it requires, the under part of the lowermoſt plank of the frame, reſts upon the ſurface of the ground, which is choſen level, and very firm, that the *piles* may hold the faſter; a *hole* is dug in the earth, immediately below the *ſpout* of the *conductor*, to receive the *pot*, K.

The *Hindoo plough*, in uſe throughout the *Circar*, is compoſed of only *three pieces* of *wood*, and *one ſmall iron rod* for a *ſock*. (Vide Pl. xiii. Vol. II.)

A. The *head*, the lower *horizontal part*, which goes in the ground, is of a triangular form (a tranſverſe ſection of it would repreſent nearly a right angled-triangle, of which the upper flat ſurface is the hypothenuſe) tapering to a *fine point*, on the *upper*, or *broad*, *ſloping ſide* of which is fixed a *piece* of *pointed iron*, a, by means of *two ſtaples*, this is all the *ſock*, or *iron work* belonging to the *inſtrument*, it is about a *foot long*, one *inch broad*, and *half an inch thick*, and projects an *inch*, or ſo, beyond the *wood*; this *head* throws the *earth* equally on each ſide, and is very ſubject to be choaked with *graſs*, *roots*, &c.

The *beſt wood* for making *this part* of the *plough* is the centre, or *coloured part*, of *mimoſa odoratiſſima*.

MISCELLANEOUS 271.

B. The *beam*, it paſſes through a *mortoiſe* in the *middle* of the *upright part* of the *head*, and is there firmly fixed in its poſition in

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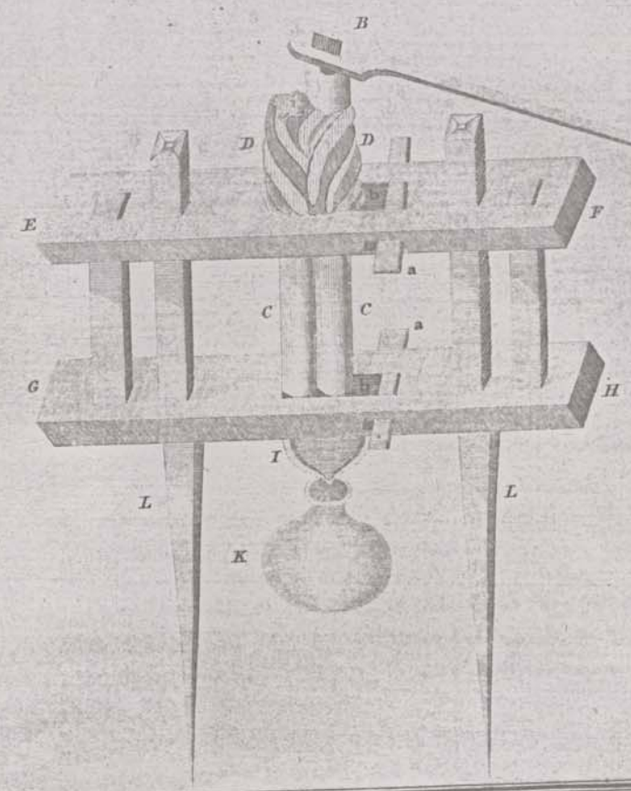
in ſuch a manner, when the *plough* is working, as to have its enlarged *head*, b, which ſerves for a bridle, or *muzzle* to *tye* the yoak, C, to, even with the middle of the *necks* of the *two buffaloes*, (hereabout never more) or *oxen*; to its *hinder end* is fixed, D, The *handle* (there is only one) in a direction nearly perpendicular, which the *ploughman* holds with the *right* hand, while, in the *left*, he graſps a *ſtout ſtick*, to clear the *head* of the *plough* of *weeds*, &c. and to *drive* the *cattle* with; a *ſecond perſon* for that purpoſe they *never think of*.

Memorandum.

MISCELLANEOUS 272. In a future Number of this Work I intend to give a detailed Account of the *Sugar Manufacture* and *Trade* of BENGAL.

Dalrymple.

The Hindoo Sugar Mill. *Vide Dr.* Roxburgh *On* Cultivation *of* Sugar. ORIENTAL REPERTORY



The Hindoo Plough. *Vide Dr.* Roxburgh *at* Supra, *Page* 513.

Hindoo Smelting

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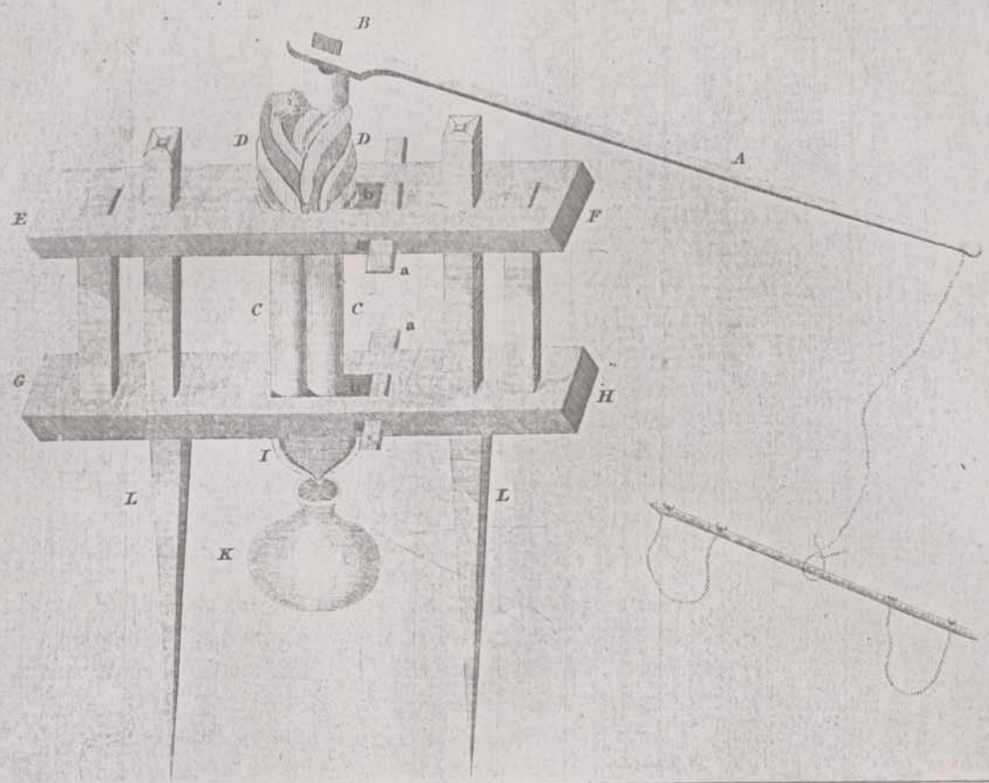
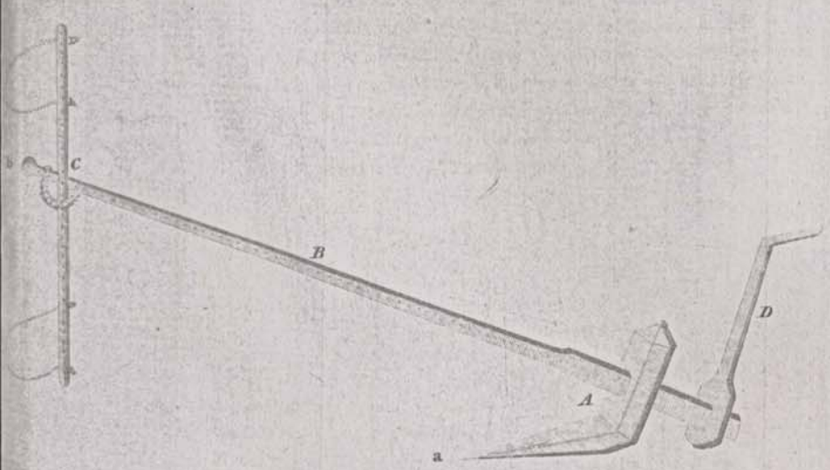
The Hindoo Sugar Mill. Vide Dr. Roxburgh On Cultivation of Sugar. ORIENTAL REPERTORY Vol. 2. Page 512.

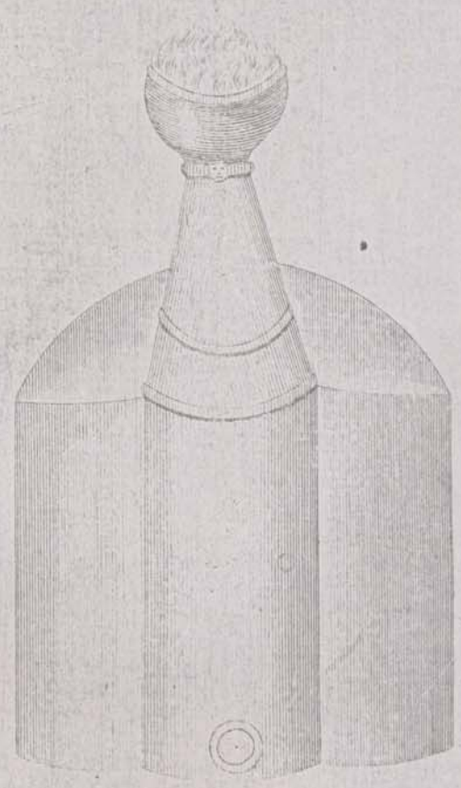


1 2 3 Feet

The Hindoo Plough. Vide Dr. Roxburgh at Supra, Page 513.



Hindoo Smelting Furnace, vide Dr. Heyne On Smelting Iron, P. 489



J. Walker

Published according to Act of Parliament, by Dalrymple, April 16th 1796.

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(EXTRACTS)

Bengal 15.10.1793

On the Agriculture of Bengal.

5246
1-4
Imp 10-14
Imp 15-19
Extracts 29-33
46-52
H.Ea.2

By the Hindu institutions, Agriculture was the particular profession of the Vaisa cast; At present persons of all casts and descriptions apply to Husbandry; Brahmans however, Rajaputs and some others are restrained by religious prejudices from manual labor; unless their inability to earn a subsistence, by their regular profession compel them to undertake agriculture. Many of this description are nevertheless found amongst the Husbandmen of Bengal, but they mostly manage their farms by hired servants: nor is this peculiar to casts which are restrained by religion from manual labor; for the great body of the Tenantry of Bengal content themselves with superintending the Culture of their farms, entertaining servants to tend their Cattle, & drive their ploughs, & hiring laborers to weed & reap their Crops.

The English reader may be apt to figure to himself the lands of this country divided into large farms as in most Countries of Europe

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Europe, & each Tenant residing on his farm, and holding it on lease for a term of Years; But in Bengal it is otherwise. The ~~quality~~ quantity of land used by a single Cultivator is in general very small — (1) A number of Peasants residing in the same village or hamlet cultivate the adjacent lands. The fields for the most part having no fence, & being limited only by the adjoining waste, or by a small ridge ~~raised~~ between contigious fields could not well be described in a lease. Every peasant is at liberty to use any land not already occupied, and he pays his rent whether in money or kind upon an ascertainment subsequent to Cultivation which is (2) regulated by the established rates of the District or by rates specified in the Tenant lease.

---

(1) By an actual ascertainment of the lands tenanted by near 70,000 Raiots in different districts in the year 1790 the average was less than 6 acres, but of these many other avocations. The average of those whose sole occupation was Agriculture was one Tenant to 11 Acres —

(2) The tenures however very considerable. In a few places (especially where ~~the~~ whole land is in Cultivation

The Husbandman needs little Stocks, for herds & flocks are not a necessary appendage of a farm. Neither fencing nor manuring his field, the Peasant requires little Capital; & gathering frequent harvests & seldom allowing a fallow, he obtains quick returns –

In comparison with the farmer in Europe he has many advantages, On a Capital of five times his rent the English farmer is well pleased if he make three rents, & besides the Rent, he has to pay besides from the remaining two thirds; many & considerable taxes: The Indian Husbandman realizes from 5 to 6 Rents, he enters on his farms without a Capital, & conducts his business almost entirely without money. His servants, the labores he hires, the Artificers who make

and

Cultivation) the fields being ascertained by long occupancy are held on a rent specified in the lease or in the Rents roll where the Tenures continue on the footing mentioned in the Text, a number of Rates & conditions engrafted on that tenure have caused much vanity & great intricacy. To develope which will belong to another work –

and repair the implements of his husbandry, the Watchman who watch the Crops, and drive away or destroy wild Animals are paid with grain, and mostly after the Harvest. With a hut to reside in, a little grain for seed, and some for the subsistence of his family and the pay of his servants.— The farmer enters on his business, and has scarce any need for Money but to pay his rents.—

The plough & reaping hook have almost continual employment.— However four principal harvests are distinguished. The early rice & other articles gathered before the Autumnal Equinox. The late rice & other Corn reaped before the Winter solstice. Wheat, Barley & other grain gathered before the Vernal Equinox. Mangoes & other fruits & some Corn gathered near the Summer Solstice —

This succession of harvests, incidentally corresponds nearer to the course of the Monsoons than to the succession of Seasons, whether we notice the successions of three Seasons, containing four months each, or of 6 containing ~~four~~ two months each, for

both

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Implements of Agriculture

The Plough used in Bengal is of a simple contrivance, & greatly resembles the Spanish Ploughs — The Share is cut to supply the place of Shears, & has a Mortice to receive the Beam, which passes thro a similar Mortice in the Handle the whole being secured by a Wedge. — The Beam draw by the Stump, & the Yoke is in Shape well adapted to this mode of Draught, it is tied to the Beam, which has two or more Notches about 3 Inches apart serving to raise or depress the Beam for the purpose of Shering a deeper or Shallower Earth, by placing the Yoke nearer to, or farther from the Extremity of the Beam. The Share is Generally armed with a Peice of Iron in the Shape of a Chisel received in Mortice & secured by a Wedge. —

A Groove cut in a timber three Inches deep, & five wide, & nearly the whole Length of the Timber, completes the Chisel; an Implement used instead of an Harrow to bre

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& level the Ground. — to increase its effect the Driver stands upon the Choke —

The Bida resembles a Horse Rake, it is furnished with one Row often or twelve teeth, either of Wood or Iron; has a Mortice to receive a Beam, which also passes thro a Mortice in the Handle, exactly like that of the Ploughs; & the Yoke is fixd to the Beam in the same Manner. —

The Hoe used in place of a Spade, is wide & curved like an Adze; it is upon a short Handle, at an acute angle, which constrains the Labourers to stoop very low, in working with this tool. — It seems to resemble exactly the Spanish Hoe —

A Smaller Hoe with a long Handle, must not be omitted among the Implements of Husbandry, tho not much in use.

A Tool in Shape of a Chisell is used for ~~many~~ several Purposes, mostly for digging —

The Weeding Hoe, is a small hook upon a Short Handle, with which the Labourer weeds from him, the outward Edge of the Hook

being sharpend, & the Inner Edge remaining Blunt. —

The reaping hook does not differ materially from the Reapers Hook used in England. —

In Sanscrit Dictionaries the only Implements of Husbandry mentiond, are the Plough, the Implement used instead of an Harrow, the Hoe, the reaping Hook; the Goad & the Pole of the threshing Floor —

The Pole is erected in the Centre of a flat Ground well cleard & smoothed, Cattle tied to it are driven in a Circle round the Pole, to tread the Grain from the Ear; but small Grains are beat out with Sticks, for a flail is unknown in India. —

We have mentiond some Implements used in Husbandry, tho not described as such by the Hindu Authors, others will be noticed when we have occasion to mention their particular use —

For the Plough no driver is employd, nor ever Reins. — The Ploughman guides the Cattle by the Voice, & the Goad, & by the

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absurd Practice of twisting their Tails, — the Pair of Oxen draws the Plough, but is occasionally relieved by another Pair, a Plough team consisting of two or three Pair, according to the Tenacity of the Soil. —

A Plough is seldom used singly, several Ploughs in the same Field, follow the same tract turning successively at the End of the Field, to stir a parallel Line 4 or 5 feet distant from the first. Having no Mould Board, nor any Substitute for it, the Plough does not turn a furrow, but stirs a Narrow tract; & Consequently must traverse the Field very frequently to break the Ground sufficiently. — On an Average a third of an Acre for each Plough is a large daily task. — A second Ploughing is given at right Angles to the first, & a third may be drawn diagonally; these several Ploughings must be often repeated before the Ground be thoroughly broken, An Old Lay will require near 20 Ploughings — & eight or ten will be barely sufficient to obtain a good Crop of Corn from Land in arrear Cultivation. — For this reason as well as on

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account of weeds becoming rank, & obtaining Lays of 3 & of 5 years place the Land in ~~Class~~ a third or fourth Class of Valuation. One Year Lay places it in the 2d Class. Land in Annual Cultivation, is esteemed the most valuable. But in poor Soils the fields are sometimes allowed to lay one year to recover Heart. A well tilled fallow for so long a period is unknown to the Indian Husbandry, but a fallow of 4 Months is sometimes given — This however is rare, & the Field commonly lays from the last harvest, until the Season of sowing be at Hand. The Interval of course varies according as one or more crops be taken from the field within the year; & according as the Husbandman may have determined, on a Succession of Crops, or on a continued repetition of the same Articles. —

Articles of Produce

The Articles, which employ the Industry of the Husbandman, are many & various, but the line of Distinction between the business of Agriculture & Gardening cannot be strictly drawn. — We may however follow the

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Hindu Authors in the Distinctions they have taken; in the first Instance considering the Articles, which they enumerate as the particular Business of Agriculture, nothing however the Articles which properly belong to the Garden, but for which field Cultivation has within our Observation been applied. —

Amer Singh in his Dictionary notices three Sorts of Corn & Grain, which it is the Business of the Husbandman to sow — Bearded ~~Corn~~, Rice, & the Seed of leguminiferous & siliquose Plants. — The first includes Wheat, Barley, & Bearded Rice; the second with Rice, several Varieties of Awnless Rice; in the third Poppy is improperly classed with several Sorts of Pulse, & with Sesame. —

The Same Author also enumerates some kinds of Grain without referring them to either of those Classes — Black & White Mustard Seed, Linseed Guinea Wheat & other small Grains, & he also mentions the intoxicating Drug Bang

While considering these Productions we shall notice other Articles, which are to the full as deserving of Attention, such as Cotton &

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Tobacco &c

Rice being the principal food of the Inhabitants claims our first Attention Many are the Species & Varieties known to Pertai[illegible]; Some distinguished by permanent Differences; others varying from Circumstances of Soil & Climate.

In the Detail of Husbandry it is especially requisite to discriminate the Species; for they are variously adapted to the different Seasons, Soils & Situations, But in attempting to give a general View of the Agriculture of Bengal it may suffice to notice the different Cultivation by sowing in Broad Cast, or by transplanting; & the different Seasons, at which Rice is Sown.

The Seed is sown in Beds to be transplanted into lands already submerged; but in the Broad Cast, it must be sown, before the Ground be covered with Water. — It is not consequently altogether in the Husbandmans Choice wch mode he shall adopt; but it is in a great measure dictated by Circumstances — The first Mode is principally applied to Rice sown before the rainy Season; the other to Rice, planted when that Season

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Season is advanced; or to a forced Vegetation before the rainy Season —

The Husbandman does not entirely trust to periodical Rains, for the Success of his Culture. The Fields are in high Districts, watering from Wells, in others the ground is watered, or artificially overflowed by Reservoirs; in some Places the Dykes retain the Water in the Fields, in others they are constructed to preserve the Land from Inundations.

However watered by Nature or by Art the Fields cannot receive transplanting Rice, if the depth of Water already exceeds a few Inches, nor unless the ground has been well prepared before it was overflowed. When a moderate depth of Water covers a Field, previously well stirring & harrowed, the Husbandman enters his Fields with the Plough, & having stirred the Earth with that Implement, & by putting into the Field his Cattle & people to tread it, till the whole be a Mass of a Mud; he proceeds to transplant the Rice from the Bed to the Field. — For this purpose is necessary the whole Operation being performed by the Hand, the Fingers make the hole to receive the plant, and the Thumb fixes the Root in the Mud, while the Labourer holds in the other hand a bundle of Plants, to be planted as he proceeds — Two or three Plants are put in each hole at distances of 8 or 9 Inches apart; and the whole Operation is completed with much expedition, Women or Children attending to supply the Labourer with Plants from the Beds (transplanted)

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15 Transplanted Rice seldom requires Weeding, & takes little more Labour, than would have been required from one weeding. It is nevertheless considered as a more expensive Culture than sowing in Broad Cast.

English gentlemen skilled in Farming have remarked that the Indian Peasant is a very expert Husbandman. But however equally he may sow, the uneven surface of heavy Rains, have a thin growth in one part of the Field, while the Plant in another part of the Field becomes choked by a luxuriant Vegetation. To thin the exuberant growth & disperse the plants more equally on the Field is the principal use of the Bird. In many Places the Plough is employed for the same purpose. Rather Instruments can be used with Ease until the Field be overgrown to a moderate depth.

Previously to the Operation, weeding is necessary, or otherwise, for only a few hour Sunshine, within a day or two after the Weeding, kill the Weeds it must be repeated. It is however generally sufficient to weed twice. A considerable rise of Water during a frequent & favourable occurrence at the period of the Cultivation. Such a rise cannot be injurious to the Crop, if the Stems 5 or 6 Inches high, and it can hardly be too sudden or too great; for Rice, is observed to rise with the Flood several feet in the day; & to rise over a depth of 15 Cubits: A current or a sudden drain to the Water would be unfavorable; the first destroys the Plants, the Latter would leave a weak Stalk, which must bend or wither.

We must in this place remark, that all Varieties of Rice are not adapted to bear sudden & great Inun-

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12 hours. A situation liable to such inundations is among the circumstances, which guide the Husbandman in selecting the Species of Rice to be cultivated. With the restriction this remark suggests — it may be understood that the inundations are little to be apprehended, as left they precede the sowing, and accordingly, though a more frequent calamity, it is not so visibly injurious as Drought.

In the case of a Drought, Wells, & Reservoirs are but imperfect resources, & a few Fields can be preserved in the Colonies: but the liable to this & to the contrary Evil, the Rice Culture is in general very successful. It frequently yields twenty-fold in the transplanted Culture; but the Broadcast, requiring double the quantity of Seed yields a smaller proportion.

A Medium might be taken at 12 for one, but it cannot be estimated with accuracy; as the Peasants from a Jealousy of their Rent very raised depreciate the fertility of the Soil.

Our own admission however carries the produce to a quantity almost incredible in some very fertile Soils. [4] Forty Maunds of Rice equal to as many Bushels, has been the acknowledged produce of a Begah of 6½ Cubits to the Cottah which is nearly the measure of an Acre; & a Begah of that size would not require more than a Maund and a Quarter of Seed; but instances of so great fertility are very rare — —

[4] The Weights & Measures vary in every District — The Maund from 50 lbs to a Cwt — It always contains 40 Seers, in speaking of a Maund we mean the Maund of 80 lbs Avordupois —
The Dry Measure for Corn is a Cottah varying from 6 to 15 lbs. The size of Cottah is a Potie, from 18 Cwt to 2 Tons & a Quarter, — The Land

Though the soil, has necessarily a considerable influence on the quantity of produce, yet, Depending on Burgee, depends so much more, on the Moisture, than on the quality of the soil, that the situation of the Lands is more an Object of attention, than the quality of the soil, at least for Rice & most other Articles.

Lands situated in or near the Village are cultivated more frequently than those which are distant, and much time is lost in repairing to, & returning from Fields remote from the Peasants habitation. – They consequently prefer Lands at a moderate distance to others more remote. – Hence these distinctions with which the quality of the soil in some degree corresponds. The Men & Cattle frequenting the Grounds, in or near the Village, afford it some Manure, while distant Fields have only their native fertility.

The situation of Lands, as liable to Inundations, to Drought suggests other distinctions familiar to the Husbandmen. – These also correspond in some degree with the nature of the soil. – For Lands liable to Inundation are for the most part Sandy & Barren –

Thus

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measure is also called the Begah containing 2 Cottahs but the Cottah is measured with a Pole, varying to 3½ to 9 Cubits, from a quarter of an Acre to 2 Acres. – The Calculations are therefore made for an Acre —

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21) This Fact is easily explained — the Soil of Bengal consists almost universally of Clay, with a very considerable portion, of a selicious Sand, joined to some Salts, and decayed Animal & Vegetable Substances, a large body of Water laying on such ground for a considerable period, or passing over it with a rapid Current, deposits the Clay & Salts, without any Chemical effects on the Sand. If the whole body of Water evaporated on that Surface, it might return to the Soil, what it had taken from it, but the greatest part of the Water, in most instances, drains off the ground, & consequently impoverishes the Soil, and tends to reduce it to a barren Sand. This Explanation is confirmed by experience, which has remarked that where the Water, drains into low ground, where there is no outlet, the Soil is improved, until the gradual progress of the same cause brings too great a proportion of Clay, takes from the fertility of the Soil, for an excess of Clay is known to constitute as unfavorable a Soil as excess of Sand. —

To return from this digression which seemed not misplaced, when treating of the

the grain; but this method gives a Red tinge to the Rice; hence a distinction of red & white Rice. the Red & scalded Rice is preferred for exportation; being effectually deprived of the power of Vegetation, and is called by the Trade Cargo Rice — For the home consumption a preference is given to the white Rice.

Expence of Cultivation

Some general information on the expence of cultivation may now be submitted to the Reader — It has been referred to this place, because a previous knowledge of the method of Husbandry was necessary to make it intelligible.

A notion may be formed of the cheapness of Labour, from the practice followed by Tenants, of advancing Seed & Subsistence to Cultivators, with whom they divide the Crops on the following terms —

1st The Seed repaid two fold, from the gross produce —

2d. A small allowance made to persons employed to watch the Crop to prevent its being embezzled by the Cultivator —

3d. A small allowance from the Gross Crop, to the Blacksmith, in lieu of pay for mending the Ploughs and other implements of Husbandry —

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4th An allowance to the weighman for weighing or measuring the grain. —

5th Some small deduction for religious purposes. —

The Remainder is equally divided, and the cultivator repays from his share the grain borrowed for his subsistence with an advance of half the loan & in some places with a greater advance —

The Tenant pays the Rent The other charges are borne by the cultivator.

To state the Expences of cultivation accurately, the enquiry must be directed to Tenants who employ Servants and labourers. Such enquiries have not been neglected and the information we shall offer is the result of a careful ascertainment in a cheap district. In none is the price of labor more than double of what we state, In some it is cheaper —

A Plough complete costs 7 to 8 annas —

Oxen Trained to the Plough, 3 To 4 Rupees each - Six are usually appropriated to a Plough, but in some Places where the

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31

Soil is light & only — The Bullocks are not fed upon grain or Hay — They are pastured on Commons, or on waste lands, for which the Tenant in some places pays a small consideration; or the Cattle are grazed on reserved Pastures, which are hired by the Year. The Pasture may be reckoned on a medium, at one anna a head per annum; and a monthly allowance of one Pun or 1/4 Puns of Cowries a head is made to the Herdsman, besides a small present at the — festival — Where the Herdsmen are hired for monthly wages, they receive in Cash, food, and Cloathing, to the value of one Rupee a Month, one Herdsman can tend 50 Bullocks —

The Husbandman if his ploughs be insufficient; borrows or hires of his Neighbours. The hire of a Plough is one anna p^r day. For his own Ploughs, the husbandman pays his Ploughman 8 to 10 annas. And his Task is performed before Noon. after which the Cattle is left to the Herdsman's care The Ploughman follows other occupations the rest of the day, and his occupation is mostly on the Tillage of some land upon his own account assisted occasionally by the loan of a Plough from his own Master or from a Neighbour —

A Good Farmer has work for his Plough.

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Plough all the Year round – One Plough and 3 pair of Bullocks in most places will suffice for 10 acres – and besides Ploughing the Cattle suffice for Harrowing and Raking –

Forty Labourers may weed an acre in a day – They bring their own weeding hooks; of which the first cost, may be one anna: They are allowed 2 to 3 seers of Grain each —

Reapers are hired at the allowance of one sheave in sixteen. In some places a sheave in eight is allowed, but the Reaper must carry in the Harvest and House it. In other places one measure in six is allowed – but the whole labor of Reaping, carrying, threshing, winnowing, measure and storing, is included in this allowance, The Reaper brings his own reaping hook, the cost of which may be one anna —

The price for the Baskets, used in winnowing Corn is very trifling. The unbaked Jars in which grain is usually stored will hold from 12 to 15 maunds & their first cost does not exceed 4 annas – In sandy soils where Clay is scarce the Grain is stored in Baskets, or in Grass twisted in the shape of Baskets.

The

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The cost is very Trifling —

A Pestle & Mortar for husking will cost 5 or 6 annas. A beater costs about 8 annas, but the waste & expence of cleaning Paddy is at once known from the usual allowance in delivering a Maund of Paddy to Laborers, on condition of their returning 25 seer of clean Rice. The Surplus and the chaff or Bran, the laborer takes for his trouble but when Rice is cheap a greater deduction is allowed. —

The Husbandman's habitation is one or more huts of Bamboos on wooden pillars thatched with dry grass & surrounded by an enclosure of matts or walls — The poorer class contents themselves with the sticks of Arhur Gram & of the Palma Christi, instead of Bamboos & Pillars.

The Peasants Cloathing & Furniture are simple and cheap; his Riches are his Cattle; and we will hereafter consider the profits of the Dairy. we now resume the subject of field Culture —

Corn and other Products.

Almost every grain ripens in the southern districts of Bengal earlier than in the Northern and western Provinces, the Seasons for Sowing

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.. begin to rise is heated in a Water Bath until the Cream has thoroughly risen, the Coated Cream is then skimmed, & Butter churned from it at leisure —

In the Indian process, the Milk is heated two hours after it has been taken from the Cow; it then stands until it curdles, as part of the Cream rises, & a small quantity of Whey remains with the Curds, the whole is thrown into the Churn, & Butter is obtained by agitation.

The Hindoo Authors notice two other kinds of Butter, one from raw Milk, not made artificially, but produced during the agitation of the Milk, when milking, the other what separates itself during the process of heating the Milk, both in small quantities, and for which we should not have quoted the Authorities, but to shew that no other process than that now practised for making Butter, was in use among the Hindoos —

Besides Butter from the agitation during the course of Milking, these Authors notice two Products of Milk, the Butter separated by heat exhibited for the purpose of obtaining Curd, & the Curds. By the first they seem to mean the Cream which rises above the Curds — the Curds diluted with an equal portion of Water, one mode used by the Natives, diluted with a greater quantity & well mixed with it, they supply the place of Butter Milk — the sale of such preparations, as well as of pure Milk is among the profits of the Dairy, but the principal product, is Butter churned from the Curds & classified for the markets. —

The Utensils of the Dairy are simple & require no explanation except the Churn, which is in Portion

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Vessel, without a Lid, but covered with a Cloth. The Beater is a Bamboo split at one end & then open by a small Hoop, the handle is not stuck in a perpendicular direction, but turned by a string of which the ends are held in each hand, and alternately, the string being then wound round the Handle — The Profit of Stock are principally from the Butter of Buffaloes & the increase of Kine, for the Milk of Cows seldom comes into the Dairy except in the Neighbourhood of Cities. —

The greatness of the Profit may be judged from the following Calculation — one made on a Grazing Estate, — A Buffalo cost from 15 to 30 Rupees, She goes to the Bull in the third year & will bear till 8 or 9 Years old, her female Calves are an increase of Riches to the Owner, the Male Calves are generally destroyed at their Birth, being seldom used for Burden in the Provinces of Bengal & Behar, but some are reared for a few Months to be sacrificed at the Durga Festival & are sold for that purpose at the Rate of 4 or 5 Rupees —

The Buffalo low yields to the Dairy about a Seer of Milk a day, & 3 when fed in rich Pastures — She may be milked until a Month before She bears again —

Milk is reckoned to yield to the Owner, a Seventh of Clarified Butter, the Dairy Man takes the Surplus & the Butter Milk in lieu of Wages — he contents an hundred Buffaloes —

The same Number requires 3 or 4 Herdsmen, who are allowed a Blanket, & a Cotton Cloth for Linnen, & a Seer of Grain with some Cummerbund in the whole about 12 Rupees a year —

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The annual increase of Stock, does not exceed 6 per Cent. of Buffaloes & cows reared to the age of breeding for the remainder of the Cattle reared will only replace the casualties ... The increase of Stock from herds of Swine is greater, as more care is taken of the Calves & as they are allowed the whole of the Milk ... the Oxen reared for sale, afford a considerable profit from a hundred cows 15 Oxen may be annually reared & sold in that third year ...

The expences incident to Stock are trifling most have been enumerated; Pasturage is cheap. In many Districts, nothing is charged for the grazing of the Plough Cattle, but in low countries an expence is incurred to supply them with Fodder in the Rainy Season.

The Pasturage is usually charged at a fixed annual rate per head, which seldom exceeds 8 annas a head, for Buffaloes & 4 annas for Cows. A Proprietor of a considerable herd frequently hires or purchases reserved Pastures, for the most part they are grazed on common Pastures, — But these Pastures must not be confounded with Common set a part for Plough Cattle in which every Cultivator is entitled to graze the Cattle he maintains for labour without subjecting himself to any charge for the Pasturage.

By the Jenkins Laws 100 Beegahs of Land must be set a part for a Village, Stable Stock quantity

quantity for a large Village, & for a town 4 times as much as for a large Village, But the Rule has been neglected in modern times. And Commons of Pasture are now rare.

The other Articles of Stock are not generally found in the Peasants farm yard, & consequently need not be noticed in a general Sketch. —

The Drawback to the great Profit we have shewn from a Stock of black Cattle is the loss by Epidemical Distempers. — These are frequent in Bengal, & have been known to sweep half or even a greater Portion of the Cattle.

Orchards

Nothing contributes more to the Peasants attachment for the Place of his Nativity than his Plantation of Trees. — It is the only Improvement he gives to the Spot he occupies: For his habitation is not constructed of durable Materials. — The Policy of not exacting Rent of the Land he occupies for his House & Plantations is well judged.

Tho not universal this Policy prevails very generally but in some Districts lands so occupied are measured & brought to the Rent Roll, or the trees are counted & valued in the Rent

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The Plantations consist of Fruit-Trees, & of Clumps of Bamboos. This useful Cane (to the Indian Peasant invaluable) grows abundance in almost every Village, sometimes detached Clumps, sometimes planted as a Fence to the House or Orchard, fruit trees are often interspersed in the Fence. The Acacia (wch produces the Gum Arabic) is frequently encouraged for the purpose of a Fence. Plants of unproductive kinds are also encouraged for the same purpose. But regular Hedges are not found, except where Ditches have been dug — These however are common, particularly in low Countries. —

In fencing his Habitation, Garden & Orchard, the Peasant consults his own birth of Privacy, as well as the necessity of excluding the Trespasses of Cattle — For altho the Universal Practice of neglecting to fence the Fields has superseded the law, which allowed the Cultivator no remedy against a Trespass on unfenced Fields, that law is still in Force for the Ground included within the limits of the Village. —

Where Trees & Plants are deficient, & the Soil is too Sandy for Ditches, the Peasants

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influenced by the motives suggested, is careful to surround his Habitation & Garden with Grass walls or Matt — And in many Districts Cane Pieces, & other fields planted for a valuable Produce are hedged with Acher grass & similar Plants, or with Reeds — For Reeds being useful in Thatching are often planted both in the Form of Hedges, & in separate Plantations.

The Mango is a very favorite fruit, & during its Season constitutes the principal Diet of the Indians. — It is beyond Comparison more numerous than other fruit Trees, The Orchards consist principally & often solely of this Tree. The Coco, Jack & Date Palms are seldom planted in Orchards, but are numerous, the Jack & Date in Bahar, & Coco & Date in Bengal. The Palm, wch bears the Areca Nut is seen in Orchards in Bengal, & is much cultivated, This Palm & the Coco do not grow in Bahar.

The other Fruit Trees claim little notice in this place — They are Myrabolans Guava, Bail Bunell Jack Coromda Jamaund &c

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The Plantain being an Annual may be considered as an Article of Garden Cultivation, as also the Vine of the Dawn leaf – The productive Trees are the Cotton Tree, the Indian Capsia, Tibulaires &c

The Culture of the Mulberry belongs to the Subject of Silk – On the Management of this Plant, & on other Topics of rural Economy, which we have only mentioned we might willingly have enlarged – Curiosity might have been gratified by a full Discussion of the various Management in different Districts of these Provinces, but altho we have suppressed much, candor requires the Confession that Materials are not in our Possession for a complete Essay on the rural Economy of Bengal.

It may be questioned whether any useful Purpose would be attained from the result of Minute Inquiries – The judicious Farmer in England could receive no Hints for the Improvement of his Practice from Indian Husbandry – & whenever Europeans are encouraged or even permitted to give their Labor to the Improvement of the Husbandry of Bengal, the Subject will be thoroughly examined & will soon be fully understood.

Bengal 15 Octr 1793

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Distillation

Their process conformable to that described in the Asiatic Researches by Mr A Kier.

The

The species of cloth manufactured principally confined to that in use amongst the lower orders, known under the following names Soorie & Jore. But in the Village of Balleah Adampore between 3 and 400 Looms are said to be employed in the manufacture of the following species of cloth Viz: Burrah-Than, Romaul, Dimmiss, Calsabere, Mauree and Ghallaband.

Their process in spinning, weaving and finally dying their cotton manufactures, with the implements in use would require to be detailed (in the best manner) by an adept in the Branch.

The striking simplicity, characteristic of all their mechanic processes to a common observer appears to run through the whole, united to an uncommon degree of patient apathy, patient and unremitting industry in the Native.

Cements and Plaister — They have long been in possession of a Glue formed with the gummy part of wheat mixed with Lime: a preparation more impervious to moisture than the Glues in common use. Nor is the preparation in use in Burbay (mentioned by Dr Shaw) composed of the Curd of Milk united with Lime unknown.

They further possess two kinds of Mortar peculiar to themselves, if not from time immemorial. Viz) a cement composed of pounded Bricks and Lime mixed with water containing a considerable quantity of Coarse

sugar

Manufactures

Tract 30

The following remarks perfectly applicable to the condition of the Manufacturers and what is termed in Europe the fine arts and apparently justly questioned.

"It faut considérer en particulier les funestes conséquences du peu de cultivateurs.

"Dans cette forme de Gouvernement le peuple est toujours très-ignorant, de sorte que tous les arts & les métiers qui ont besoin du secours des sciences de la Géométrie & des Mathématiques, ne peuvent jamais s'élever à ancun degré de perfection.

"Dans cette forme de Gouvernement le peuple est toujours très pauvre, de sorte que les artisans n'y ont jamais le moyen d'acquérir le nombre des machines & des instruments dont ils auraient besoin. Mais les Voyageurs qui ont parcouru l'Asie meridionale m'ont donnés d'y voir travailler avec soin et de rendre utiles à des ouvrages au lieu on emploie plus de cinq cents en Europe. Cela ne vient point comme on en serait d'abord tenté de la raison de la paresse ou du défaut d'industrie de ces peuples; mais cela résulte uniquement de leur indigence.

"Lorsqu'on considère la nature du climat asiatique on voit clairement que tout un effet remarquable du despotisme.

"Plus la servitude augment dans un pays & plus la terre y reste stérile comme de croître jusqu'à ce qu'il arrive au point ou il se change en une solitude vaste & profonde qui exclud tous les ouvrages faits avec goût & tous les chef d'oeuvres des beaux arts.

"Des hommes, que dont tous égale sont misérables que n'ont aucun moyen de s'exposer pour n'avoir rien

The mechanic arts only exercised by the meanest orders among the aborigine community, under every possible discouragement contemptible by contempt and neglect in the higher orders who derive consequence alone from the distinctions (originating in the prejudice annexed to the dogma of an original primitive inequality of birth, or the possession of power or wealth; these last alone constituting the supreme good in their opinion.[a]

Dis

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a These distinctions (of which they are not only tenacious but conceited to excess, in the supposed superiority over the rest of mankind) are diminishing within the Company's provinces. What from their unprincipled conduct when engaged in the service of Europeans, as from the evils entailed by the sacerdotal influence in corrupting the morals of the other orders of the community, unveiled principally in our Courts of Justice from the general litigious disposition pervading all orders of the native Community.

The Natives comprized in this tract principally composed of Cultivators of the soil. Fishermen or Mechanics such as Smiths, Carpenters, Boatbuilders, Potters and Weavers: of the last about 25 families residing in Soilspoor, and about thrice this number in the extent of the Mazgan of this district called by the Poor Peoples.

Market with the succession of the fruits of the soil and species of fish in season.

Of the Knowledge of Agriculture possessed by the first something has been already offered in these remarks; and of the latter, they full to be considered very expert, possessing the several modes of fishing known in Europe, and some processes it is apprehended peculiar to themselves.[a]

Music

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a A line some hundreds yards long furnished with floats, as used for suspending Nets, is swept in shallow water towards the tail of a Bank. In the bite of this suspended cord a small Boat is drawn along covered with a horizontal matting projecting considerably over the Boat and but a few inches above the surface of the water with its edges turned up about 5 or 6 inches. The fish driven toward the bank endeavour to escape by leaping over the bite, when they fall upon the matting. This Process mostly used for catching small and flat fish.

In inland deep creeks the Fish are driven into Weirs and Nets extended across, by disturbing their auditory nerves the fishermen in Boats extended from side to side of the creek proceed leisurely abreast, each boat being provided with a noisy clattering instrument, made of split Bamboo which is plied whilst they approach the nets.

In the same situation a great quantity of crabs and

The Cultivators and Fishermen

engaged principally in furnishing the Calc

Marble

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sugar: this last ingredient producing nearly the effect ad-
tributed to Pozzalani or Terrace, causing the mortar to
set quickly; and in a short time acquiring a great degree
of hardness. The proportion of ingredients composing
this Mortar differs in relation to the degree of causticity of
the lime employed — If long slacked two measures of
Brick dust to one of lime and more sugar being added to
Water.

Another ingredient used in the Composition employed
in forming the flat terraced Roofs of houses, obtained from
steeping a species of Grain* in water. The period for ob-
taining the proper state of the decomposition of this ingredient
and drawing off the water, on its attaining a viscous sizing
quality joined to a very offensive smell; but the particular
effect of this last ingredient not so obvious as that apparently
produced from the aid of sugar used in the other Process. An
extract by fire of the Fruit of the Hurreetukah (understood to be
the Terabolana) applied to the same purpose.

A Plaister is likewise made from calcined shells
which in whiteness, glaze and durability may be said to rival
Persian Marble. This it in some degree owes to the labour em-
ployed in polishing it with a steel or Agate burnisher and
careful removal of the moisture, as it exudes, with fine Muslin
ten days; equal care being taken in preparing the Lime from the
purest calcareous substances. The Cowree shells said to afford
the best

* the Grain here termed Ellettu
sugar by the Aborigines —

There are several methods in use for preparing this incrustation.

1st The Lime mixed with pure water alone —

2 — With pure water & fresh Oil expressed from the Kernel of the Coconut —

3 With pure water & subsequent mixture with the white of Eggs —

The Plaster not exceeding the 30th part of an inch in thickness upon the Wall. —

rounded by a net extending from the bottom and supported

their attainments in the Arts of Poetry & Ethics

Grammar, & Mathematics, & Astronomy or the

& Mechanic

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bottoms by diving.

The Configuration of their fishing Boats appears well adapted to the limitted sphere of their action — the experienced rapidity of the Tides — the degraded and precarious circumstances of the natives employed in the Fisheries. Their construction conformable to the ideas first probably called forth by the inexperienced primitive adventurers on the liquid Element — a Cone with the apex foremost. The form undergoes some approximation to the models obtained from contending with the more boisterous element, as the situation of the natives approach the mouth of the River.

But in the exertion of the mechanic powers of the human body they have called in aid resources unpracticed I believe in the western world, namely the action of the feet in plying the paddle or oar, exhibited by the left hand supporting the Oar or paddle as a fulcrum in the place of the row-lock while it is plied with the opposite leg, grasping the extremity or handle of the oar or paddle with the toes. In such occasions the Fisherman is sometimes seen smoaking the Hookah held by the right hand, the boat continuing its course by this temporary substitute. In other situations the oar is grasped by both hands performing the office of a fulcrum whilst the extremity is plied by the opposite foot. On common occasions the oar or Paddle is only plied with both hands.

Music

The state of Music by no means corresponds with the degree of civilization and their

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faggot wood is thrown promiscuously into the Creek but in a circular form reaching nearly from the bottom to the surface: this operation takes place about sunset. In the Morning before sunrise this mass of brushwood is surrounded by a net extending from the bottom and supported with Bamboos several feet above the surface. The fishermen enter this enclosure after sunrise and by diving and other means remove the whole of the brushwood throwing it on the outside of the net, which enables them to draw with the net all the fish collected there during the Night.

The explanation given respecting the congregation of fish drawn together by this expedient. They attribute to the shelter afforded by the brushwood to the small fish against being preyed upon by the larger species, and the presence of the first attracting the latter laying in wait for their prey.

The Otter is also tamed by the Indians and rendered subservient to the catching of fish. This I have seen practiced by Individuals but not in general use by the Fishermen.

They are also in possession of several ingredients for intoxicating fish and robbing Pools. They also catch with their hands fish frequenting muddy

bottoms

Painting
Sculpture
Architecture

Whatever attainments they may have made in these sciences no vestiges at present appear deserving notice.* a

C Medicine

* From this Remark must be excepted the Temples of Gyah and Bishenpore situated in a very different style and apparently from their massy solidity resembling Egyptian under a remoter period than the Relation hereunto annexed refers to.

The Chords of the Indian Violin, stopt by introducing the fingers between the strings touching them laterally with the flat of the Nails of the fingers.

Trumpet constructed in the Europe form, only gives utterance to harsh jarring unconnected sounds utterly devoid of air.

Drums of different sizes in an octave progression. These drums are beat in a kind cadenced alternate or more varied succession of strokes, but not embracing the extent of an octave, something like what is heard from a smith's shop when the Anvil is beaten with hammers of different sizes. Some of the smaller sort, altho' a perfect Cylinder and shrunk at both ends, one is rendered an octave lower by smearing the middle part of the Parchment with a Plaister of Resin.

Cittar and Violin. Their performance alike rude and unengaging; Are seldom seen but in the hands of the natives of the upper Provinces.

a Sciences like these of not originating, fostered by Ease and the enjoyment of liberty, no traces can reasonably be looked for under the Iron reign of despotic Anarchy so

Mechanic Arts.* The Instruments in use are the Flute, Hautboy, Trumpet, Altar, Violin Cymbal, Castanets and Drums.[a]

Of Musical characters or a Notation they appear to have no Knowledge.

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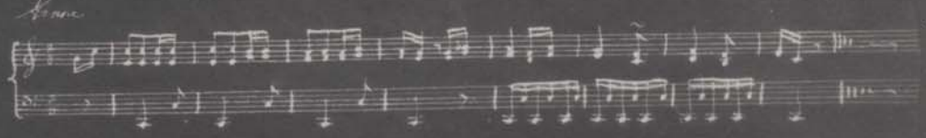
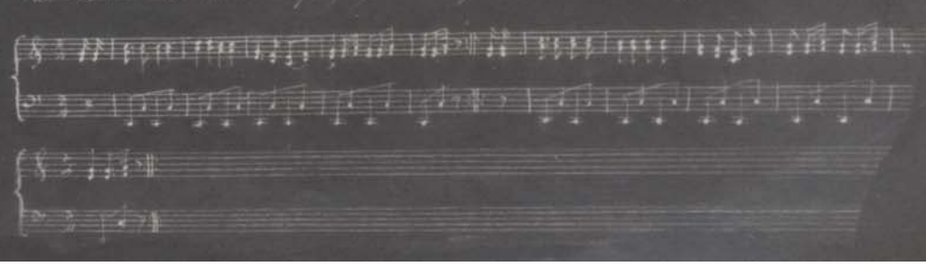
[a] Flute something approaching Melody, but an insipid languid monotonous taste is attempted in a Flutabeck made in a rude and artless manner from the joint of a Bamboo pierced with holes by a hot Iron. This instrument in use amongst only a few of the lowest orders.

Hautboy used in the marriage and religious processions. Something like a wild kind of recitative, in a very harsh tone (doubtful if subjected to regular measure)

of their vocal music; such songs as appear to approach to our Melody it may be doubted whether they are not borrowed from the upper Country, of which the two following will convey some idea. The first an Invocation of the Deity



The second some under imprisoning - Dialogue between an Monkey and a Bear



* that they possess elementary knowledge in Chimistry, Medicine Grammar Logic Ethics and Theology, and in the latter Sciences perhaps as deep and exact as our ancient and modern Divines, may be inferred from the Conversation in the following Extract from the Abyssin Library Vol 3rd Page 95

The Learning of the Hindoos

"The Hindoos have upwards of three hundred Arts and Sciences. The Author of this work have apprentied himself intimately with the learned men among them, has heard and comprehended the various Doctrines of each Art and Profession. It is impossible in a single Volume to give a particular relation of such a variety of subjects but for the satisfaction of those who are uninformed I shall sketch out the Rudiments of each Art and Science without offering any comment for or against them. This may serve an useful hint to some future enquiring Investigator who wishes to compare the Doctrines with those of Plato and Aristotle the Sorjers and Commentators of the Sacred Text.

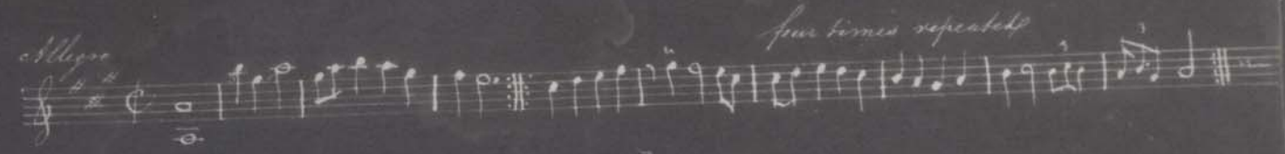
Other Arts Page 107

In the extensive Empire of Hindostan there are so many arts that they cannot be described. Something however shall be said of them which may prove an acceptable present to the curious Enquirer and perhaps excite an further Curiosity."

Bunny Kistnan! Bunny Kistnan! Kistnan Kistnan Bunny Bunny! Bunny Ram Bunny Ram Ram Ram Bunny Bunny.

Hillee Bandee pajeeh Kellah Bandee Ho just intended Kellah Chaelah.

An Air performed on the Sinay (a species of the Hautboy) on their Wedding Processions. Of this only an imperfect Idea can be formed, requiring a more minute examination than will repay the trouble in the opinion of most modern Musicians.



Extract communicated by Wm. G. L. —

In recurring to the Indian Musician I only found what indeed I expected, that without a very laborious and minute examination of their Keys, Measure, Execution and Cadences it would be very difficult to convey by our mode of notation to the european Musician a distinct Idea of their Airs with the Expression suited to direct the execution; their Melodies differing so widely from ours that probably only a Savage Ear can relish it, or a sense of it duly conveyed by an aboriginal Musician after being instructed and accustomed to the performance of our Melodies

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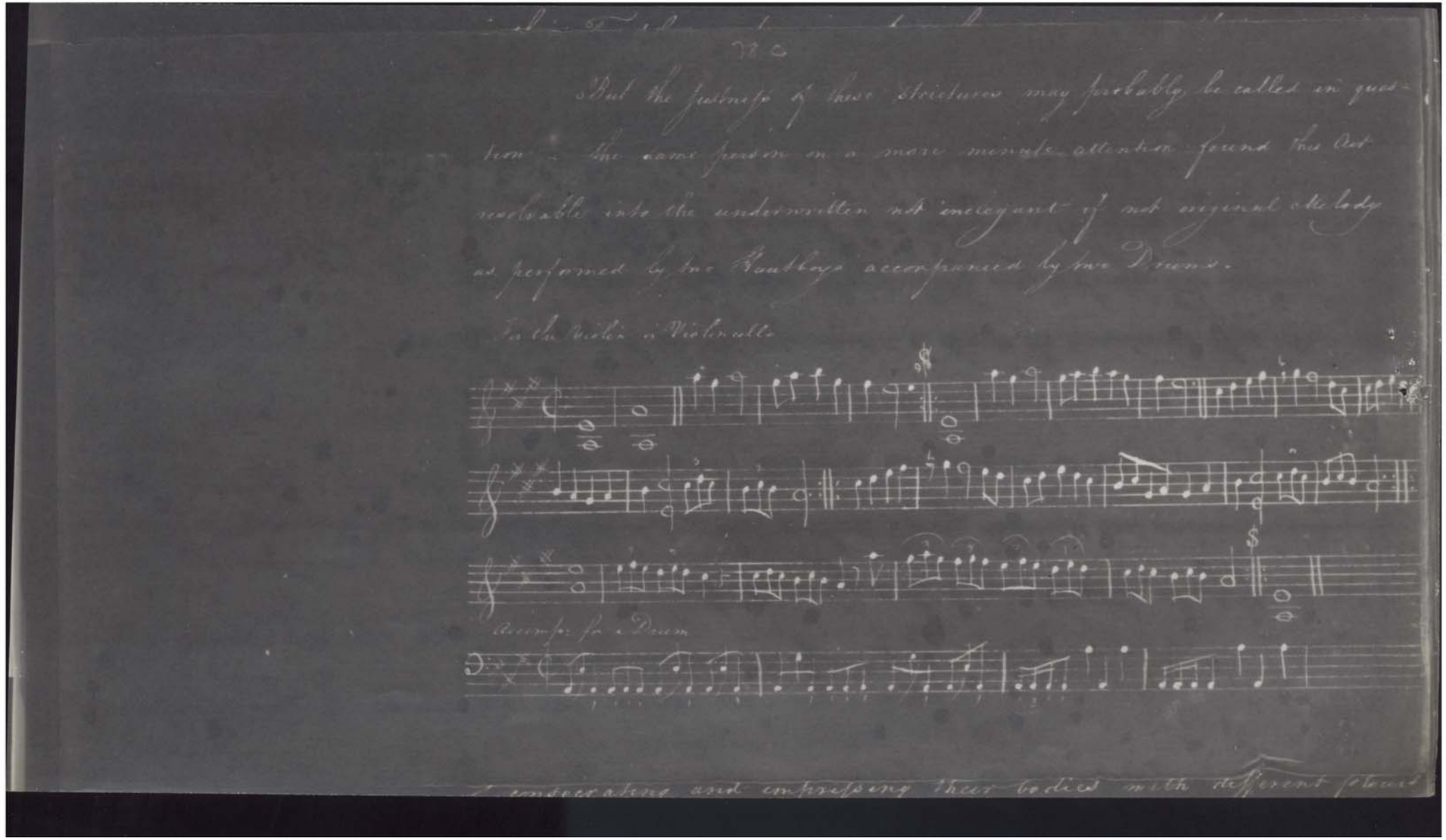
No 2
But the justness of these strictures may probably be called in question – the same person on a more minute attention found the Air resolvable into the underwritten not inelegant if not original Melody as performed by two Pauthays accompanied by two Drums.
To the Violin & Violoncello
Accompn for Drum
Ennobrating and impressing their bodies with different passions

what extent I am not competent to determine

any

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primarily selected from the bone forming the specimen into the previous arrangement of the fibres and form of the bone allowing the cotton to wind off of itself conformably to the first impression given. The spindle a bit of iron about a foot long the size of a knitting needle, to which motion is given by a small compressed ball of clay surrounding the lower part.

Coarse cotton separated from the seed by two cylinders turning different ways and spun with the wheel as practiced in Europe.

Price of Labour In the country from 2 to 2½ Rupees. At the Presidency 3 Rupees ℔ month. The Rupee two shillings sterling which makes about 2ˢ to 2½ ℔ day.

Cookery In their cookery they possess a process for rendering fresh meat tender, apparently unknown to the professors of this art in the western world however renowned, namely by steeping or stewing it in sour milk for some hours or macerating it in the juice of ginger; this without imparting any of the flavour of the articles produces the same effect in a more complete manner, than probably the slower and more insalubrious process of spontaneous putrefaction recurred to in Europe.

The bones of fish softened in the same manner so as to be eaten without any ill effect.

Hot

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Medicine Surgery Chymistry	Their proficiency considerable, to what

which they have been subjected. Of the remains exhibited in their Temples a drawing has been given. Of perspective they possess no knowledge, altho' under the tuition of European Artists they become ready proficients in drawing colouring and carving.

Gunpowder Cannon and Fireworks	In use from an unknown period.
Arms	The Bow and Arrow, Matchlock, Pike, Sword and Buckler.
Printing	Unknown altho' wooden Stamps inscribed with magical characters, or from their holy writings recurred to on the occasion of consecrating and impressing their bodies with different colours on the particular festivals already adverted to.
Cotton Manufacture	The finest Cotton thread spun with a Spindle but by a different process than practised with the Distaff in Europe.

1st. The finest Cottons are plucked from the seed with the fingers only, afterwards passed under the action of a slender Bow string for the purpose of arranging the Fibres; it is then spread out and by means of a cylindrical stick formed into a hollow cone from which the fibres wind off by the mere extension of the hand holding the line; the thread being twisted by the motion of the Spindle impressed with the other hand, the lower end resting on a shell: the size of the thread conforming to the quantity

primarily

is most copious drawn the vegetable and

mineral

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singular Dogma whose hopeless and degraded state has apparently entailed an equivalent dissolution of manners from being subjected to the performance of the vilest offices incident to humanity and being excluded from society often reduced to the necessity of feeding on carrion to support the wretched existence.

Lime, Myrobolan and Allum or a Decoction of the Tamarind are the principal ingredients employed in preparing the Leather for use and dying.

An infusion of the fruit of the Myrobolan (supposed the Mirabolans) employed in staining it black.

Red dye. An Infusion of red wood or of a species of stick lac deposited on the branches of the Peepul and Ficus by a particular Insect.

Yellow. From a decoction of the Lasserah[a] and Burril bark.

Green. From a Solution of the Lasserah Bark united with filings of Copper and Borax

Various other substitutes are resorted to according to the means and abilities possessed such as the common Stick Lac and Oucl Root, the particulars of which the Natives do not readily communicate.

Ink

The common Bengal writing is formed of Rice Water blackness. One Chittack in weight infused in 6 Chittacks of water for 8 or 10 hours. This is also sometimes ground with Lamp-black obtained by burning common oil under an earthen Pot until it attains the requisite consistence. For Persian writing a Solution of Shell lac and Borax is mixt with Lamp-black

a This Tree not ascertained

any more than enumerate the several articles composing their Materia Medica which is

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Wax Obtained in considerable quantities from the mountainous east and west Frontiers, as well as from the overflowed intermediate tract termed Sunderbunds.

In Calcutta it is manufactured into Candles and sold at from 45 to 60 Rupees P. maund.

The Bee furnishing this wax is of a far more diminutive size and more inoffensive in its sting than that in Europe; the honey of an insipid Quality.

Soap Of a coarse quality, prepared from a mixture of oil Tallow and Jyemutty (supposed to be a Natrum).

The fine cotton Muslin purified and cleaned by steam. Coarser cloths and body Linen with a Lixivium obtained from the ashes of the Plantain and other vegetable matters.

Paper Formed from the Indian Flax termed Coon of various degrees of fineness. One species of Paper used for Records independent of inscribed Copper Tablets, tinged yellow with Orpiment to preserve it from insects.

Sugar The Juice of the Sugar Cane obtained by a simple machine worked by hand on the principle of the Cylinder used in the West India Islands. The Juice granulated into coarse Sugar, crystalized into Sugar Candy, or refined into Loaf sugar. This last process not in common use.

Leather. The preparation of this article however necessary and in universal use, held in abhorrence by the aborigines and only practised by the unfortunate lower orders reproached by their

3d. * Tobacco Seed – One Maund affording 8 Srs at 7 Srs ₹ Rs

4th Raddish seed – One Maund affording 7 d° at 8 d° ₹ d

The preceding Articles already adverted to afford oil in the following quantities.

Meesnee	1 Maund affords	18 Seers
Teel	1 d°	18 d°
Ghee	1 d°	10 d°
Sersoong	1 d°	12 d°
Rye	1 d°	14 d°
Coco Nut	1 d°	10 d°

The oil expressed in a Mill of a peculiar construction worked by a Bullock, capable of expressing about one Maund of seed or 10 seers of oil ₹ day of 12 hours, with the relief of two additional Bullocks.

The seed undergoes no previous preparation by heating or pounding, being only moistened with a little cold water, the machine uniting the powers of pounding and pressing.

Eighteen Mills employed in Sickpore by eight Fam-lies – See annexed Drawing of the Mill.

The composition of glass not practised, whether known or ascertained, altho' they convert our glass into weak and ill proportioned Phials.[a] [b]

a Atto. at the period of the compilation of this observation, gilded glasses are noted as the manufacture of the Behar Province. The same Record reports that the mountains of Bihar have since all the requisites for making glass and soap.

Glass

Probably cultivated from a far more remote period than the introduction of the use of it into Europe; if not known in the western world before the discovery of America; inferable from its very general cultivation and its throughout India; altho' it is to be observed that it is still rejected by the rigid Brahmins as reprobated by their Doyma or ancient prescription. My enquiries respecting its first introduction and use have proved altogether unsatisfactory.

Tobacco

* Tobacco passing by Virginia a Colony thus formerly Raleigh had there planted brought home with him Ralph Lane, who was the first that brought Tobacco into England, which the Indians took against crudities in the stomach. –

Raleighs Hist. of England

mineral worlds. [a]

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[a] Inoculation long in use. All chirurgical operations held generally in abhorrence and only practiced amongst the Aborigines by the inferior orders; Inoculation accepted by the Brahmins. – its origin probably lucrative in the practice.

Chirurgery (in which they are considered by us the least advanced) they often succeed in, in removing Ulcers and cutaneous eruptions of the worst kind, which have baffled the skill of our surgeons, by the process of inducing inflamation and by means directly opposite to ours, and which they have probably long been in possession of.

In the preparation of Cinnabar, Minium, Corrosive Sublimate, Vitriol, Sal amoniac, Saltpetre, refining the precious metals; smelting and refining Iron, Lead, Copper Tin and Tutenage, with the various combinations of the same preparation of steel of a very high temper, well versed[a]. Polishing and engraving precious Stones. In the process of dying. Extracting the precious essential oils for perfumes. Extracting Sugar from the Cane – Rearing the Silk worm probably from the remotest antiquity. On the process of refining Gold and Silver, see the Appendix. *

c. Alchymy in its application to the transmutation of the Metals still in vogue amongst the aborigines, and attended with the same impositions practiced in the western World amongst its deluded votaries and by no means by the innocent & harmless process remarked by M. B. Pauw –

Mais il ne faut pas croire que les Orientaux le cherchent de la même manière que les adeptes de l'Europe ne ordinairement ils n'employent a fournaux ni creuset, mais des formules mystérieuses des prières des cérémonies & rapprochent en fin tout ce qui a rapport à l'empire de la nature des Magiciens, ou à ce qu'il nomme les Alchymistes.

Oil

[a] The Manufacture of steel fallen into desuse from the introduction of European Steel – sold at a cheaper rate —

Independent of the Articles specified in the preceding Remarks, Oil is extracted from the following vegetables, principally used in medicine and for burning.

1st From the seed of the Dhallo orinchah used in Medicine but not cultivated. From 1 to 2 seers p. R.

2d Opium seeds. One Maund affording at the rate of 12 seers – Price 7 Sicca Rs.

b

Glass not used in their Windows and in the upper Provinces where from the difference of climate it might sooner call for its advantages the first more natural substitutes Tale and transparent Shells little if at all accessed to, altho strong coarse coloured glasses are found in the construction of the hot Baths, in use only amongst the Mahomedans throughout Hindostan.

Pottery Ware

Of the composition of porcelain and lacquered ware they appear to possess no knowledge, altho the materials are afforded in the Burmah and most frontiers — the Chittagong frontier producing a very fine Gum known to Europeans under the title of wood oil. the Patchee and Ramgee frontier the Petunee and Kachan. In the manufacture of China some progress was made by the late Collector of Gyah sufficient to ascertain its practicability.

Their Pottery ware of the coarse unglazed kind made from Brick clay turned on a wheel suspended horizontally on a Pivot. In this Article they are excelled by the bordering natives of Pegu and Siam who practice glazing their earthen ware.

In some of the antient building (such as have come under my notice) of a Mahometan Architecture small Bricks glazed green and white are seen.

Wooden turned in a turners loom is lacquered by the application of Gum Lac tinged with the different colours — Wood painted in oil colours is also varnished with a solution of Gum copal termed by the natives Kachah — this ingredient obtained from the Ports of the Red Sea.

In the Manufacture of Gold thread — Enamel & Filligree, long Practised —

Indigo

By the fermentive and boiling process — the faecula precipitated with some water or the Gum of the Jaub Apple

Corn Mills

The corn either hedden rent with opening by beating the Ears of the Sheaf against the Edge of an inclined Board; and freed from the Husk in a wooden cylindrical mortar under a heavy stamper moved by the foot.

Their Corn ground by hand Mills of the simplest and cheapest construction; the cheapness of labour and horizontal ~~nature of the~~ surface of the country probably accounting for their not securing to more complicated Machinery; water Mills being used in the North east mountainous frontier of Serinagur, and the Wind Mill, altho' lately introduced by Europeans at the Presidency not likely to be secured to by the Natives from the expence of the Machinery.

Purification of Water

The impurities contained in the River and Pond water are precipitated by the opulent Natives by a solution of Allum or rubbing the interior surface of the containing Vessel with the Nut termed Nirmoney[a] obtained from the western frontier.

[a] the plant producing this nut not ascertained –

The water is cooled in an unbaked earthen vessel composed of black clay and coarse Sand of a texture sufficiently porous to allow the water to exude and moisten the exterior surface; which exciting a constant evaporation, particularly when exposed to a draught of air in the Shade, cool the water sufficiently for common use. The luxurious resort to the use of Salt petre*; Sal-Ammoniac altho' manufactured in the upper Provinces and capable of producing the same effect in a greater Degree not having been resorted to by the Natives probably from their ab-horrence of the experimental Ingredients from which it is formed.

* the discovery of this process attributed to the Emperor Akbar and Sycamore Library

These Sherbets congealed from a mixture of Ice (collected in the cold Season) Sal-tait and Salitpetre. The liquid to be congealed enclosed in very thin ~~[illegible]~~ earthen Vessels. These last put into a cast Iron pot lined with a coarse woollen Blanket; the Salt-petre and Sal-tait shewed on them and the whole covered up in another coarse Blanket. The solution takes place in about half an hour and congeals the contents of the Pot.

The Ice preserved in Ice houses wrapped up in coarse blankets until the cutting in of the Rains in the middle of June.

Lime

Principally obtained from the Sylhet frontier made from a mineral of a very hard texture and Black colour.

Glue

A very strong kind made from the sinews of the Buffalo.

Potter

The Banks of this tract bordering the Hooghly River almost throughout their extent disfigured by excavations formed by Brickworks, the Soil being adapted to furnishing this artificial mineral[a] the only one used in the Buildings erected in Calcutta during the Course of 25 years past – the Ground so broken exhibiting an unexpected and disagreeable Barrier, in some places rendering the access to the interior parts of the Country difficult. The immediate margin much strewed with dissevered human Bones and entire Skeletons – the River often wafting Carcasses in every stage of putrefaction, empoisoning the air with noisome effluvia not less shocking to the sight than offensive.[b]

This

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a These Bricks (prepared from a Soil impregnated with Salt) generally become friable if exposed to the effects of the Atmosphere without a covering of plaister to prevent their decomposition.

b The apparent insensibility to such objects (exposure of the dying and dead on the banks of the river, heightened by the contrast of the view of a Country diversified with the richest Culture and Vegetation under the Canopy of heaven considered in the western Hemisphere as only attainable and connected with civilized and humane manners) greatly indispose and prejudice, on a first view, the lower order of Europeans so as to induce them to consider the Natives as beings of a

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This tract throughout so level, that viewed from an artificial height of considerable elevation, stand out

different nature from themselves, unanimated by the same feelings or motives of action and from being insensible, undeserving of humane treatment.

This studied inattention to the social Duties often extending even to the clamorous voice of the distressed objects of humanity, because they are not immediately within the range of their Charge, or connected by the ties of affinity, convey impressions widely differing from those imbibed under a free Government, where every member of the Community conceives himself interested in the protection of his fellow Creatures however distant the relation.

This apparent insensibility, one of the dreadful evils accruing from Despotism, to every participation in the public feelings, commonly indispositions on a first view, against the general Indian character, as conceiving them devested of all humanity, when in fact by their Configuration, they certainly possess it in an equitable degree and ought rather to excite compassion from their being devested of all exercise by the influence of the Government they have grovelled under. Nor, independent of other observations, are instances wanting to confirm it.

Quoique l'homme soit au fond partout le même partout le jouet des mêmes passions produites par elle même le sentiment, et l'on peut espérer de trouver des hommes assez civilisés pour n'être pas forcés & assez naturels pour n'être pas corrompus il faut les chercher où il n'y a ni Seigneurs ni riches ni voir abondé fréquent d'étrangers — Ceux qui n'ont vu l'homme de la Nature — ; la connaissant des maîtres Alys à discrétion ensuite

as the Spire of Calcutta Church appears nearly overspread with dark forest wood; the intermediate plains however considerable appearing foreshortened in the perspect in proportion to their distance.

The Margin of the River generally exhibit a continued Skreen of high tufted monotonous dusky vegetation, unenlivened by the variegated tints which in a nearer view discriminate the component articles of the Mass, excluding all view of the country and strewed with the habitations of the Natives alike shaded.

The general face of the country examined internally exhibits a succession of Plains of five or six miles, their greatest extent laying generally North and South covered with rich vegetation. These plains skirted by what appears on a first and distant view, high and

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"crasse par le faste, corrompue & méprisée même par des Nom-"mes avides par la servitude, il devient aussi objet que cuy-"que le corrompent."

De Sanpere

These observations drew from my tmanuensis the following a-necdote — "That during the severe captivity which some of the "British Troops suffered in the Fortress of Dermpt in the war of 1782

and

and extensive forest wood, which on examination is found to be only cultivated borders of the fruit trees peculiar to this tract. The Mango, Jack, Tamarind Coca, Palmira, Betle &c interspersed with the Bamboo, Bhut, Peepul, Baubul &c and this artificial plantation throughout inhabited and strewed with houses and enclosures of the Natives. These Stripes appear to have attracted their residence from their original insensible undulating risings above the level of the Country — The interior Plains generally forming the species of ground termed Dowrah affording only one crop of grain from remaining overflown or drenched with moisture until the end of December; rented at 1 R ℔ Beyzah and where the North

border

"in which he participated — A native Traveller passing by and "looking into the wretched place of their sufferings, where they lay "linked in Irons under the additional pressure of famine and sick "ness, from the bad quality of the scanty pittance of food allowed them" — this traveller burst into Tears and exclaimed aloud — What is "this treatment deserved by men, who bind up and the wounds "of their Prisoners and dismiss them on being restored to life with "Money and Provisions"? the Guards not less struck with remorse than astonishment at the audacity and danger to which the stranger exposed himself, by the utterance of such sentiments after looking at one another for some time in silent wonder replied, "that

border on the artificial eminences or more elevated Banks of the Creeks before described at Sir R. Q.s Bungalow affording (the richest productions) in the Wet monsoon season a subsequent crop of Wheat or Barley intermixed with the Rajgurry, Korella or Sucker cane &c, or in detached patches the Water-melon and Phulwul. These last cultivated separately.—

"can we do? We are helpless and should expose ourselves to "worse treatment, if not death from disobedience of our orders "by attempting to mitigate their sufferings."—

Truly concerned am I to remark for the sake of the national Character that the appearance of an European in the internal parts of this tract besides proving a Bugbear to Women and Children puts the Labourers in the adjoining fields to flight until assured of the intentions of the visitor. This owing in some degree to the prejudices pervading the lower order of Europeans in general against the native Character but chiefly, it has been represented to me, to the unprincipled Violence committed by the numerous depraved race of native Portuguese, who under the Garb of a European, possess nothing of his humanity, but all his defects, aggravated with the vices and imperfect part of the character of the Natives of India unalloyed by the virtues of either. Let others determine whether it is not this depraved miscreant Race which have discredited the European character so much throughout India. I offer this remark under the exceptions indispensable from all general characteristics, there being several characters among them who would do honor to the most enlightened Society and whose Names I should not [illegible]