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Sq T. Both No 125–139

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 a 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 these 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 desireus 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 employers; 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 philosophical societies in Europe.

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

scrutinised for antiquities, these 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 these 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 Delhaselles 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 nutation 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 ~~mmm~~ 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 ~~d~~ 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 observat~~ions~~ sufficiently point out a diminution, yet these ~~i~~ions observat~~ions~~-ions 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 oppertunity 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 (ff267r) 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 fore-telling eclipses, as authors 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 India 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 may be seen in Boulangir, Costaud and others, and I have lately met with a similar instance in the Imag Deorum of V. Centari, respecting the copy of an ancient Persian monument, in which Apell 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 earths 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 they 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 these 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 "Deeth Sayers of Babylen"; 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 (the rage of governing, and giving advice, and with 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 Gnomen; 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 the declination of the sun are of the same name, and the latitude less than the declination; the feet of the Gnomen 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 Gnomen 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 idolateries of Ahaz and several other of the Israelitish kings, it

seems probable that the Centoo 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) idolatery 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 these customs extend, and whether there are yet any remains of them among the priests at Benares, as I think there must.

Our 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 Ptolemaick 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 expleded. 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 Ptolemy'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 these excellent works (ff 274r) of Archimedes, Euclid, Diophantus and Apellenius &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 surveyers, 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 ~~materially~~ 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 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

(4.2)

12 June 1783

Honourable Sir

The favourable attention you were pleased to shew to the hints concerning the Observatory at Benares which I had the honour to lay before you by means of Colonel Watsen, 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 these 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 these were by Apollonius; but unfortunately & I found that the [redacted] 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 [redacted] and expedition of the moderns, mathematical knowledge might be greatly

BrM. Add MS 29159

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 unsuccessful.

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 Almamon, 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 these 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 these 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 these 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 1½ page mention in the British National Biography where his publications are also listed. He was born on 30.12.1747 and died at Buxer (India) on 7.6.1792.

(36)

(A.3) Col Robert Kydd to Sir William Jones: 1791

Dear Sir,

In submitting the remarks on the vegetation and soil of the western side of the river Hoogley I never entertained the most distant idea of its meeting your approbation, being perfectly aware, (considered in a literary view) of its being grossly deficient, and of the political opinions, that you had long entertained a decided and opposite view of the subject, (ff 3v) namely of the fundamental impossibility of benefitting any country under the idea of the assumption of landed property by Government, a position which I have been prevented subscribing to from a view of the evils accruing under the migratory state of the administration joined to the improbability of ever remedying this fundamental defect by any means but one, which I apprehend may be justly considered visionary, (ff 4r) namely, by an edict enacting that whoever accepted any office in India, should be rendered incapable of ever returning to Europe, unless expelled for criminal malversations. But, I am wandering from the point in addressing you these lines, which you will perceive is far from asking an opinion respecting the propriety of any thing there-in advanced, for in this subject I (ff 4v) not at a loss; the only thing on which I hesitate, altho it has throughout principally induced me to commit these remarks to paper, I mean by bringing therein them forward either here or at home, to induce others better informed to produce more perfect; should it ever tend to the reputation of what has occurred to me. This point alone I am anxious to ascertain, and of which from past experience I ought to remain very doubtful (ff 5r) as well from the reception of some observations which have fallen from me, by the court of directors, as by the Board here, in the late remarks respecting Rouncan (?) island.

I am Dear Sir, your faithful and obedient
Calcutta, 18th April 1791 servant, Robt Kyd
(Receipient's name not written)

Dear Sir

It is not without much hesitation I send you the enclosed remarks on the soil and vegetation of the western side of the river Houghly, altho principally led thereto, in the view of inducing others better qualified to afford the completer information they may possess.

If I have glanced at other matters which you may consider not strictly connected/with the subject, it is from my incapacity to /ff8v form a due discrimination while impressed with the intimate union and importance of the subject and the not less critical situation of the national possessions in this part of Asia.

I have only to regret my inability to treat the subject in a manner more deserving your attention – a reflection (independent of losing the satisfaction afforded by obscurity) removes from my mind every the least desire of appearing in public (ff 9r) and induces me to request they may be offered (if you judge their insertion at all suited to the plan of the Asiatic Researches) under the anonymous title of Remarks of one of the Company's servants.

With great respect, I have the honour to be Dear Sir
Your most obedient and faithful servant
December 7th, 1791. Robt Kyd
To Sir William Jones

IOR: MSS Eur F 95/I: The above piece is on ff . The sketches pertaining to it are in F 95/II.

NOTE: According to the DNB Robert Kyd was founder of the Botanical Gardens, Calcutta; was made Lt Col on 7.12.1782 and appointed secretary to the Military Department of Inspection about that time. This post he retained to the day of his death at Calcutta on 26.5.1793. The volume has come into the possession of IOR only recently and belonged to William Jones Papers.

(4.4) SOME REMARKS ON THE SOIL AND CULTIVATION ON THE WESTERN SIDE OF THE RIVER HOOGHLY : AD 1791

MANUFACTURES

The mechanic arts only exercised by the meanest orders among the aboriginе community under every possible discouragement en by contempt and neglect in the higher orders who derive consequence only 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) (ff 75v)

Distillation:

Their process conformable to that described in the Asiatic Researches by Mr A Kiar. (ff 76a.r)

The cultivators and fishermen engaged principally in furnishing the Calcutta market (ff 76a.v) 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 fall to be considered very expert, possessing the several modes of fishing known in Europe, and some processes it is apprehended peculiar to themselves. (b) (ff 77a.r)

Music:

The state of music by no means corresponds with the degree of civilization and (ff 77v) their attainments in the arts of (ff 78r) poetry, ethics, grammar, mathematics, astronomy or the mechanic arts. (c) The instruments in use are the Flute, Hautboy, Trumpet, Cittar, Violin, Cymbal, Castanets and Drums. (d)

Of musical characters or notation they appear to have no knowledge. (ff 78v)

Painting, Sculpture, Architecture:

Whatever attainments they may have made in these sciences no vestiges at present appear deserving notice. (e) (ff 79r)

Medicine, Surgery, Chymistry:

Their proficiency considerable, to (ff 79v) what extent I am not competent to delineate any more (ff 80r) than enumerate their materia medica, which is (ff 80v) most copious drawn the vegetable and mineral (ff 81r) worlds. (f) (ff 81v) blank (ff 83r)

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 (g) 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. (h) (ff 83v)

This tract throughout so level, that viewed from an artificial height of considerable elevation, such (ff 84r) as the spire of Calcutta Church, appears nearly overspread with dark forest wood; the intermediate plains however considerable foreshortened in the prospect in proportion to their distance.

IOR: MSS Eur F 95/I: The very long footnotes are separated here from the above text. Their connection with the above is indicated by (a), (b) etc.

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 (ff 84v) 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, cocoa, palmira, beetle &c interspersed with the bamboo, bhur (?), 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 Domrah affording only one crop of grain from remaining overflowed or drenched with moisture until the end of December; rented at 1 Re per Biggah and where the skirts (ff 85r) border on the artificial eminences or more elevated banks of the creeks before described at 1½ Re per Beggah affording (the richer productions) in the Heymontic season a subsequent crop of wheat or barley intermixed with the kassary, korella or suckercundy, or in detached patches the water melon and phulwul. These last cultivated separately.

SOME REMARKS ON THE SOIL AND CULTIVATION ON THE WESTERN SIDE OF THE RIVER HOOGHLY: AD 1791

NOTES

Manufactures:

(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. That 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 litigeous disposition ~~prevailing~~ 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, boat-builders, potters and weavers: of the last about 25 families residing in Seibpoor, and about thrice this number in the extent of the margin of this district bathed by the river Houghley. (ff 75v)

The species of cloth manufactured principally confined to that in use amongst the lower orders, known under the following names Soarie and Jore. But in the village of Balleah Adumpore between 3 and 400 looms are said to be employed in the manufacture of the following species of cloth viz: Durrah-than, Romaul, Dimmies, Cassaberie, Meinsee and Chullabund.

Their process in spinning, weaving and finally dressing 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 passive 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 Barbary (mentioned by Dr Shaw) composed of the curd of milk united with lime unknown.

They further possess two kinds of mortar probably 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 (ff 76r) sugar: this last ingredient producing nearly the effect attributed to Pozzalnai 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 mortar.

Another ingredient used in the composition employed in forming the flat terraced roofs of houses, obtained from seeping a species of grain (of the vetch kind termed petter-saque (?) by the aborigines) in water. The period for obtaining the proper state of the decomposition of this ingredient and drawing off the water, on its attaining a viscous quality joined to a very offensive smell; but the particular effect of this last ingredient not so obvious as that apparently produced from the acid of sugar used in the other process. An extract by fire of the fruit of the Hurritukah (understood to be the Mirabolans ?) applied to the same purpose.

IOR: MSS Eur F 95/1: by Col Robert Kyd (sent to W.Jones)

A plaister is likewise made from calcined shells which in r whiteness, gloss and durability may be said to rival Persian marble. This it in some degree owes to the labour imployed in polishing it with a steel or agate burnisher and careful removal of the moisture, as it exudes, with fine muslin rags; equal care being taken in preparing the lime from the purest calcarious substances. The Cowrie shells said to afford the best. (ff 76v)

(b)

A line some hundred yards long furnished with floats, as used for suspending nets, is sweeped 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 towardx 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 wiers (?) and nets extended across, by disturbing their auditory nerves. The fishermen in boats extended from side to side of the creeks proceed liesurely 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 brush and faggot (?) (ff 77r) 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 in not in general use by the fishermen.

They are also in possession of several ingredients for intoxicating fish and robbing ponds. They also catch with their hands fish frequently muddy (ff 77v) 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-locks while it is plied with the opposite leg, grasping the extremity or handle of the oar or paddle with the toes. On such occasions the

fisherman is sometimes seen smoking 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. (ff 78r)

(c)

That they possess elementry treatises in chemistry, medicine, grammar, logic, ethics and theology, and in the latter sciences perhaps as deep as any of our ancient and modern writers, may be inferred from the enumeration in the following extract from the AyyeenAkbarry Vol 3rd page 95:

The Sciences of the Hindoos:

"The Hindoos have upwards of three hundred arts and sciences. The author of this work have associated himself intimately with the learned men among them, has heard and comprehended the various doctrines of each sect 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 argument for or against them. This may in useful to some future ingenious investigator who wishes to compare their doctrines with those of Plato and the and commentators in the sacred text.

(page 167):

"In the extensive empire of Hindostan there are so many arts that they cannot be described. Something however should be said of them which may an acceptable present to the curious enquirer and perhaps excite his further curiosity."

(d)

Music:

Flute: something approaching melody, but an insipid, languid, monotonous taste is attempted on 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 recitation, 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:

(Hurry Kistna! Hurry Kistna! Kistna Kistna Hurry Hurry:
Hurry Ram Hurry Ram Ram Ram Hurry Hurry)

The second some verses comprising a dialogue between a monkey and a bear:

(

(ff 78b.r)

An air performed on the Sinoy (a species of the Hautboy) in 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 Mr 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 melody differing so wildly from ours that probably only a savage ear can relish it, or a sense of it duly conveyed by an aborigine musician after being instructed and accustomed to the performance of our melodies. (ff 78c.r)

But the justness of these strictures may probably be called in question. The same person on a more minute attention found this Air resolvable into the underwritten not inelegant if not original melody as performed by the Hautboys accompanied by two drums:

(ff 78v)

The chords of the Indian Violin, stopt by introducing the fingers between the strings touching them with the flat of the nails of the finger.

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 smiths' shop when the anvil is beaten with hammers of different s sizes. Some of the smaller sort, altho a perfect cylinder and struck at both ends, one is rendered an octave lower by smearing the middle part of the parchment with a plaister of resin.

Guitar and Violin: Their performance alike rude and unengaging; and are seldom seen but in the hands of the natives of the upper provinces.

(e)
Painting, Sculpture, Architecture:

From this remark must be excepted the temples of Cyah and frontier (?) of Bishenpore adjoining to this tract constructed in a very different style and apparently from their massy solidity resembling Egyptian under a remoter period than the relation hereunto annexed refers to.

Sciences like these if not originating, fostered by taste and the enjoyment of liberty no traces can reasonably be looked for under the iron reign of despotic anarchy to (ff 79r) 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.

Printings:

Unknown altho modern 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 practiced with the distaff in Europe. 1st the finest cottons are plucked from the seed with the fingers only, afterwards passed under 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 cone, 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 (ff 79v) primarily selected from the cone forming the specimen int the previous arrangement of the fibres and form of the allowing the cotton to wind off of itself conformably to the first impression given. . The spindle a bit of iron a foot long the size of a knitting needle, to which momentum is given by a small compressed ball of clay surrounding the lower part.

Course 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 per month. The rupee two shillings sterling, which makes about 2d to 2½d per 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 reknowned, 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. (ff 80r)

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 per 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 Sejeutty (supposed to be 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 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 Indian islands. The juice granulated into coarse sugar, chrystalized 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 abhorence by the aborigines and only practiced by the unfortunate lower orders reprobated by their (ff 80v) 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 of reduced to the necessity of feeding on carrion to support their wretched existence.

Lime, Hurtooka (?) and Allum or a dedoction of the tamarind are the principal ingredients employed in preparing the leather for use and dying.

An infusion of the fruit of Hurtooka (?) (supposed the Mirabolums employed in staining it black.

Red dye: An infusion of redwood or of a species of stick lac deposited on the branches of the Pepul and Behr trees by a particular insect.

Yellow: From a dedoction of the Lujseeah (?) (this tree not ascertained) and Burril bark.

Green: From a solution of the Lajseeah bark united with filings of copper and borax.

Various other substitutes are recurred to according to the means and abilities possessed such as the common Lac and Cucl root, the particulars of which the natives do not readily communicate.

Ink:

For common Bengal writing is formed of rice blacknys. One Chuttuck in weight infused in 6 Chuttucks 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. (ff 81r)

(f)

Medicine, Surgery, Chymistry:

Inoculation long in use. All Chirurgical operations held generally in abhorrence and only practiced amongst the aborigines by the inferior orders; inoculation excepted 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 removing ulcers and cutaneous irruptions 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, Sul Amoniac, Saltpetre, refining the precious metals; smelting and refining iron, lead, copper, tin and Tulenuge (?) (with the various combinations of the last three)preparation of steel of a very high temper, well versed. The manufacture of steel fallen into disuse from the introduction of European steel sold at a cheaper rate. Polishing and engreving 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.

Alchymy in its application to the transmutation of metals still in vogue amongst the aborigines, and attended with the same impositions practiced in the ~~xx~~ western world amongst its deluded votaries and by no means by the innocent and harmless process remarked by M.D. Pauw (?). @

Glass not used in their windows and in the upper provinces where the difference of climate it might sooner call for its advantages - the first more natural substitutes Talc (?) and transparent shells little if at all recurred to, altho strong convex coloured glasses are found in the construction of the hot baths, in use only amongst the Mahomedans throughout Hindostan.

Oil:

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 Dhall Orinchah used in medicine but not cultivated (from 1 to 2 seers per Rupee).
2nd: Opium seed. One maund affording at the rate of 12 seers. price 7 seers per Rupee. (ff 81v)
3rd: Tobacco seed. One maund affording 8seers at 7 seers per Re.
4th: Raddish seed. One maund affording 7 seers at 8 seers per Re.

The preceding articles already adverted to afford oil in the following quantities:

Meenee	1 Maund affords	11	Seers
Teel	1 " "	11	"
Ghab (?)	1 " "	10	"
Surseony	1 " "	12	"
Rye	1 " "	14	"
Coco Nut	1 " "	10	"

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 per day of 12 hours and 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 Seebpore by eight families. (see annexed drawing of the mill)

Glass:

The composition of glass not practiced, whether known unascertained, altho they ~~xxxxx~~ convert our glass into weak and ill-proportioned phials.

Altho at the period of the completion of the Ayeen Akbary, gilded glasses are noted as the manufacture of the Behar province the same record asserts that the mountains of Berai (?) produce all the requisites for making glass and soap.

@ A few lines of quotation in French from author mentioned.

Tobbacco: @

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; inferible from its very general cultivation and use throughout India, altho it is to be observed that it is still rejected by the rigid aborigines as reprobated by their dogma or antient prescription. My enquiries respecting its first introduction and use have proved altogether unsatisfactory . @@ (ff 82r)

Corn Mills:

Their corn ground by hand mills of the simplest construction; the cheapness of labour and horisontal surface of the country probably accounting for their not recurring to more complicated machinery; water mills being used in the north east (?) mountainous frontier of Serinagar, and the windmill, altho lately introduced by Europeans at the Presidency not likely to be recurred to by the natives from the expence of the machinery.

(in margin) (The corn either trodden out with oxen, by beating of the ears of the sheaf, against the edge of an inclined board; and freed from the husk in a wooden cylindrical morter under a heavy stamper (?) moved by the foot.)

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 Neermooney (?) (the plant producing this nut not ascertained) obtained from the western frontier.

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 recur to the use of saltpetre (the discovery of this process attributed to the Emperor Akbar: vide Ayeen Akbarry); Sal-Ammoniac altho manufactured in the upper provinces and capable of producing the same effect in a greater degree not having been recurred to by the natives probably from their abhorrence of the excremental ingredients from which it is formed.

Their sherbets congealed from a mixure of ice (collected in the cold season) sea-salt and culphur. The liquid to be congealed/ /enclosed in very thin earthen vessels: these last put into a cast iron pot lined with a coarse woolen blanket; the ice, saltpetre and sea-salt shewed on them and the whole covered up with 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 setting 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 bluish colour.

Glue:

A very strong kind made from the sinews of the buffaloe. (ff 82v)

@ This para under Tobacco should at "3rd" under "Oil" on preceding page. @@ In the original there is a short(rather illegible) marginal note against "Tobacco" regarding its introduction into England from some contemporary "History of England".

Pottery Ware:

Of the composition of porcelain and lacquered ware they appear to possess no knowledge, altho the materials are afforded in the and most frontiers. The Chittagong frontier producing a very fine Gum known to Europeans under the title of wood (?) oil. The Patchett and Ramgur the Petunu and Kaolian. In the manufacture of China some progress was made by the late of Gyah sufficient to ascertain its practicability.

Their pottery ware of the course unglazed kind made from brick clay turned on a wheel suspended horizontally on a pivot. In this article they are excelled by the bordering nations of Pegu and Siam who practice glazing their earthen ware.

In some of the antient building (such as have come under my notice) of Mahomedan architecture small bricks glazed green and white are seen.

Wood turned in a turner's loom (?) is lacquered by the application of gum lac tinged with the different colours. Wood painted in colours is also varnished with a solution of gum Copal (?) termed by the natives Karpah - this ingredient obtained from the ports of the Red Sea (?).

In the manufacture of gold thread - Enamel and Filligree, long practiced.

Indigo:

By the fermentive and boiling process - the facula (?) precipitated with lime water or the gum of the Guul (?) apple. (ff 83r)

(g)
(Brickworks):

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.

(_____

The apparent insensibility to such objects (exposure of the dying and dead on the banks of the rivers heightened by the contrast of the men 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 nativesxxx as beings of a (ff 83v) different nature from themselves, unanimated by the same feelings or (?) motives of action and from being insensible, undeserving of humane treatment.

This steeled inattention to the social duties often or tending even to the clamorous voice of the distressed objects of humanity, because they are not immediately within the ergo (?) of their charge, or connected by the ties of affinity, convey impressions wildly differing from those imbibed under a free government, where every member of the community conceived 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 feeling commonly in disposing, on a first view, against the general Indian character, as conceiving them divested of all humanity, whereas by their configuration, they certainly possess it in an exquisite degree and ought rather to excite compassion from their being divested of its exercise by the influence of the government they have grovelled under - nor, independent of of other observations, are instances wanting to confirm it.

(ff 84r)

These observations drew from my amanuensis the following anecdote: "That during the severe captivity which some of the 'British troops suffered in the fortress of Darwar in the war of 1782 (ff 84v) 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 sickness, 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 anotherfs for some time in silent wonder replied, ' what can (ff 85r) 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 orders of Europeans in general against the native character but chiefly it has been represented to me to the violences committed by the numerous depraved race of native Portugese, 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 inseparable from all general characteristics, there being several characters among them who would do honour to the most enlightened society and whose names I should mention could my feeble testimony add any thing to their general acknowledged merit. (end 85r and this section)

27.

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 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.

(46)

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

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 ~~xxxxxx~~ 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)

(4.7)

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 Nesterian 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)

(4.8)

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 [illegible] 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...

(introduced trigonometrical tables of sines. The

(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 Galilee: 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")

(4.9)

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)

(4.10)

(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.

1786

British Museum :Add Ms 38347: Proceedings of Committee 11.8.

(411) (Construction and Design of Houses, Dancing Girls etc in Surat)

The chief expence of every Bramin consisted in the ornaments of his house. The construction was adapted to the climate. The second storey came forward over the first, and the third over the second. By these means, the roofs approached each other towards the middle of the street, and secured the inhabitants from the heat of the sun, without intercepting the circulation of air. The outsides of the houses were wainscoated with beautiful pannels, like our best apartments. The walls on the inside were covered with tiles of porcelain, and adorned with an infinity of vases of the same composition, which gave an air of singular gaity to the room. Every apartment was crowned with a cieling richly inlaid with ivory and mother of pearl, and surrounded with magnificent sophas, contrived for the indulgence of people, who always sat crosslegged. To these delights was added a particular chamber, in which a fountain constantly played within a marble bason, and by its coolness and murmurs invited to slumber. During the time of their repose, their chief pleasure, indeed the most usual pleasure of the inhabitants of Surat was to lie extended on a sopha, where they were kneaded like paste by men endowed with uncommon dexterity. Their office was to draw the extremity of every limb, without giving the smallest pain, altho they did it with strength enough to crack the joints of the wrists and knees, and even the neck. The necessity of facilitating the circulation of the fluids, slackened by excessive heat, gave the (p 184) first idea of this operation, in which they discovered the source of an infinity of delicious sensations. They felt that it created a delicate langour, under which the patient frequently swooned away. This custom had been introduced from China into India. Some of Martials epigrams and sen declamations seem to intimate that it was not unknown to the Romans, at the time when they refined upon all the pleasures, as the who enslaved these masters of the world afterwards refined upon all the fortwees (?).

There was at Surat another species of which, to our effeminacy, would have been perhaps a subject of greater envy. I mean their dancing girls. Every inhautment (?) that has been imagined by fable or by poetry to adorn the nymphs and priestesses Venus, who rendered the worship of that so celebrated among the ancients, has been realised by the dancing girls of Surat. There are certain seminaries of voluptuousness in which these girls are collected in troops. The chosen societies of this sort are consecrated to the richest and most frequented of the pagodas. Their destination is to dance in them on great solemnities, and administer to the of the Bramins. These priests, (who have made vows of abstinence in order to enjoy) prefer the of women who belong to them, to a system which (p 185) corrupts both celibacy and marriage. They do not invade the rights of others by adultery; but they are jealous of their dancing girls, whose worship and whose vows they divide between themselves and their gods; and it is with reluctance they ever permit them to contribute to the entertainment even of kings and princes. Without doubt they think that love, the pure celestial incense paid to beauty, cannot fail to be profaned in courts, where every thing is bought, where every thing is prostituted; where the prostitution of every species of honour is the road that leads to the most honourable situations.

In the principal cities there are other companies of dancing girls, not quite so select, who serve for the amusement of the rich of all ranks. Both Moors and Gentiles are equally at liberty to enjoy this amusement in their country houses and public assemblies. Besides these, there are strolling companies, under the conduct of old women, who after receiving their education in seminaries of this sort, at last arrive at the direction of them.

TOR: Francis Papers: MSS Eur E 28: undated Note Probably around 1700 AD. Should be placed between 1630-1750.

OPERATION OF INOCULATION OF THE SMALLPOX AS PERFORMED IN BENGALL

(ff 271v) ... Here ffellows 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 Cassimbasar 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 superate and no feaver or eruption insues, then they are no longer subject to the injection.

The punctures blacken and dry up with the ether 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 coell and give coelling 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) Rs: 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 ineculation for smallpox started in England cir 1720.