Observations on the dentition of the Lilliputian Aztecs / by Dr. Robert Reid.

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OBSERVATIONS

ON THE

DENTITION OF THE LILLIPUTIAN AZTECS.

BY DR. ROBERT REID,

DENTIST TO THE MERCHANT MAIDEN HOSPITAL, EDINBURGH.

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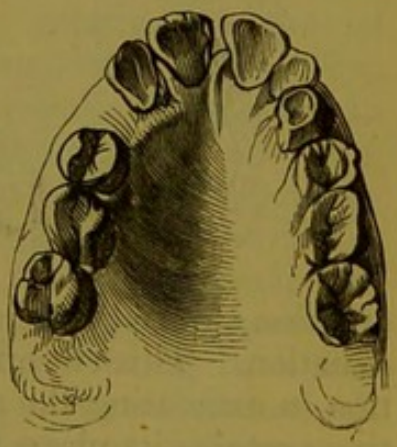
DENTITION OF THE AZTECS.

THE appearance in this country of those interesting little strangers called the "Aztec Lilliputians," has occasioned a good deal of speculation as to their origin, history, age, etc., in all which there is a mystery yet to be cleared up. A question having arisen as to the last mentioned point, professional opinion was sought thereon, in so far as could be formed by an examination of their physical structure, present appearance, and particularly their dentition. As this in both cases presented features of considerable interest, a few observations on it may prove worthy of being put on record.

No. 1.



Having taken casts of the dental apparatus in both individuals, I shall note the peculiarities in either case respectively, beginning with the boy, Maximo. In the upper jaw (see woodcut No. 1), there are altogether eleven teeth; of these, three are deciduous, namely, the left canine, and two molars right and left. The remaining eight are all permanent, and rank as follows, namely:—

2 Central Incisors.
2 Lateral Incisors.
2 First Bicuspids.
2 Molars, being the six-year old teeth.

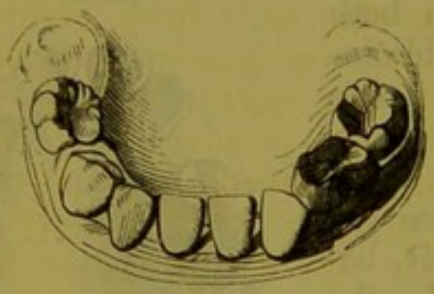
It will be observed that the right canine is not included in this table. The space is unoccupied, and from the appearance of that portion of the jaw, there is nothing to indicate the approach of the tooth. It may also be stated that the left one remains quite firm in its socket; and as the party exercising a guardianship over those diminutive beings, asserts that there has been no change in the dentition of the boy during the three years he has been under his care, it is not at all improbable that the miss-

ing tooth has been forcibly ejected from its place, the supposition being strengthened by the fact that marks of violence are to be found on the face and other parts of the body. The statement of that party, however, must be received with caution, as it is more than probable, that during so extended a period as three years, important changes may have taken place, without exciting his notice. I shall immediately offer proof on this point. The lower jaw contains only seven teeth, all of which are permanent. They stand thus:—

2 Central Incisors.
2 Lateral Incisors.
1 Bicuspid (being the first, right side), and
2 Permanent Molars (six-year old teeth).

There is a vacant space for the first left bicuspid caused by the disappearance of the remaining milk grinder, and which, it must be remarked, took place *unobserved by the above-mentioned party*, and that during the interval betwixt the 5th of November and the 3d of December, these being the days on which I took the casts which are represented in the accompanying wood-cuts, Nos. 2 and 3—the one showing the presence of the tooth in

No. 2.



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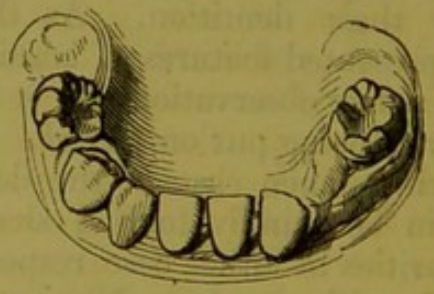


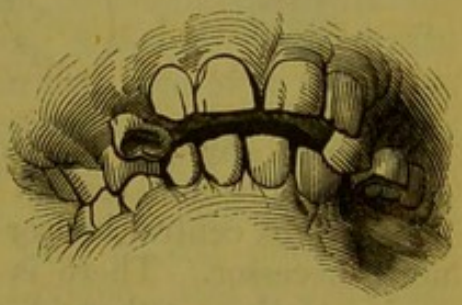
question, and the other the depression in the gum denoting its situation. This circumstance in itself is not deserving of consideration in estimating the age of the individual, as the milk grinder at times retains its place till an advanced period in life. In a case which recently fell under my notice, the patient, then in his 49th year, applied for extraction of the same tooth, the second bicuspids on that side having not yet appeared.

The absence of the canine teeth of either denomination in the lower jaw, will be observed, and constitutes one of the most remarkable features in the case. There is no space to receive them, neither is their presence in the jaw bone indicated by protuberance either anteriorly or posteriorly. The incisors, were they placed in antagonism to the upper ones, might be found very serviceable, being strong and well grown, the laterals so much so, that, at first sight, they might be taken for canines. The opinion may therefore be hazarded, that nature has not destined the last mentioned teeth to make their appearance at all, an assumption favoured by the extraordinary relative position of the jaws to each other. To this point

I shall shortly return. The permanent teeth are, on the whole, well developed, neatly shaped, in fair proportion to the general structure of the individual, and at same time well placed, both as regards their growth above the gum, and the contour of the dental arch. There is, as yet, no appearance of the second molar in either jaw, but its situation is indicated by the flattened appearance of the gum and the space betwixt the first molar and the ramus.

The form of the upper arch is somewhat remarkable, being rather narrow and pointed, yet without that overlapping of the front teeth usually accompanying what is familiarly termed the rabbit shape. The relative position of the jaws to each other, that is, the bite, has already been alluded to, and deserves special notice. Irrespective of the Assyrian lineaments marking the upper portion of Maximo's face, the retreating lower jaw gives his profile a strange hawk-like expression. Instead of the under front teeth falling immediately behind the upper, there is a clear space of $\frac{4}{10}$ths of an inch between the two arches when shut, such as will admit of the thumb being freely passed up to touch the palate, (see woodcut No. 4). This peculiar feature might, at first sight, be regarded as a freak of nature, exhibited in a solitary individual; but the relative position of the upper and under back teeth militates against such a view, and rather favours the assumption that the peculiarity extends to the immediate family, if not to the tribe (supposing such to exist), and that for the following reasons, namely, that while the upper jaw contains eleven teeth, all arranged with due regularity, the under contains only seven, by which provision of nature the molars in either jaw antagonise and fit into each other with great exactness, the posterior edge of the last tooth in either jaw being in a line with that of its adversary. This feature my observation has not enabled me to trace in cases of dental irregularity or mal-arrangement with children in this country, such, on the contrary, tending to effect the symmetry of the opposite arch, and destroy the regularity of a close-fitting bite.

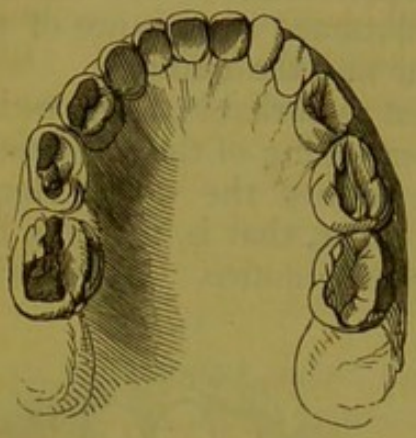
No. 4.



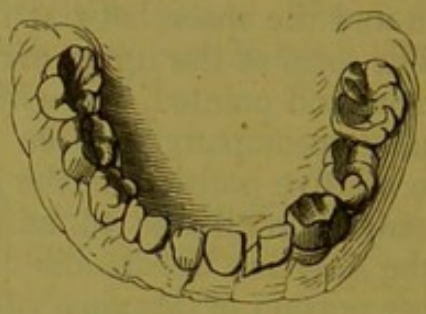
It is highly interesting to trace the means by which nature has brought about the antagonism of the four six-year old teeth with each other. While the upper jaw has ample room for the full complement of teeth from the incisors to the first molars inclusive, and which will be twelve when completed; the retreating shape of the under jaw leaves room for eight only, the remaining four, namely the canines and second bicuspids being denied a place among their fellows, and thus by their exclusion the end is accomplished, the space betwixt both dental arches at their apex answering to that which would be required on each side to contain the teeth wanting.

We now come to the case of the girl Bartola. In her dentition there is little to note, it being in a backward state. In the lower jaw (woodcut No. 6), she has got her two six-year old teeth, and a

No. 5.



No. 6.



permanent central incisor on the left side. All the other nine are deciduous and remain firm in their sockets, with the exception of the right central incisor which is about to give way to its permanent successor. There is a peculiarity in the lateral incisors and canine teeth on either side worthy of remark. These teeth are fused together, forming one instead of two separate teeth, all attempts to pass a thin blade down between them having failed. Such may occasionally be met with in single instances, but rarely in corresponding teeth in opposite sides of the dental arch. In the upper jaw (woodcut No. 5), the only permanent teeth that have as yet made their appearance, are the six-year old, the temporary set remaining quite unbroken. A word may, however, be said as to the shape of the dental arch.

On beholding these little creatures for the first time a few months ago, I was forcibly impressed with the idea that they were not of the same race. There was nothing in the physiognomy of the girl that corresponded with the prominent nose, lustrous protruding eye, retreating brow and silky hair of the boy. Her facial angle was entirely different, her eyes small, and her hair curling and even crisp (were it not carefully looked after, and parted into ringlets), all which point to an African rather than an Asiatic origin. An examination of the upper dental arch strengthened the impression first made, its breadth and roundness with a slight flattening in the centre, bearing no small resemblance to that of the negro, and which must in the course of time become more apparent when the jaw is fully developed. This point, although away from that immediately before us, is still interesting and worthy of being touched on as showing the assistance to be obtained from an examination of the dental structure in determining the race to which an individual probably belongs.

Having already mentioned that the object sought in examining the dentition of these children was, in the absence of any positive

evidence on the point, to afford an opinion as to their probable age, I may shortly state the conclusion come to, and the means by which it was arrived at. The ages were judged to be about twelve years in the boy, and eight in the girl. In estimating them thus, the present stage of dentition, in either case, would scarcely have warranted it, were that to be relied on as positive evidence on the point. Other appearances were sought for and found, tending to solve the difficulty. The development of the permanent teeth, as to their height above the gums, and, in the boy, the flattened appearance of the latter, at the heel of the jaw, betokening the advent of the twelve-year-old teeth, also the marks of attrition on such of the permanent teeth as had antagonists, were significant features, and although affording apparently but scanty evidence, yet taken in conjunction with the general structural development betokening a slow physical growth in each individual, warranted the opinion hazarded as to their age. In the absence of direct and positive evidence on the point, it is satisfactory to me to learn that the above opinion is identical with that expressed by one whose authority in such matters is of the greatest weight. A friend informs me that he was present at a meeting of the Ethnological Society of London, held in July last, when an elaborate essay was delivered by Professor Owen on the physical structure, age, etc., of the Aztec children, in which he assigned to them nearly, if not exactly, the ages which my examination led me to consider as nearest the truth. I have not been able to ascertain more precisely the exact opinion of Professor Owen, or the grounds on which he formed his conclusions. His paper has not yet been published, but will, I am led to understand, appear in the Transactions of the Society in the course of the approaching year.

19, Heriot Row,
December 1853.

Notes on Certain Discoloured Appearances met with on the Surface of the Sea in Warm Latitudes.—*By Dr. G. Buist, Bombay.*

(Reprinted from the Nautical Magazine for May, 1854.)

It is one of the numberless agreeable results to which the pursuit of physical science has led us that it has, to a considerable extent, dispelled the unpleasant impressions which long prevailed as to the credibility of the writers of ancient times when treating of unusual natural appearances. The flames seen to tip the helmets and spears of warriors, the contests visible in the clouds, the showers of fire and showers of blood, the statues of the deities which descended from heaven, the seas of milk and seas of flame,—all, at one time, supposed creatures of the imagination and proofs of the mendacity or credulity of those who described them,—are now recognized as perfectly authentic and intelligible things, the only matter untrue in the writings of antiquity regarding them being the theory of their origin.

The descriptions so long contemned as fabulous are now found, in most cases, to be remarkable for their fidelity, and a wise man, instead of throwing aside, as formerly would have been done, a statement as incredible, merely because it was old or extraordinary, will assume at the outset that it is in all likelihood substantially true, and endeavour to discover its explanation or find a parallel to it in modern times. If, in the present age, we avoid the errors of the ancients of ascribing marvellous phenomena to special interpositions or miraculous causes, we are some-

times given to accept a singular fact as established without making any attempt to ascertain its cause at all; and in nothing is this more remarkably the case than in reference to the luminous appearances and the extraordinary discolourations so frequently to be met with in certain regions of the sea. These are all allowed to be of animal origin: in some cases they are supposed to be caused by the spawn of fishes, and others by that of moluscous animals, and in the majority by animalcules. But when we have got thus far in our explanations we have hitherto rested contented; no inquiry has been made and no explanation attempted to be offered of what may be the nature or origin of the spawn or form of the animalcules, and our various manuals of observation or instructions for inquirers when they call attention to most other things seem to ignore these as unworthy of notice.

I am not, at present, prepared to do anything to illuminate the pervading darkness. I have very frequently met with discoloured portions of the ocean, such as those referred to, in my voyages betwixt Bombay and Suez and back again, and the following notices which I have made or collected on the subject may probably be of interest. As I expect, some months hence, again to sail on the eastern waters, I shall take care to prepare myself better hereafter than heretofore I have been prepared to take advantage of anything remarkable of this sort that may fall in my way.

The best of all observations are those made on the spot, on sea water fresh drawn and with the objects to be examined still alive, were it not that it rarely happens that instruments of sufficient power are available for the purpose on a voyage, and the flutter and confusion of a passenger ship are eminently unfavourable for study of any description, especially where quietness and tranquillity are required.* There are besides many persons competent to collect and preserve specimens altogether unqualified to examine or describe them, and if the first of these tasks is performed by them carefully the second may be left to the hands of others. I have provided myself with a tin box, three inch cube, with a culender bottom, on which a piece of paper may be placed for the filtration of the sea water to be examined. This being filled a sufficient number of times to supply an abundance of specimens may, after being well washed, be forwarded by letter to any one desiring to examine it. Of course this will only preserve vegetable matters or animalcules with siliceous crusts or which can sustain desiccation or moderate compression. For general purposes I have had a set of test tubes some two inches in length and a quarter of an inch in internal diameter drawn out into miniature bottles with apertures just wide enough to admit the largest sized object that may be met with; into these should be introduced a small quantity of arsenical solution, they should be then filled with the sea water to be examined

* The vibration occasioned by the motion of a steamer can easily be got rid of by placing the microscope on a cushion or on the folds of a mat so that there is no difficulty worth naming required in this particular department to be surmounted.

and warmed moderately, say to 120° or so, and then hermetically sealed by a lamp. So prepared, the bottle may be inclosed in a tin tube, and thus sent through the post office, or by any other means of conveyance, to any party desirous of examining its contents.

The region in which these singular appearances, as will be seen from the subjoined extracts, are mostly to be met with is the lower part of the Red Sea, but more especially off the mouth of the Persian Gulf, betwixt the 55th and 60th meridians and the 10th and 15th parallels.

In sailing over a sea of the deepest azure few things are more striking to a stranger than to find the ship, which just before had been rushing through the profoundest blue, traversing what seems a sheet of blood; for, in most cases, nothing can surpass the intensity of the redness of the water, and the margins of the coloured space are well defined—sharp and abrupt. In cases where the colour is very intense I have seldom seen it extend over an area of more than a few hundred yards in diameter, but the occasions on which I have met with it at all have not been numerous. In general, the red tint is very much diluted, and I have seen the sea, in and around Bombay Harbour, for miles together faintly tinged with red. The following description of the creature by which this is brought to pass, when seen by the microscope is given by Dr. Carter of Bombay.

"They are subglobular, compressed vertically, convex above, concave beneath and consist of a transparent coriaceous envelope, within which there is a mass of blood red and transparent granules, suspended in a greenish coloured gelatinous substance and divided crucially into four compartments by transparent interstices terminating at the circumference in notches which are deepest at the sides. The blood red granules are disposed around the centre in a circular form, within which is a transparent area, so that under a low magnifying power they appear like a central nucleus. In progression this *infusorium* becomes slightly elongated or lozenge shaped, obtuse posteriorly and most deeply notched at the side. It has no appearance of celia; its movements through the water are rapid and waddling, frequently turniug over and momentarily altering its shape, wheeling about in circles or advancing in straight lines, never retrograde, in length it is the 860th part of an inch, and the diameter of its transparent and red granules does not exceed the 18,000th part of an inch. When dead, it assumes a subglobular shape and turns green."

In most cases the tint of discolouration is milk white, yellowish white, brownish yellow, or yellowish brown, and in this condition I have seen it extend for ten, twenty, or thirty miles; wherever it prevails the sea seems to become suddenly smooth, all spray and ripple disappearing, even should a brisk breeze be blowing. For the most part, however, the discolourations are met with in thick, dull, muggy weather, when there is scarcely any wind;—such, at least, are the conditions under which it has been my fortune to meet with them.

The following extract is taken from the *Colombo Observer*, in reference to these singular appearances in the sea, observed off the shores of Ceylon in 1844 and again in 1851:—

"Those who frequent the Galle Face may have, of late, perceived at different places, a few yards from shore, large patches floating of an oily brown appearance which exhale a disagreeable odour to the passing breeze. They always appear about the beginning or middle of the S.W. monsoon. On the coast of India the accumulation of this substance is so great that for a long distance to seaward the ocean appears to be covered with a huge expanse of oil, and the smell becomes so putrescent as to lead to the supposition that the carcases of dead whales or the dead spawn of myriads of fish had caused it. This is, however, a mistake, as it is nothing other than a vegetable production called conferva, a vegetable filamentary body, which makes its appearance on fresh and salt water at certain periods. The following note from a valuable work on the vegetable kingdom extracted from the former *Ceylon Herald* of the 14th May, 1844, shows that the appearance of these confervas is not unusual in Ceylon.

"'The sea to the southward of Colombo and, more lately, opposite the fort itself, has presented a very uncommon appearance for some days past. Instead of its usual brightness, the surface has been, to a considerable extent covered with what appears to the naked eye a sort of nasty froth or scum emiting a fetid smell. In the morning, when it has been usually calm, this scum has presented itself in broad belts and fields, and by the afternoon, after being exposed to the sea breeze, it is broken down into streaks lying in the direction of the wind, which, if it blow pretty fresh, disperses it altogether. We have examined some of this unusual substance in a tumbler of salt water, and were not a little surprised to find that, while it floated on the surface in the form of a scum, some parts of a yellowish green and some of a purplish brown colour, it tinged the whole water of a beautiful violet. We afterwards found that the whole water in the bucket in which it was brought from the sea had acquired the same colour; and, indeed, it appeared to us the other day, when it was very abundant, as if the sea itself had been stained of this beautiful tint. We found, on minute inspection that it consisted of an infinite multitude of small spindle-shaped bodies, each of which in its turn was a bundle of small threads jointed but unbranched and, seemingly, very brittle. We have no doubt but it is a vegetable production in the sea something similar to the green substance which covers stagnant pools of fresh water. The most remarkable and unpleasant feature is its fetid odour. When we read in voyages, however, of ships sailing for so many hours through seas of a blood colour and similar wonders, we are apt to suppose the author is taking the liberty of a traveller, but witnessing such a phenomenon as this is calculated to prepare us for giving them more credit. We are also glad to think that we have now an accomplished and indeed a most distinguished botanist in office in the island, who will, no doubt, be able to inform us accurately respecting the nature of such productions and on botanical matters generally. It says not a little for the interest of our island in the eyes of European botanists, that a situation at present so indifferent as Superintendent of the garden at Peradenia should have attracted such an accomplished traveller and

discoverer of new plants as Professor Gardner, to whom we alluded in our last issue.'—May 14th, 1844.

"These confervas have, at the same time, at one period of their existence, something of an animal nature, which may account for the fœtor attending the masses floating about, as they have the power at one time, it appears, of moving about from place to place independently of the action of the wind and waves. As the subject is interesting, we shall, in our next, give some information on this matter."

The following extracts are from a journal of a voyage round the globe by D. F. Bennett, published in the Transactions of the Royal Geographical Society of London 1837.

"In lat. 19° N., long. 107° W., about half way betwixt the Gulf of Revilla Gigedo, on the continent of America, a remarkable milk white and luminous appearance of the sea was observed at midnight all around as far as the eye could reach from the mast-head, and which lasted until daylight. Nothing could be detected in the water to account for it, nor could any soundings be obtained."

For the following extracts from the log of the H.C. steamer *Atalanta*, from Aden to Vingorla, I am indebted to Lieut. Constable.

"17th January, 1850.—Lat. 15° N., long. 63° E., 7 a.m.—Observed the water to have a luminous appearance. 9 a.m.,—The sea of a turbid chalky colour. 10 a.m.—The sea assumed its natural appearance.

"18th Jan.—1 a.m.—The sea assumed a luminous appearance and continued so till 3 a.m." There is no remark on the subject during the day time.

"19th Jan.—1 a.m.—The sea gradually became of a dark chalky colour, inclining to milky. An intense haze all around so that it was impossible to see ten miles off.

"3rd Feb., 1850.—Lat. 10° 50′ N., long. 6° 20′ E., 7 p.m.—The sea had a similar appearance to what it has now assumed on passing across from Vingorla to Aden on the 17th Jan., at 9 p.m., and so on till the 19th, till 2 a.m., betwixt lat. 15° and 14° 30′ N., and long. 63° 50′ to 56° 50′ E."

It will from this almost appear that for more than a fortnight the sea betwixt India and Aden had been thus discoloured for a distance of three or four hundred miles from north to south and nearly as much from east to west, and as many vessels must have passed through the discoloured surface it would be highly interesting to obtain extracts from their logs, and should any of those who commanded them observe these remarks they may, perhaps, supply the notices that are required. The officers of the *Atalanta* state that these luminous appearances, observed in crossing, in January, from Vingorla to Aden, were accompanied by dense fogs and heavy masses of grey cloud all over the sky. On their return voyage from Aden to Vingorla, on the other hand, there was no fog but the sky was entirely concealed by murky black clouds and there was every appearance of bad weather. Although in the coldest part of the season, the air felt close and oppressive; the temperature of the sea was two degrees hotter than that of the at-

mosphere. There was a perceptible smell similar to that given out by spawn in calm hot weather.

The 15th January and 15th February happened to be two of the dates when those singular disturbances which make their appearance all over India, and, perhaps indeed, all around the world, almost simultaneously, may be looked for; and, accordingly, on turning to my journal, I find the following entries at the dates referred to by the *Atalanta*.

"17th January.—Fine soft morning. A perfectly dead calm till 1 p.m.; the sea breeze then sprung up from N.W. and immediately blew somewhat freshly; curious little cirrocumuli with long grey mare's tails in the S.E.; the barometer falling. At sunset, fine cirri all over the sky; the current in the upper air from the S.W., almost right in the teeth of the breeze.

"18th.—Night perfectly still. Curious mist in the sky all over the morning. The sea breeze light and late in setting in; died away at sunset.

"19th.—A singular thin mist in the morning, with very heavy dew. Showery looking clouds in the east. A fine halo round the moon a little after sunset.

"This state of matters had been preceded by considerable falls of rain in N.W. provinces, betwixt the 10th and 15th. On the 12th, Calcutta was visited by a severe north-wester. There had been considerable rain and storm again in the end of January. On the 5th of February, one of the most violent gales of wind that had been experienced for years passed over the north of Europe."

The following are the entries from my journal of this date:—

"February 4th.—The character of the weather all at once completely changed. The eastern sky covered with dense clouds. The temperature suddenly rose by nearly 10°, from 83° to 93°, at noon.

"5th.—Soft misty morning, the heat most oppressive. Clouds all around the horizon with appearance of rain. A damp west wind set in just after sunset. Weather very squally to the northward.

"In central India there was a heavy shower of rain on the 1st, and a thunderstorm on the 6th. On the 7th, 8th, and 9th the thermometer rose at Bombay to 94° and 95° at the coldest part of the whole season, a temperature rarely reached by it in the hottest portion of the heats." At Aden at both the dates the weather was showery and irregular.

The following is an extract from the log book of the ship *Clive*:—

"August 22nd, 1832.—Lat. 16° N., long. 59° 35′ E. At 7·15 p.m., observed the water to become quickly discoloured and of a very white luminous appearance, the sea considerably foamed and smoothed down, having all the appearance of a shoal water over a coral and sandy cottom. Observed the same occurrence both in the *Nautilus* brig and *Elphinstone* schooner on previous years when in the same vicinity."

The following extracts were published, some years since, in the Transactions of the Bombay Geographical Society; but the work is so little known in this country that they will probably be new to most readers. The first extract obviously refers to what has just been noticed.

A remarkable Appearance in the Indian Seas; in a Letter from Lieut. Dawson. Communicated by William Newnham, Esq.

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

WILLIAM NEWNHAM.

During a passage from Bombay to the Persian Gulf, on board the H.C. sloop *Clive*, on the 22nd August, 1832, at a quarter before eight o'clock at night, a phenomenon appeared of the following nature, and to all on board, of an unheard of kind, which gave rise to transitory feelings of apprehension as to the vessel's contiguity to danger. Sailing under double-reefed top-sails and fore-sail, at the rate of nine and a half miles per hour, before a strong S.W. monsoon wind, and a high sea, without any indication of a change in the elements, the ship was surrounded *instanter* by water as white as milk or snow; it seemed to have no termination until it reached an altitude of 75° or 80°, where it subsided in a strongly-marked ecliptic, above which the heavens presented a beautiful and bright blueish cast, not dissimilar to polished steel. No line of horizon was visible; the dead white colour of the water close to the ship, as it increased in distance from her very gradually brightened, until, where I supposed the horizon to be, it assumed a silvery aspect, which, increasing as it ascended, became brilliant and dazzling towards the zenith, obscuring the stars and clouds which had before this visitation been distinctly visible. The sea in a moment became smooth; the ship, from rolling and labouring considerably, quite steady; no diminution in the wind occurred, but a sensation that it had fallen, even to a calm, was general, but momentary. The delusion was occasioned by the instantaneous steadiness of the vessel, as well as the cessation of the previous noise from the lashing of a mountainous and confused sea against the vessel's sides, and on her decks; her progress through the sea, however closely scrutinized, could not be

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

observed; the disturbed water alongside and in her wake, as well as the foam around her bows, did not contrast with the adjoining unagitated fluid, notwithstanding, from the velocity of the ship through the water, these must have been considerable. Not a particle of phosphoric matter was once observable, either in the surrounding ocean, or in the water immediately displaced by the ship's passage through it; but when taken up in a bucket, and agitated with the hand, such was visible, but not in a greater proportion than is usual, nor did the water vary in appearance from common sea-water; nothing could be perceived to attribute this strange phenomenon to.

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

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

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

I have before mentioned that the ship was quite steady during her progress through the white water; this was the case, with the exception that in a few instances she gave a heavy roll, as if influenced by a following swell; these were not more frequent than once in a quarter of an hour. Latitude 21° 40′ N., long. 59° 40′ E.; therm. 87°, bar. 29.09.

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

On my arrival at Muscat, a few days after, I endeavoured to gain some information on the foregoing matter; but beyond finding that the phenomenon was occasionally met during the strength of the S.W. monsoon, about the limit noted, and that the water was then *quite fresh*, I could ascertain nothing satisfactory. My informants were the Nakodas, or captains of H.H. the Imaum's ships of war, who frequently navigate between Muscat and Zanzibar, consequently must pass about the spot the *Clive* met what I have related. The Arab captains were firm in their assertion in the particular of the fresh water, althongh they confessed that they had never tasted it. I did, as also the surgeon of the vessel, and, as I mentioned before, it did not vary in any way from ordinary sea-water.—*Journal of the Royal Asiatic Society.*

The following is the extract from the Bombay Geographical Society's Transactions in reference to the appearance seen in 1849:—

"Moozuffer, 25th January, 1849.—I cannot permit this opportunity

to pass by without describing to you, in the best way I am able, a most extraordinary phenomenon which we all witnessed on the night of the 23rd instant. It would indeed require a far abler and more scientific pen than mine to do justice to it—however, I hope you will take the will for the deed, and pardon all imperfections.

At 6·30 p.m. observed a very remarkable milky appearance in the water, the colour assuming the same tint as a shallow mud-bank or sand-bank. The sea, which had, a few minutes before, been turbulent and confused, suddenly became smooth and placid, and the air felt cold and chilly. In the space of an hour the whole verge of the horizon, as far as the eye could reach, was most brilliantly illuminated. The vessel shortly after entered a vast body of water of the most dazzling brightness, and of a highly phosphorescent nature; in fact it looked as if we were sailing over a boundless plain of snow, or a sea of quicksilver. The surface of the ocean for miles in extent was unbroken—not a wave or ripple disturbed it, and the waters seemed so dense and solid, that the *Moozuffer* actually appeared as if she was forcing her way through molten lead. That part of the surface which was broken by the stroke of our huge paddle-wheels resembled small patches of thick milk or cream. The sky and everything around us was quite lighted up by it.

The weather was peculiarly fine, though the atmosphere was damp and moist: the wind was light from the N.W., stars overhead clear and light, but those of a lesser altitude were rendered dim by a haze. The horizon nearly the whole time was dark and ill-defined; a few thin cumuli, floating very low down, occasionally swept past; but no other peculiarity in the atmosphere could be perceived until about ten o'clock, when a singular light was seen in the heavens, to the northward, as if day was dawning or the full moon was either setting or just rising. It strongly resembled a faint Aurora Borealis, being of a roseate tinge near the horizon, and was a steady fixed light, but without those corruscations which are usually observed in the higher latitudes. It extended along the horizon in the form of a segment of a circle from N.W. to N.E., and the altitude of the centre of the arch was 15°. It continued visible until a few minutes after midnight, when it disappeared as suddenly as it appeared, and the sea about the same period lost also its luminous quality. The light in the heavens and the lightness of the sea were, however, again seen for about ten minutes at 2 a.m., when both became once more invisible. The horizon, except where the light appeared, was everywhere dark and indistinct, and could not be made out: the sky and sea were apparently blended together. The phenomena was altogether as beautiful as it was extraordinary. I could have stood on the deck gazing at it the whole night, and should not have felt fatigued. There was something grand and sublime in such a scene as I have faintly endeavoured to pourtray. No language of mine could ever do justice to it.

We were upwards of six hours in passing through this vast body of luminous water, and during that time we ran a distance of upwards of

forty miles. Our lat. on first entering it was 16° 13′ S., and long. 61° 51′ E., so that our position was exactly abreast of the entrance to the Persian Gulf, and in the fair channel to the Red Sea. From the fact of our having seen immense quantities of sea-weed floating past whilst in this luminous water, I should conclude the accumulation of this and other decayed matter, whether vegetable or animalculæ, was the sole cause of this phosphorescent appearance; and that all this matter might have been swept out of those narrow seas by strong currents, which meet no doubt about this spot: and I am still more inclined to believe this is the case, as a luminous stream of water has often been noticed nearly in the same lat. and long., and about the same season of the year. I saw it once in the *Victoria*, when I commanded her, in the month of January, 1842, whilst on our voyage from Aden to Bombay; but the sea was not nearly so bright then as this time. The colour of the water so strongly resembled a shoal that I stopped the engines, and took several casts of the lead but could get no bottom with eighty fathoms of line. Several buckets of water were drawn up by Dr. Wilson, of the *Moozuffer*, but nothing whatever could be seen. It seemed as clear as crystal: on taking a bottle of it, however, in the dark, it became highly phosphorescent, giving out a strong light. It was full of animalculæ: some were in the shape of most minute globules of gelatinous substance, and others were not unlike small worms, about an inch in length and about the size of a fine hair. On removing the bottle to the light, the animalculæ became instantly invisible. The light seen in the heavens I cannot account for, unless it was the low fleecy clouds which hung on the verge of the horizon that reflected back the brightness of the sea; but why the whole sky should not have assumed the same appearance, I cannot imagine. It continued to shine in one spot only, and disappeared at the same time the sea lost its brilliancy. I send you an extract of the log, in which the luminous appearance in the sea and heavens is noticed:—'At 6·30 p.m., passing through an illuminated sea: the sea also became suddenly smooth, with quantities of sea-weed floating by. At 10 an extraordinary luminous appearance to the northward, as that of a full moon rising or setting: the water of a thick white; with a very dark horizon: wind N.W.—hazy blue sky, with passing clouds.'"

Some months since I received from Dr. Haines an account of this as witnessed from on board the *Maria Soames* on her way from the Persian Gulf, lat. 21° N., long. 42° E. The phenomena are not only interesting in themselves but an account of them is valuable as explaining the so-called seas of fire, seas of milk, and seas of blood, which we read or hear of and regard as fancies of a heated imagination or the baseless tales of travellers.

"In May 1840, when about one-third across from Aden to Bombay, the aspect of the sea suddenly changed upon us, and at once seemed as if oil had been poured upon its surface. It was still as a mill-pond, and of a brownish soapy hue. The water, on being examined, was full of little fibrils—like horse-hair cut across—in lengths of the tenth

of an inch or so. A wine-glass full of it contained hundreds of them. They were, to all appearance, spawn or creatures of some sort in an embryotic state. I kept them for days, in hopes that they would develope themselves, and drew up fresh specimens of the water so long as it remained discoloured. But no symptoms of life were manifest, and decomposition speedily ensued. In the dark they were not luminous. We sailed through them for about five hours, so that they probably extended over a surface of 500 miles:—what myriads of living things were there! The officers of the ship told us that similar appearances were not unusual; and that one much more remarkable than this was sometimes to be observed, when the sea seemed for hundreds of square miles white and milky, so that it was at times difficult to believe that the vessel was not on the point of getting aground."

In all likelihood the luminous appearance in the sky described by Captain Kempthorne was merely the reflection by the clouds of the light from the sea.

In November the ship *John Line* came on a large sheet of discoloured water in the Eastern seas, supposed to be a shoal: the following is an extract from her log:—

"November 19th, 1849.—At 3 p.m., suddenly came across a large patch of discoloured water (ship at the time running 9½ knots with a heavy sea on). Hauled out E.S.E. and ran along the eastern edge until 2·15 p.m., when the edge trended off to the W.N.W. in a spit. The reef appeared to extend as far as was visible from the topsail yard in a W.S.W. direction, and from four to five miles S.S.E. and N.N.W., and the current setting very strong to the westward over it. There was apparently broken water on the S.E. spit. I had no soundings where the ship was, and it blew too fresh and with too high a sea running for me to lower a boat to sound on the reef, the edge of which was perfectly defined, from the deep blue of no soundings to a dirty green. When off the S.E. end, the lat. was 12° 52′ N. and long., by mean of three chronometers, 109° 46′ 17″ E.—Cape Varella W.b.N., fifteen miles, but not in sight from the thickness of the weather."—Extract from the log. of the *John Line*.

The appearance described as seen from on board the *John Line* so closely resembles those already treated of, that I think we might almost hesitate admitting the certainty of the shoal until more proof of its existence reached us, considering that it must have been so often passed for a century or more without having hitherto been observed.

We have a variety of animalculæ which at certain seasons frequent our shores, imparting to the water in shallow pools, where they chiefly abound, the tint of blood: the exuviæ of this minute creature are found in abundance in the rock salt on the Indus and in the salt range. It tinges the back water surrounding our salt pans, the depth of the hue being considered a sign that the brine is strong enough for being run into the pan. Under a glass of moderate power they are seen in a state of great activity before the salt crystallizes: these once embedded in the salt seem on re-dissolving it to be motionless. On a

recent voyage to Kurrachee I found off the shores of Kattiawar, where the general colour of the sea was of the deepest blue, large patches of the most intense red, apparently some fifty or sixty feet square—they looked like fresh drawn blood, as if some monster of the deep had just been slain there. We did not get near enough any of them to draw a bucket of water, but I have no doubt that they were occasioned by the same animalculæ which visit our shores. May it not have been from appearances such as these that the Red Sea has derived its name rather than from its corals, to which it is ascribed, which are usually white and seem greenish through the water, and are without a tint of red ?

I must not here omit to note a curious incident which occurred at Pore Bunder on the 3rd November, of which the following account is given by a correspondent of the *Telegraph and Courier:* I am altogether unable to determine to what class of phenomena it is to be assigned :—

"Pore Bunder, 3rd November, 1849.—We were visited with an epidemic amongst the fish a few days ago, caused, I think, by some submarine eruption of mud, mephitic gas, &c. The colour of the sea water on Saturday evening last, the 27th October, was changed from its usual tint to a deep red, emitting a most foul smell ; the fish speedily were all destroyed, and were washed upon the beach in large quantities. The eruption must, I conclude, have been in the vicinity of the place, for many fish were taken alive, apparently stupified. The sea retained its peculiar colour until the 1st instant. I hear that the epidemic extended upwards of forty miles down the coast, and I am told that a similar phenomenon occurred three or four years ago, the natives attributing the death of the fish to a star having fallen into the water. The Geographical Society would do well to examine into the affair. I think the idea of a submarine disturbance is much more rational than that of the falling star. I have no means of telling whether there was any atmospherical disturbance at the same time: we had, however, no sea breeze on the 28th or 29th, and the weather was, on the whole, I fancy, clearer than is usual at this season. The tides also at the last full moon have receded much farther than I have ever seen during the last year. Have you a file of Cape papers at hand? Not long since a similar occurrence was experienced in Table Bay, and, at the time, even such fish as were taken by hook produced disease amongst those who ate them. No such calamity, I am glad to say, has attended the incident here. It appeared quite a windfall to the poorer classes, who gathered up such as had not become decomposed with great eagerness."

This state of matters extended, I am assured, at least forty miles out to sea, and while the native theory of the fall of a star is that which will least readily be admitted, I am at a loss what theory to adduce to account for the phenomenon.

I observe from my journal that the 23rd January, the date at which this extraordinary appearance was met with, was near the close of a periodic atmospheric perturbation of unusual violence. It prevailed all over India, and was felt from Ceylon to the Mediterranean Sea. I am very far from assuming that luminous appearances of the sea have anything to do with the condition of the air, but there are three of the cases that I have enumerated where they have occurred coincidently, and all that can be said of the others is that I have no record of what the state of the weather then was. It would be very unsafe, however, on this ground to assume the want of coincidence. Everyone is aware of the susceptibility of the birds of the air and the beasts of the field to atmospheric influences, and it is quite possible that the inhabitants of the deep may be as much so. What we want is more information on the subject, and I place in your hands my humble mite that I may not be blamed for at once complaining and failing to contribute.

Since the preceding remarks were in type, I have fallen in with a paper by Ehrenberg on the bloody appearance of water, a translation of which appeared in 1831 in the tenth volume of Jamieson's Edinburgh Philosophical Journal. After giving enumeration of the instances quoted by the ancients of red snow, red rain and rivers, and seas covered with blood, he gives a list of our experiences on these subjects in modern times. I give the following entire; he comes to the same conclusion as that which I have arrived at as to the origin of the name of the Red Sea.

"In 1823, I was for a number of months at Tor, on the Red Sea, in the vicinity of Mount Sinai. On the 10th December I there observed the striking phenomenon of the whole bay which forms the harbour of Tor of a bloody colour. The main sea beyond the coral reef that encloses the harbour was, as usual, colourless. The short waves of the calm sea, during sunshine, carried to the shore a bloody coloured slimy mass, which it deposited on the sands, so that the whole bay, fully half a league in length, at the ebb of the tide exhibited a blood red border of more than a foot broad. I took up some of the water itself with glasses and carried it to my tent at hand on the sea shore. It was immediately discovered that the colouring was caused by small flakes, scarcely distinguishable, often greenish, sometimes of a lively green, but for the most part of a dark red colour, although the water itself was not stained by them. This very interesting appearance attracted my attention as explanatory of the name of the Red Sea, a name hitherto so difficult of explanation. I, for many days and with perfect leisure, accurately examined the appearances and made microscopical observations on the colouring mass. The flakes consisted of small spiral or longish irregular bunches of oscillatoriæ threads, which were enclosed in a gelatinous sheath, and the flakes neither resembled one another nor the threads in each flake. In the glasses placed beside me I observed that the flakes during the heat of

the day and in sunshine floated together on the surface of the water. During the night and when the glasses were shaken they descended to the bottom. After some time they returned to the surface. The observation made by Dr. Englehardt on Lake Murten was very similar to this appearance, and the delineation of the single threads by De Candolle exhibits a very close relation to it. De Candolle informs me he has preserved no dried specimen of that substance, for which reason no comparison can be made. The gelatinous covering and the union of many threads into very small spiral groups give to the substance of the Red Sea a peculiar character, which entitles it to form a particular genus of alga. * * * * The appearance of the Red Sea was not permanent but periodical. I observed it four times: on the 25th and 30th December, 1843, and on the 5th January, 1844.

[Frequent references to discoloured appearances in the sea will be found in the earlier volumes of this work —Ed.]

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