

have also the settlements of Pollok and Cota Batu in Ilana Bay. The whole of the above-named places are in regular steam-communication with Manila.

2. In the map of the Malay Archipelago the geography of the north-west coast of Borneo is so inaccurate as to be quite valueless. The great Rejang River should run to near the head of the Koti, and therefore the Sarawak Territory be prolonged much further eastwards. The Limbang is brought down far into the Sarawak territory; and the Baram, a river nearly as large as the Rejang (up which I have myself steamed 200 miles), is entirely omitted. The Brunei Territory should extend as far as Marudu Bay. All the old errors in nomenclature which have long been corrected appear afresh. Considering Mr. Wallace's local knowledge, it is surprising that he should have inserted a map of Borneo which is quite the most inaccurate as regards the physical geography of the island of any that have come under my notice.

3. In the summary of the mammalian fauna of the Philippines (p. 272) only three species of insectivora are enumerated, the two quite distinct species of *Tupaia* inhabiting Palawan and Mindanao respectively being unnoticed. Speaking of the avifauna (p. 273), Mr. Wallace mentions the absence of pheasants as one of its negative characteristics—but he includes the Palawan group in the Philippines, and this group has *Polyplectron*. Mr. Wallace also states that there are deer in Palawan. It would be interesting to know on what authority this statement is made, for I believe that Dr. Steere and myself are the only naturalists who have visited Palawan, and to myself both Spaniards and natives strenuously denied that any kind of deer existed on the island. With regard to the observation that the Malayan indigenes have more or less frizzled hair (p. 293), I may remark that the only tribe with which I came in contact—the Tagbenúa of Port Royalist—were straight-haired. I inquired about a Negrito race, but could hear nothing of any in that part of Palawan. The Spanish capital of Palawan and residence of the Governor is Puerto Princesa (Port Royalist of our charts), not the older settlement of Taitay (p. 274).

4. Tibang Mountain in Borneo (p. 349) is by common report of the natives the source of the Rejang, Kapuas, Banjar-Masin, and Koti rivers. It is said to have a *white* summit. The rhinoceros (p. 354) is by no means confined to the head of the Koti river. It is quite common on the east coast of Borneo, in the Kinabatangan valley especially, and is found also in the upper waters of the Kapuas and Rejang. Wild cattle can hardly be said to be confined to the northern part of the island. They abound in the Upper Rejang, are found on the shore near Bintulu, and have been seen as far west as Batang Lupar. There are possibly two species. They are certainly *not* the descendants of Spanish cattle, though these exist, and they may have interbred locally. At p. 356 Mr. Wallace writes: "The Dusun or Idään tribes—the Kanowits and Pakatans—correspond to the Land-Dyaks of Sarawak, while the Milanows correspond to the Sea-Dyaks." This is a most extraordinary statement. Dusuns, Kanowits, and Land-Dyaks may correspond to one another—though this has yet to be demonstrated—but there are as radical differences in language, customs, and physical characters between Milanows and Sea-Dyaks as between any two tribes in North-west Borneo. Pakatan, by the way, should be written Bakatan (*bukit*, a hill).

5. I add a few notes on the Appendix. The Balow Dyaks (p. 629) people the Lower Batang, Lupar, and Liŭgga rivers. There are only a few immigrants in Simunjon. The Sea-Dyaks of Borneo (p. 634) are clearly distinct from the Kayan tribes, as much so as they are from Milanows, who are related to the Kayans. The Sea-Dyaks have within the last thirty years become the dominant race of North-west Borneo, but the Kayan tribes seem to be decaying. The correct spelling of Ilanun (p. 637) is, I believe, Iŭnun (cf. Maludu = Marudu). It is worthy of note (p. 638) that the indigenes of Basilan style themselves Jakuns. The Idään (p. 647) inhabit the vicinity of Kina Balu, but the Muruts the Padas and Limbang rivers, with intervening districts inland.

Papan, North Borneo

A. HART EVERETT

Nicholson's Palæontology, 2nd Edition, 1879

MAY I ask the favour of your inserting in NATURE the following remarks on the second edition of Prof. Nicholson's "Manual of Palæontology," which has but lately reached us in India.

First of all, I desire to express my sense of the obligations which are undoubtedly due by all palæontologists to Prof. Nicholson for the amount of labour which he must have expended

in bringing together such an amount of facts as are contained in the work before us. Such a labour can be only fully appreciated by those who have experienced the difficulty of keeping pace with the discoveries even in one branch of the subject.

In a work like the "Manual" there must, almost inevitably, be many sins of omission, and some of commission, and it is accordingly with a full sense of the difficulties of Prof. Nicholson's task before me that I venture to point out certain errors and omissions in the part devoted to the palæontology of the vertebrata, and more especially in regard to India.

In his preface Prof. Nicholson observes that the greater part of the work was written in the early part of the year 1878, and consequently that his readers must not expect to find notices of discoveries made after that date. No one can, of course, take exception to that statement, but there are to be found in the text numerous omissions not covered by this saving clause, as will be seen from the following instances:—

The first point I have to notice is in relation to the Siwalik rocks of India. It was surely due to Prof. Nicholson's readers to know that those who had most recently studied the newer tertiaries of India were of opinion that the Siwaliks are in great part of pliocene, and the Narbuda rocks of pleistocene, age. Whenever Prof. Nicholson alludes to the latter, they are termed pliocene, while the former, except in two places, are termed upper miocene. I may add that these newer views as to the age of the rocks in question were published in India as far back as 1876.

Again, whenever any reference is made to the Siwalik fauna, no notice is taken of any of the additions made to it since Falconer's time, though many of them were published before 1878.

The succeeding remarks bear reference to some of the more striking of the omissions and errors occurring in the part of the work under consideration (vol. ii.).

P. 136.—When treating of the *Lepitosteids* no mention is made of the occurrence of several genera of this group in the Gondwana rocks of India, and of their being possibly older than their European representatives.

P. 169.—It would surely have been well to have made mention of the occurrence of three species of *Ceratodus* in the probably triassic rocks of India.

P. 209.—The Indian genus *Parasuchus* (as yet undescribed) ought to have been referred to, when mentioning the division Parasuchia, of which it is the type.

P. 222.—We find the sentence, "*Dicynodon* and *Oudenodon* are known only from strata of supposed triassic age in India and South Africa." The inference from the above would be that both genera occur in India, whereas the former only has been found there.

P. 256.—"In the miocene and pliocene tertiary we have no remains of *Cursors* to notice." *Struthio asiaticus* of Milne Edwards is ignored.

P. 300.—No mention is made of any fossil species of *Manis*, though one was described from India in 1876.

P. 324.—We again meet with the old statement as to the "hexaprotodont" character of *Rhinoceros sivalensis*, although it was shown in 1876 that there was no ground on which such statement could be supported.

P. 346.—No mention is made of the Siwalik species of *Sus*, nor of the peculiar Siwalik genus *Hippohys*. The well-known and widely-distributed genus *Lutridon* is not mentioned in the book. The very peculiar genus *Tetraodon* (described in 1876) is also omitted.

P. 348.—The genus *Anthracotherium* is stated to be exclusively European, no mention being made of the Indian species described in the "Records of the Geological Survey of India" for May, 1877.

P. 349.—*Hyopotamus* is stated to occur only in the eocene and lower miocene; the Sind species, described in the above-quoted paper, being unnoticed.

Pp. 379-80.—The dentition of the elephant seems to be a source of stumbling to Prof. Nicholson. He observes: "The first three teeth of the grinder series, which would ordinarily represent premolars, are supposed to be milk-molars, as they have no predecessors or successors." If any inference could be drawn from the above, it would be that the teeth in question were true molars; it is on quite different grounds that these teeth are classed as milk-molars. In the next sentence we find: "None of the molars, in fact, undergo vertical displacement," and immediately afterwards it is stated that premolars occur in

Elephas planifrons. In that species the premolars do vertically displace the milk-molars, as is shown in the "Fanna Antiqua Sivalensis."

P. 389.—*Dinotherium* is not mentioned as occurring in India, and *D. giganteum* is said to be the only species. Two species were named by Falconer in India!

P. 395.—We read: "The earliest remains of *Melide* are from the upper miocene deposits of the Siwalik Hills in India, in which we meet with the living genus *Mellivora* (comprising the Honey-Badgers), and the allied but extinct *Ursitaxus*." *Ursitaxus* is not an extinct genus, but the generic synonym given by Hodgson for *Mellivora indica*! There is only one species of *Melide* from the Siwaliks, *Mellivora (Ursitaxus) sivalensis*.

P. 396.—*Ichtherium* is mentioned as occurring only in Attica, no notice being taken of the Indian species described in our Records for February, 1877.

P. 402.—*Pseudelurus* is only mentioned from Europe and America, the Siwalik species described in our Records for May, 1877, being ignored.

Other instances of omission occur in the book, which might be noticed here, but sufficient have been quoted to show that as regards Indian vertebrate palaeontology, even up to the beginning of 1878, the work is not trustworthy. It is to be presumed that a writer would not willingly disfigure his own work, yet what can be said of a compiler who, in writing on Indian palaeontology, omits to refer to the publications of the Geological Survey of that country.

RICHARD LYDEKKER

Indian Museum, Calcutta, February 3

The Mean Free Path of Molecules

MR. CROOKES estimates that a bulb $5\frac{1}{2}$ inches diameter, attenuated 1,000,000-fold, would contain a trillion of molecules.

Assuming in round numbers such a space to contain 100 cubic inches, there would be 10,000 billions per cubic inch.

The molecules, considered as mathematical points, would have a mean distance apart of less than 0.00005 inches.

The cube of 200,000 gives 8,000 billions instead of 10,000; therefore a linear inch would contain more than 200,000 in any direction.

How then can the mean free path of actual molecules be considered as from 2 to 6 inches?

S. E. P.

The Zoological Station, or Aquarium, at Naples

WHEN, last week, you referred to the account in the *Daily News* of the above-named institution, you omitted what you probably did not know, which is, that, as you will see by the accompanying copy of a letter from Dr. Anton Dohrn to Dr. W. B. Carpenter, it was I who devised all the aquarium portions of the place, and that my ideas were carried out by the engineers, Messrs. Leete, Edwards, and Norman. But I had nothing to do with the laboratory part of the establishment.

We are now so accustomed to aquaria, as being useful adjuncts to biological studies, that it may surprise many persons to be informed that in the earliest published official notice of the Crystal Palace, Sydenham, a now very rare duodecimo of thirty-five pages, dated September 22, 1852, it is stated on pages 22 and 23 that, owing to the difficulty, amounting to what seemed to be impossibility, of exhibiting living marine animals inland, in sea-water, they, the fish, crustacea, mollusca, zoophytes, &c., would be shown dead, but, "on a plan not hitherto tried, that of making them appear to be swimming in very large glass vessels containing a sufficient quantity of some preservative fluid having the appearance of water."

Something of this kind was attempted by Dr. Bowerbank, but it was not till the year 1870, after applying for fifteen years, that I, assisted by the same engineers, was permitted to arrange the aquarium now existing there, and which possesses the same sea-water, never since renewed, nor has it been changed in marine aquaria, which I set up in Paris in 1860 and Hamburg in 1862.

It is a pity that no one in Britain seems inclined to work our British aquatic animals, marine and fresh-water, as Dohrn exhibits and studies those of the Mediterranean and the rivers adjoining it; and British creatures of the same range of organisation, viz., sponges to fishes, are quite as interesting and almost as brilliant as those of the South of Europe.

We can, with modern appliances, possess these forms of life in perfect health, even inland, especially as recent improvements

in manufacturing artificial sea-water causes it to be quite as good and as lasting as water from the sea. In Berlin and Hanover it has been so used for years on a large scale. In a small way it was employed long ago by Warrington, Gosse, and by myself, and now, in the February, 1880, number of the *Midland Naturalist*, can be seen how wonderfully successful Mr. H. W. Jones has been with it in a great aquarium, in conjunction with me, in a place where water brought from the ocean would have cost more than six times as much.

W. A. LLOYD

4, Zingari Terrace, Gipsy Road, Lower Norwood, April 6

Ice Crystals and Filaments

SOMETHING very like the "comb-like masses of ice" appears upon the surfaces of plaster-models such as dentists make, after they have been coated with a preparation called *Liquid Silux*; except that it is finer and woolly. It seems to be caused by the contraction of the models forcing out very fine jets of water or watery vapour, which dissolves the coating and spins it out until dried and fixed in the shape we find it. The varnish is readily soluble in water.

S. T. BARRETT

Port Jervis, New York, U.S., March 20

Ozone

WILL you please allow me to make a suggestion concerning an additional element of observation at climatological stations? I refer to the observing of ozone. As the salubrity of a district to a great extent depends on this powerful factor, would it not be well to include ozone in climatological observations, especially in the case of hill and valley stations? The tests would, I think, at least enable some conclusions to be drawn as to the purity and salubrity of the atmosphere at the different health resorts, and in my opinion present means, even though imperfect, should on no account be neglected until better are found. They might be exposed on a hook in Stevenson's thermometer screen, as recommended by Mr. Buchan; but I find that this plan is only of service during dry weather, and I think Clarke's ozone cage is preferable.

CLEMENT L. WRAGGE

Farley, near Oakamoor, Cheadle

Meteors

ON the night of April 4, between 10.5 and 10.25 p.m., I observed the following four meteors, viz.:

1. Crossing the "Chair of Capiopeia," at an angle of 45° with the horizon, from the direction of *Ursa Minor*. Course about 20° , time about 2 seconds, leaving a train.

2. From 10° east of *Capella* to 10° below *Regulus*, nearly parallel with the horizon, passing below *Castor* and *Pollux* and above *Procyon*. Course about 80° , time about 5 seconds, leaving a train, and breaking up into several fragments before its final disappearance, the fragments travelling one behind the other in the same direction. I have never before seen a meteor of this kind with so long a course.

3. From 10° west of *Castor* and *Pollux*, to 5° west of them, leaving a train. The trains of these three meteors were all of the same bluish white colour. Their radiant points would probably be somewhere between *Ursa Minor* and *Cassiopeia*.

4. In exactly the contrary direction, just above *Castor* and *Pollux*. Course about 5° , leaving no train, or a very faint one.

Birstal Hill, Leicester

F. T. MOTT

THE meteor described by your correspondent "B. W. S." was also observed by me at Birstal traversing a long path of 59° from $247^\circ + 42^\circ$ to $200^\circ \pm 0^\circ$. It was brighter than Jupiter, and travelled very slowly, the estimated duration being 7 or 8 seconds. The nucleus cast off a tail of sparks as it went along, and varied very perceptibly in brightness. At mid-course it seemed near extinction, but suddenly revived to its previous brilliancy, which was then sustained until near the end point.

A comparison of the meteor's track, as recorded at the two places, shows it to have been directed from a radiant near ψ Cygni (at $297^\circ + 52^\circ$), and it is important to know whether any observations were made at additional places. The long duration of the meteor and its very conspicuous apparition in the evening sky must have brought it under the notice of a host of observers.

Ashley Down, Bristol, April 5

W. F. DENNING