

which deposited the Lower Boulder-clay of this region, must therefore have been from north to south; but in the Cowdon valley there is evidence of a movement in the opposite direction. The knob of trap-rock, against which the *Bos*-bearing beds have been deposited, is glaciated *down* (i.e. north-east), and not *up* the valley as stated in my note. An older and much fainter set of striæ (the direction of which is not apparent, but may either be up or down the valley) are nearly obliterated by the later set; while on the north side of the valley above the railway cutting, and quite close to Crofthead, the rocks are glaciated *up* the valley or towards the south-west. Similar appearances have been noted elsewhere, showing that the ice-streams, from the various centres of outflow sometimes prevailed the one against the other.

In concluding this short note it may be remarked that the intercalated deposits of sand, gravel, and clay, so commonly met with in the Lower Boulder-clay, are of much greater extent sometimes than is generally known. During the progress of the Geological Survey in Scotland we have collected many data bearing upon this point, which we expect to publish ere long. Meanwhile, it is to be hoped that local geologists will lose no opportunity of searching the intercalated beds of the Boulder-clay, for the discovery of *Bos primigenius* in this position renders it not improbable that there may be other mammalian remains waiting to be disinterred.

NOTICES OF MEMOIRS.

I. PALÆONTOLOGICAL ADDRESS. By Dr. ALBERT GAUDRY.

[Faculté des Science. Cours annexe de Paléontologie. Leçon d'ouverture.—Extrait de la Revue des Cours Scientifiques. Paris, 1868.]

AFTER a few introductory remarks, Dr. Gaudry gives a brief sketch of the history of palæontology. The notions respecting fossil remains were very vague, until George Cuvier asserted that in order to arrive at a definite opinion on the subject, it was necessary to study living animals. From that time palæontology has steadily progressed. Between 1823 and 1867, so M. D'Archiac relates, 5,852 plates of fossils were published;—the figures sufficiently express the advance of the science. Cuvier was, above all others, the founder of Palæontological Science, and well may France be proud of him.

“The beings of geologic times,” says Dr. Gaudry, “present a marvellous diversity, but more marvellous still is the unity which is concealed under this diversity.”

In regard to the interesting question of the origin of species—does each species represent a production independent of that which has preceded or followed it? or were they descended from beings found in the more ancient geological epochs?—Dr. Gaudry's opinion may be surmised from his again asking “Is it not the history of a slow evolution which, harmonious in all its phases, has been going on since the first days of the world?”

"The hour for definitely deciding this question," he continues, "has not yet arrived, but we can, at least, work towards its solution." The founders of palæontology have paid attention to the differences rather than to the resemblances between fossils and living animals. Cuvier's design was to prove their distinctive character. Moreover, the older writers had not sufficient materials for studying the connecting links, which are now more and more apparent.

In the time of Cuvier, it was not known that there were fossil apes, whence have been descended the existing species; the intermediate forms between the dogs and the bears, between hyænas and civets, between the mastodons and the elephants, between horses and the other pachyderms, were not known at that time; and further, it was not known that there are certain transitions between reptiles and fishes, between fishes and crustacea.

Now we have the labours of Falconer and Cautley, of Lartet, Kaup, Leidy, Owen, Huxley, Hermann von Meyer, Agassiz, Deshayes, Barrande, Pictet, Davidson, Milne Edwards and Haime, Unger, Heer, de Saporta, and a host of others. We must not only admire their works, we must also profit by them. They have accumulated treasures so well that we begin to feel embarrassed by our riches.

Dr. Gaudry concludes with an outline of subjects to be embraced in his course of palæontological lectures for the year.

Commencing with the Lake-dwellings of Switzerland, and the Kitchen-middens of Denmark, he will take the formations in descending order, noticing the fauna and flora of each. "Among the molluscs," he remarks, "the Ammonitidæ, above all, will interest us by the numerous examples of evolution which they present, from the straight Baculite to the spiral Ammonite." And among the Palæozoic Cephalopods the transformations between the simple *Aphragmites*, *Ascoceras*, to the complicated *Nautilus* and *Goniatites*. "Finally," says the Doctor, "I shall say some words on the *Eozoön*, that rudimentary animal, which, as its name indicates, marks the dawn of life. Arrived at the mysterious point of origins, I shall make some remarks on the evolution of beings, to make apparent the simplicity and beauty of the plan which has been followed by the Author of Nature.

II.—CONTRIBUTIONS TO THE GEOLOGY OF DEVONSHIRE.

1. THE SUBMERGED FOREST AND THE PEBBLE RIDGE OF BARNSTAPLE BAY.
2. THE HISTORY OF THE DISCOVERY OF FOSSIL FISH IN THE DEVONIAN ROCKS OF DEVON AND CORNWALL.
3. THE LITERATURE OF KENT'S CAVERN, TORQUAY, PRIOR TO 1859.

BY W. PENGELLY, F.R.S., F.G.S., ETC.

[Reprinted from the Transactions of the Devonshire Association for the Advancement of Science, Literature, and Art, 1868.]

1. **T**HE Pebble Ridge is situated on the southern shore of Barnstaple Bay, in North Devon, where it forms a natural break-water to protect an extensive, sandy, and grassy plain, but little, if at all, above the level of spring-tide high-water, and known as

Northam Burrows. "The pebbles, or boulders, vary from half an inch to a yard in mean diameter, the majority being about nine inches. The greater number of them are oblate spheroids, but occasionally prolate and nondescript forms present themselves." They are derived from the Carboniferous grit of the district, and without doubt came from the cliffs westward of the ridge,—between Northam Burrows and Hartland Point—the southern shore of the bay.

"Seaward from this ridge, the tidal strand at first consists of small pebbles, of which the great majority are also of grit, whilst a few are of flint. Beyond this, to the low-water-line, it is composed of fine sand, beneath, and frequently projecting through which, are large accumulations of tenacious blue clay and vegetable matter, containing roots, trunks, and branches of trees. The vegetable remains are known as 'The Submerged Forest of Barnstaple Bay.'" The clay is in some places six feet thick, and reposes on a bed composed of rounded and angular fragments of the grit of the district, which, with the exception of the angular pieces only, resembles in all respects the Pebble Ridge.

The present position of this Forest-bed may be hypothetically explained either by a subsidence of the country, or by the removal of some natural breakwater which formerly protected the Forest from the ravages of the sea. Mr. Pengelly shows that the former supposition is the only one with which the facts agree.

"That the entire country around Barnstaple Bay has undergone upheaval in times geographically recent, is established, beyond a question, by the fine Raised Beaches which fringe its coasts." It is obvious, then, that the Forest and the Raised Beach represent two distinct periods. Mr. Pengelly regards the Beach as the more ancient—that the elevation preceded the depression, and that during the Forest era the height of the Raised Beach above the sea-level was, at least, twice as great as it is at present.

He finishes by remarking "how utterly fallacious must be any conclusions based on the assumption that our country has stood still ever since the ancient beaches were first raised."

2. Until very recently but four specimens of fossil fish from the Devonian rocks of Devon and Cornwall were on record, and two of these were considered very doubtful. But now "the paucity is by no means so marked as was then believed; and this, not in consequence of the discovery of new specimens, but because certain fossils, formerly supposed to be sponges, have been found to be veritable ichthyolites." Mr. Pengelly's object is to give an historical statement of the discovery and examination of the fossils alluded to.

In his own collection he has upwards of three hundred fragments of Pteraspides from the Devonian rocks. "We have been taught to believe that the Devonian System and the Old Red Sandstone System are of the same age. One of the greatest difficulties in the way of the acceptance of this doctrine, was the fact that, whilst the Old Red Sandstones teemed with fossil fish, there were none in the

Devonian rocks. The shoal of *Pteraspides* now caught in Devon and Cornwall will go very far to remove this difficulty."

Twenty-five years ago, Mr. C. W. Peach introduced these fossils as fish—for eight years their claims were unquestioned—they were then determined to be sponges, but confessedly on imperfect materials. "For seventeen years this has remained the prevalent opinion, but it now proves to be incorrect. Mr. Peach's judgment has received the fullest justification, and we all congratulate him heartily on the fact."

3. In the third paper, Mr. Pengelly gives extracts from all the papers he has been able to ascertain which relate to Kent's Cavern, and have appeared prior to the year 1859. Amongst them the writings of Blewitt, Godwin-Austen, Owen, and Vivian, appear prominent.

III.—SCIENTIFIC JOURNALS.

1. THE QUARTERLY JOURNAL OF SCIENCE, begun in 1864, has just commenced its sixth volume, and will in future be published by Messrs. Longmans & Co.

The editors, Messrs. James Samuelson, and William Crookes, F.R.S., each contribute an original article to the January number, on "The Ethereal Hypothesis of Light" by the former, and on "The Great Solar Eclipse of 1868," by the latter gentleman. Mr. J. Arthur Phillips gives an account of "The Alkaline Lakes of California;" there is also an able Review of Dr. Bigsby's *Thesaurus Siluricus*, and a Notice of the principal discoveries in science during the past year; with many other topics of general interest. Besides these there are the usual Quarterly Chronicles of Archaeology, Geology and Palæontology, Mineralogy, Mining, etc.

2. THE POPULAR SCIENCE REVIEW for January, contains an article on "True and False Flint Weapons, by Mr. N. Whitley, C.E. His remarks refer chiefly to the implements of the so-called Palæolithic age. "These stone implements pass, by such insensible gradations, into other forms of fractured flint, obviously the result of natural causes, that their advocates find it difficult to determine whether they are artificial or natural;" while "the implements of Neolithic age," he says, "cannot be inspected without producing the conviction of their human origin."

He regards the flint flakes, of which about 30,000 were found in one Belgian cave, associated with human bones, as formed by natural causes, some of them being afterwards selected and adapted for use by man.

He has made a large collection of these flint flakes from various localities. "They show a gradation in size from $\frac{1}{8}$ inch to 8 inches in length. A gradation in form from the roughest fracture to the most perfect flake. The good and the bad are all mingled in indiscriminate confusion; but the most degraded savage would not cast away his well-formed implements with the refuse chips. They

show no additional workmanship beyond the ordinary fracture of the flint, and bear no evidence of use.”

We would ask, before accepting Mr. Whitley's interpretation of these flakes, may they not be the refuse-chips left from the formation of flint implements or weapons?

3. THE COMPTES RENDUS, tome LXVII., contains an account of the discovery of a new locality for Adamite (Arsenate of Zinc) in France.

This mineral, hitherto only observed in small quantities on some specimens of silver ores from Chañarcillo, Copiapo, Chili, has been discovered by Messrs. Gory and Boutigny in the refuse heaps of a copper mine situated at Cape Garonne, near the town of Hyères, Department du Var, France. In a qualitative examination M. Gory found arsenic, zinc, and cobalt. At the request of the finders M. Damour undertook the analysis of this interesting mineral. The following are its principal characters. The crystals are lenticular, curiously grouped and maced, sometimes coated and interpenetrated with minute acicular crystals of olivenite. Colour grey, with a slight rose tint. Some specimens show a cloudy carmine-red, somewhat similar to that of some varieties of erythrine. Hardness, a little above that of calcite. Exhibits two cleavages, with angle of 107° , as observed by M. Des Cloiseaux in the Chañarcillo mineral. Specific gravity, 4.352. M. Friedel obtained 4.338 for that from Chili. Heated in a tube disengages a little water neutral to test papers, and takes a slight bluish tint. Dissolves completely in acids, only partially soluble in caustic potash. B. B. on charcoal, melts into a blackish scoria, giving off white fumes with an arsenical odour. On cooling, leaves a white ring around the scoria, tinted with blue upon the edges. When fused with borax, or microcosmic salt, this gives the characteristic blue colour of cobalt. Deducting the cupric and cobaltic arsenates, regarded by Damour as accidental admixtures, the numbers obtained approach near to those which indicate the formula, $Zn_4 \ddot{A}s. \ddot{H}$. Isomorphous with olivenite, as observed by Des Cloiseaux in the Chili mineral. The Adamite of Cape Garonne is found in thin layers lining the fissures of a quartz rock, which is traversed by veins of sulphide and carbonate of copper, and is situated on the side of a hill more than 900 feet high, composed of Keuper Sandstone. A small quantity only of this mineral has yet been obtained.—T. D.

REVIEWS.

HEALTH AND GEOLOGY COMBINED.

I. PUBLIC HEALTH. TENTH REPORT OF THE MEDICAL OFFICER OF THE PRIVY COUNCIL. With Appendix. 1867. Published 1868.

OF late some little attention has been turned to the connection between Geology and the prevalence of certain diseases. The following reports have reference to this subject.

Dr. Buchanan reports on an Outbreak of Typhoid Fever at Guild-