the sections in casual clay-pits or chalk-pits, or in the sea-cliffs; sections which have been read almost in as many ways as there have been explorers. No wonder that the results satisfy nobody, least of all (as I know in several cases) the reporters themselves. All this I quite agree in, and I hope if the Government will not find money, the British Association or the Royal Society will do so, in order that we may have some test digging. What I do object to is that Mr. Jukes-Browne should transfer the burden of proof to my shoulders, and that he should bid *me* dig, in order to supply the lack of evidence for *his* conclusions. The burden of my paper is to show that the case of those who affirm the so-called inter-glacial or post-glacial existence of the Mammoth completely breaks down when tested. It is, therefore, for the champions of that view to find some evidence to support it which is not entirely fly-blown. Those who ought to dig are those whose case is in jeopardy. No one would welcome such digging more than myself, whatever its results, for I never can understand the pique and temper which some men show when their views are no longer tenable, as if all human knowledge were not more or less tentative; and as if any sensible man values an hypothesis by its finality. Let Mr. Jukes-Browne, then, press on, with the help of us all, in the application of a real test to the evidence in question; and if we cannot have digging, let us at all events retain our scientific credit by applying adequate criticism to every statement and every fact upon which a wide-reaching conclusion is based.

NOTICES OF MEMOIRS.

I.—On a Sample of Cone-in-Cone Structure, found at Picton, New South Wales.[1] By A. J. Sach, F.C.S.

THE so-called Cone-in-Cone structure, which appears to be found in most countries, and which consists either of impure carbonate of lime or, less frequently, of impure carbonate of iron, still awaits a satisfactory explanation as to its mode of formation. It is more for the sake of eliciting the opinions of the geologists now assembled, than of advancing any theory of my own, that I exhibit the present specimen, and offer a few remarks on its composition and structure.

Out of some half-dozen of geological text-books that I consulted in the public libraries of Sydney, that by Sir Archibald Geikie, F.R.S., is the only one containing a reference to the Cone-in-Cone structure. Geikie appears to adopt the opinion of Professor Marsh, who states that the complex structure known as Cone-in-Cone may be due to the action of pressure upon concretions in the course of formation.

H. C. Sorby, F.R.S., in a paper read before the British Association, 1859, stated that he had examined transparent sections of the structure with a low magnifying power under polarized light, and concluded that it was intimately connected with some kind of Oolitic

[1] Read before the Australian Association for the Advancement of Science, Section C. (Geology), Hobart, 1892.

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grains, which have crystals of calcium carbonate deposited almost entirely on one side along the axis of the cones in such a fan-shaped manner as to give rise to their conical shape. He states his conviction that the structure is one of the peculiar form of concretions formed after the deposition of the rock in which they occur by the crystallization of the calcium carbonate and other isomorphous bases.

Dr. Dawson, in his Acadian Geology, 1868, asserts that the structure is produced by concretionary action proceeding from the surface of a bed or layer, and modified by gradual compression of the material.

R. Daintree, F.G.S., Quarterly Journal of Geological Society, vol. xxviii. 1872, says that the structure has more of the appearance of a chemical precipitate than of a mechanical deposit.

John Young, F.G.S., Transactions of the Geological Society of Glasgow, vol. viii., read a paper on the subject in 1885. He possessed evidence that the band of Cone-in-Cone structure, which he described, rested on a clay-band ironstone, and that it was on the same horizon as a bed of stratified shale, composed in bulk of calcareous shells of Entomostraca, of species frequenting lacustrine waters. He possessed many samples of the mineral which had been found in Scotland, and none had been associated with marine deposits. After careful examination he concluded that the Cone-in-Cone structure is the result of a mechanical action set up by chemical agencies generated in the stratum, and whilst the deposition of the sediment was going on. The chemical agencies were the outward and upward escape of gases generated by the decomposition of organic matter in the deposit; the gases, as they escaped through the oozy and plastic mud, elevated the sediment around the several points of eruption into ring-like layers.

The sample which I now exhibit occurs at Picton, New South Wales, in the upper course of the Picton Creek, which traverses a valley locally known as Glenforsa. The hills on either side are well-grassed slopes of Wianamatta shales, which are of Triassic age, and are generally considered of fresh-water origin. I do not know of any extensive shell-beds or other lime deposit found in the shales, but when traversing the glen some irregular nodules of calcium carbonate were picked out of the banks of the creek. The Cone-in-Cone mineral occurs as a horizontal layer, which is exposed in the bed of the creek, but passes under the adjoining bank. So far as I could learn, it is not now in process of formation. The thickness is about two inches, composed entirely of cones within cones closely packed together. It has been asserted that in some European specimens the apices of the cones point both upward and downward, but in the specimen now under consideration all the apices point downward. The open bases of the cones, formed of ampitheatre-like cavities, are about half an inch in diameter, and small ones are sometimes formed within the larger ones. The chemical composition of the specimen is, approximately—Calcium carbonate, 67·54 per cent.; matter insoluble in strong hydrochloric acid, 21·2; sesquioxide of iron, 4·14; magnesium carbonate, 0·7; water, 3·1. In some parts

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the mineral is distinctly crystalline, and, in my opinion, a purely mechanical origin can scarcely be entertained. It appears to be a chemical precipitate which has resulted in imperfect or disguised crystallization. The floor crystallizations, known as "crystal cities," at the Jenolan Caves, N.S.W., have a somewhat similar external form. The mineral might have been formed in the drying up of the calcareous waters of a lake.

PAPERS AND REPORTS READ BEFORE THE BRITISH ASSOCIATION, EDINBURGH, AUGUST, 1892.

II.—REPORT OF THE COMMITTEE, consisting of Messrs. H. BAUERMAN, F. W. RUDLER, and J. J. H. TEALL, and Dr. JOHNSTON-LAVIS, appointed for the investigation of the Volcanic Phenomena of Vesuvius and its Neighbourhood. (Drawn up by Dr. JOHNSTON-LAVIS.)

SINCE the last Report, nearly all the tunnelling for the great main sewer is complete, and few additional facts of interest have come to light. Several little problems of purely local geology have, however, been solved. In the lower sewer collector, beneath the tramway tunnel of Naples, a peculiar grey trachytic mass has been met with, and was penetrated for a short distance. On account of a lawsuit the works do not progress. The mass, however, is of considerable interest, as it is below the great yellow tuff of Posillipo and Naples. The rock was ejected rapidly in very pasty or almost solid fragments, which in some cases blended with the others thrown out just before and after, and are flattened out in a pipernoid manner. At other points the fragments are broken, mixed with dust, and consequently incoherent. When this deposit is cut through, it will probably confirm my theory regarding the piperno of Pianura and Soccavo, as being the result of lumps of lava ejected in great blobs, which, falling quite hot around the vent, have become resoldered together, and have even flowed a little.

Very high temperatures have been met with in the tunnel near the Solfatara, where I registered myself 59° C. on a day that the workmen considered a very fresh one for the workings, *i.e.*, with a high barometer still rising.

The statement made many years since by Professor A. Scacchi, that fragments of leucitic lavas had been found by him at the Foce di Fusaro, near the Torre Gavetta, led me to suspect the existence there of the Museum breccia. On examining the locality this was confirmed, and, in fact, the whole sea cliff of Mte. di Procida exhibits a most interesting, though complex, section of the volcanic series of the Phlegrean Fields.

We there have a series of trachytes forming the base of the section, very various in texture, and often covered with thick beds of their own scoriæ, which are often consolidated into a kind of trachytic breccia quite analogous to the 'sperrone' of the Alban hills. This is overlaid by fine lapilli and pumice beds, which vary very much in thickness. Lying unconformably upon these are irregular buried outliers of the grey pipernoid tuff of the region.

In one place the pipernoid tuff is seen in section as an exceedingly obtuse V-shaped mass, having choked an old valley, and possessing the following characters: The black scoria fragments are very slightly, if at all, flattened, are very spongy, are of good size, and form an important constituent of the deposit. From this we can conclude that the distance would well correspond with my supposed eruptive mouth to the S.S.W. of Camaldoli, not very far from the Lago d'Agnano, from which I believed issued the piperno and the greater part of the pipernoid tuff of the Campania. The distance was, in fact, such as to allow time for only the lighter pieces of scoriæ, the equivalent to the black flackers of the piperno, to travel so far, and these to be so cooled, that when they fell they were sufficiently rigid to no longer be flattened out by the impact.

This grey pipernoid tuff has here suffered much denudation, for in many places it is quite removed. Towards Torre Gavetta the 'Museum' breccia is well developed, being composed of very large blocks of the numerous varied rocks, followed by beds of the woody pumice, woody looking scoriæ, and scoriaceous black centred vitreous trachyte fragments and pumice. Lying with very marked unconformability upon it is a great thick bed of the compact yellow tuff, either derived from Campagnone or the neighbouring cone, a slice of which forms Misenum. In this section we have splendidly exhibited many of the great geological records in the history of this remarkable volcanic region. Each of these stages is defined from those above and below it by more or less long periods, during which, in some cases, very extensive denudation had taken place. At this point also I am satisfied we have products of the eruptions of the Procida and neighbouring centres interstratified with those of the mainland, and in which in time I hope to work out the relative chronology.

The discoveries, which in so striking a manner confirm my conclusions regarding the highly complex stratigraphy of this region, induced me once more to examine in detail that isolated eminence upon which once stood the renowned Greek town of Cumæ, founded about 1000 B.C.

Time has favoured the geologist, for here, however much the archæologist may grieve, it has once more exposed to human eyes sections that for many centuries were hidden by buildings, but which reveal the fact that those very rocks that, as geologists, we look upon as very recent, had nearly 3000 years since much the same characters as now. The pumices that form the uppermost yellow tuff had then already been converted into a rock that those early colonists cut out and used for the construction of their walls. When we first visit Cumæ, and our thoughts wander back through historic time, we are impressed by the human associations with this hill for such a long period; but when we return with our eyes and minds geologically cultured, the ancient Greek town sinks into insignificance by the side of the physical history of the mound it stood upon, when we remember that not only this mound, but the whole region is post-Pliocene in age.

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The foundation of the Cumean hill is the well-known trachyte, rich in inclusions of sodalite, of amphibole, and I have detected, not uncommonly, crystals of fayalite. Were it more vesicular it would very much resemble the western mass of trachyte of the Cumana railway tunnel at the back of Naples.

Above this come some pumice and dust beds, which are probably the equivalent of the Rione Amedeo tuffs. Superposed on this we find a dirty grey pipernoid tuff which shows much *remaniement.* The Museum breccia is well represented in patches, and is overlaid by a bed of vitreous trachyte produced by the resoldering of the falling masses into one solid stratum, where the surface was flat, but where on an incline the fragments have remained separate. The whole is capped by the compact yellow tuff. There are also some minor pumice and dust beds which require further working out.

The trachyte seems to have oozed forth in a highly pasty condition, breaking up its scoriaceous surface, which rolled down the sides of the dome-shaped mass, and by pressure and heat from the main mass become again soldered together—in fact, a sort of regelation. The brecciated structure is undiscernible in hand specimens or under the microscope, but is well etched out by meteoric agencies. Each of the deposits mentioned above shows more or less unconformability, which correspond as they themselves do with those beds of the Monte Santo Funicular Railway, the Cumana Railway, Pianura, Soccavo, Monte di Procida, Nocera, Castellamare, St. Agata, Capri, Caserta, etc., that I have described in other reports and papers.

These are the principal sections which record the later geological history of the Phlegrean Fields, and from which I have been able to unravel the stratigraphy of the highly complex Neapolitan volcanic region. So far it has been explained only in these reports and other disjointed papers, but before long I hope to be able to place before the scientific world a far more detailed description of one of the most interesting as well as the most classic and accessible volcanic regions of the world.

Before quitting the subject, however, I wish to call attention to the confirmation that the sections mentioned in this Report afford of my explanation of the piperno and pipernoid structure in general. We see distinctly that the variation in colour and texture of the two constituents of the piperno, which chemically are identical, is simply due to the greater saturation with H_2O of one portion of the magma than the other in the old chimney of the volcano at the time of the eruption. The consequence was that the more aquiferous part was erupted as a fine dust, and the less aquiferous, more coherent magma was ejected in large fragments or more or less scoriaceous cakes, which lost their heat the more slowly, in proportion to the less water they contained. The densest, and at the same time the slowest to cool, fell near the eruptive mouth, flattened out, squeezed out those beneath them, and were squeezed out by those above them, forming, with the included dust, the compact piperno in which the foliated structure is most developed towards the west end of the

Soccavo section, where the nearest existing remnant to the old crater is now preserved, and where the inclination was greatest, and consequently where actually slight flow took place. The more scoriaceous of these lava cakes were carried to greater distances, so that as we travel away from the eruptive axis we find, first, that the black fragments become less markedly flattened because they cooled more rapidly from expansion, and also because they travelled farther, until they no longer show flattening parallel to the bedding more than what would be due to any of them being accidentally of a flattened or elongated form, and so lying flat on the surface they fell upon; second, we find that as their radial distance from the eruptive axis increased, the fragments at first get lighter; and third, when the limit of lightness and cohesion is reached, they get smaller and smaller, so that at Roccamonfina and Salerno the pipernoid tuff is chiefly composed of the grey dust with only few and minute fragments of black scoriæ. This seems to have been modified by strong winds and possibly by the eruption taking place along a cleft much like that formed in the late Tarawera eruption, or as in many cases in Iceland, such as the Skaptar outburst, though most of the latter locality does not belong to explosive types of eruptions.

There is in Iceland, at Krisuvik, the principal one of several crater lakes that exhibit in a striking manner the resoldering together of ejected fragments, into what might at first appear to be a true lava stream. I allude to the Groenavatn, in which we have an almost circular conical hollow nearly filled with water. There is only a very low ring round it, composed of *accidental* ejectamenta, being nothing more than the ejected fragments of the materials, through which it was drilled, with practically no essential ejecta, except on one side, where we have a mass of rock that looks like a lava stream. It seems there must have been at the moment of the eruption a very strong wind which carried all the lava fragments in one direction, and as they fell they blended together into one fairly uniform mass, the components of which are only faintly indicated by a slight variation in colour, somewhat like piperno, but not so well marked. The top and bottom are less coherent, for at the bottom the fragments fell on cold ground, whilst the top, although falling on the hot mass beneath, could not be pressed into contact with it by later falls. No doubt also the explosions were feebler towards the end and the interval longer between the fall of the last fragments.

We find exactly the same thing in the piperno, namely, a spongy tufaceous-like bottom and top. Besides this, the lulls and accentuations of the explosive action are well marked, as well as the time that large masses of the crater edges fell in and were re-ejected. At one time the eruptive action seems to have been arrested, and the partly or entirely consolidated plug was blown out into fragments and deposited amongst the piperno.

Vesuvius has since the last report, up to the time of my last visit in May, shown very little variation. It will be remembered that lava was issuing at the site of the eruption of June 7, 1891, at the

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foot of the great cone, more than three hundred metres below the summit at the junction with the Atrio del Cavallo, and nearly opposite the Punta del Nasone. This outpour practically never stopped—at times it increased to no inconsiderable quantities, but flowed only a short distance, on account of the low gradient, tending to pile itself up into a mound. On other occasions it seemed to become almost arrested, but it never practically stopped. The consequence of all this was that at the foot of the great cone in the Atrio, during the year from June 1891 to June 1892, a tremendous mound or low-pitched buttress had been built up, so that its highest part I estimate to be 20 m. above the old floor of the Atrio. This thickening away in all directions, but even under the escarpment of Somma, the present floor stands for considerable distances over 5 m. higher. In consequence of this many of the dyke numbers which cost me so much labour to put up some years since have been covered over. These I hope to be able to replace this winter, and to repaint all the rest that are now becoming obliterated. It will be remembered that these numbers correspond with the dykes figured in my geological map of Vesuvius, and all collectors now adopt these numbers to indicate the locality of the dyke from which the specimens were obtained. Professor Bassani has added a new and complete collection of these interesting dyke rocks to the Naples Museum, and has arranged them according to my numbering. The great importance will be seen of maintaining this numbering intact.

The actual details of the variations in the activity are as follows. During the summer and autumn of 1891 more crumbling in of the crater edges took place, followed by black sand and dust-charged vapour. The outpour of lava from the base of the cone in the Atrio from time to time almost stopped, to be followed again by fresh gushes. On the first day of December a marked extension took place to the south and south-east of the crater by the further crumbling in of its edges. On the last day of the old year and commencement of 1892, the outflow was much accentuated. During January and February few variations were observable, but on March 17 and 18 slight reflection from the crater was visible for the first time for nearly a year, showing the rise of the lava in the chimney, due certainly in part from blocking of the lateral channel as the outflow of lava below was markedly diminished. On the 21st the activity at the crater was distinctly at the first degree, but on the 22nd the second degree was attained. On that evening, however, a gush of lava showed the removal of the lateral obstruction to its outflow, and the central activity so diminished that the following night no reflection was visible. On March 29 and 31 the crater again showed the first degree of activity.

This was followed during the first week of April by a fresh outflow of lava, which still more increased during the next week. During the first four days of the month feeble reflection was from time to time visible from the crater. On the 12th, black dusty smoke was puffed out from time to time. On visiting the Atrio, I

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found the lava that flowed had formed the mound above spoken of, surmounted by the fumaroles figured.

During the night of May 3–4 fresh portions of the crater wall collapsed and blocked the vent, so that during the following day hardly any vapour crowned the summit of the volcano. By the next day the increased tension of the vapour was sufficient for it to force its way through the obstruction, and much black sandy smoke escaped during the 5th, 6th, 7th, and 8th. Obstructing masses that had detached themselves from the crater sides again plugged the vent on the 27th and 28th, followed the next day by dark, sandy, and dusty smoke.

The flowing lava showed few new phenomena, with the exception of the fine examples of conical and tubular spiracles formed above the lava exit at the same locality, but above one set figured in the last report that are now buried. One of these is unique on account of its curved overhanging form. It has been ejected at the highest point of the new lava, and quite at the foot of the great Vesuvian cone. I can only explain its inclination at the lower part, other than that the escape of vapour and lava fragment were projected upwards and outwards in a plane radial to the volcanic chimney which corresponds with the orientation of the fumarole. This lateral projection seems to have gone on for some time, so that many of the blobs of lava blown out, fell and formed a support for the inclined tube. As the blasts escaped more feebly the edges of the mouth became more solid, and so the lower lip diverted the column more in an upright direction, until the growth became almost vertical. The whole effect is to produce a large mass somewhat resembling a recumbent animal with its neck and head erect.

About twenty yards more distant from the foot of the cone was another large, obtuse, conical-shaped fumarole, which had been broken away on one side and well exhibited the dome-like interior covered by stalactitic lava. These constitute very fine examples of what kind of spiracles may be built up on the surface of a coarsely crystalline lava, such as that now issuing from Vesuvius. They differ very considerably from those described and illustrated by Dana and others from Hawaii, as also those formed on acid lavas at Reunion, of which one or two figures have been published.

At the time of visiting these fumaroles I was accompanied by my friend Dr. R. D. Roberts, of London, who was much interested in these striking formations. He is a man of average height, so that the dimensions of these fumaroles can be judged of by comparison with his figure by their side (photographs exhibited).

At the summit of the great cone few changes have occurred beyond the further enlargement of the crater. When slips took place from the edges, dark dust-laden vapour was puffed out from time to time. On one or two occasions the lava rose sufficiently high in the chimney, combined with the sufficiently strong explosions, to project a few lava cakes beyond the crater edges. The bottom of the crater has been invisible from the large amount of vapour present on each occasion that I visited the mountain summit. The extreme truncation of the old eruptive cone is very strikingly seen by comparing the photograph, taken a little over a year ago and published in the last report, and the present one (photographs exhibited).

Since I quitted Naples an actual crateret has opened in the Atrio at the point where these fumaroles stood, and several gushes of lava have taken place. I shall more fully report on these new phases on my return to Naples.

III.—Ninth Report of the Committee, consisting of Professor T. Wiltshire (Chairman), Dr. H. Woodward, and Professor T. Rupert Jones (Secretary), on the Fossil Phyllopoda of the Palæozoic Rocks. (Drawn up by Professor T. Rupert Jones.)[1]

EIGHT reports by this Committee have been handed in and printed, the last in 1890. Part I. of the 'Monograph on the British Fossil Phyllopoda,' by Prof. T. Rupert Jones and Dr. H. Woodward, published by the Palæontographical Society, contained twelve plates, illustrating thirty-nine species, belonging to four genera of *Phyllocarida* (*Ceratiocaridæ*) therein described. Part II. of that Monograph is now finished, and has five plates of twenty-eight species in seven genera (including some of both the bivalve and the univalve *Phyllocarida*).

The genera here treated of are *Hymenocaris*, *Lingulocaris*, *Saccocaris*, *Caryocaris*, *Aptychopsis*, *Peltocaris*, *Pinnocaris*, and *Discinocaris*.

I. Of *Hymenocaris* we know of only two species, both British, namely, (1) *H. vermicauda*, Salter, very common in some beds of the Lingula-flags in North Wales; and (2) *H. lata*, Salter, represented by a unique and distorted specimen from the same strata.

II. Of *Lingulocaris* there are (1) *L. lingulæcomes*, Salter; (2) *L. siliquiformis*, Jones; and (3) *L. Salteriana*, T. R. J. and H. W. These are from the Cambrian of North Wales.

III. *Saccocaris major*, Salter, from the Lingula-flags, and *S. minor*, T. R. J. and H. W., from the Arenig series, are described and figured.

IV. *Caryocaris Wrightii*, Salter, and the thinner *C. Marrii*, Hicks, from the Skiddaw slates of Westmoreland, are fully treated of; and it is suggested that the latter form is possibly due to a sexual difference.

V. Of *Aptychopsis* we have recognized thirteen species, mostly British: 1. *A. prima*, Barrande, with its varieties *longa* and *secunda*, all Bohemian. 2. *A. Barrandeana*, sp. nov., and its variety *brevior*, nov. 3. *A. cordiformis*, sp. nov. 4. *A. lata*, sp. nov. 5. *A. glabra*, H. W. 6. *A. Wilsoni*, H. W. 7. *A. Salteri*, H. W. 8. *A. Lapworthi*, H. W. 9. *A. ovata*, sp. nov. 10. *A. subquadrata*, sp. nov. 11. *A. angulata*, Baily. 12. *A. oblata*, sp. nov.

Nos. 5 and 8 are probably represented among the several figures of various forms of '*Aptychopsis prima*' given by Barrande in his Syst. Silur. Bohême, vol i., Supplement, 1872, plate xxxiii.

Nos. 10 and 11 are from the Silurian of Ireland; the others (excepting No. 7, from South Wales) are from the Moffat series of South Scotland.

[1] Read before (Section C) British Association, Edinburgh, August, 1892.

VI. Three species of *Peltocaris* are (1) *P. aptychoides*, Salter; (2) *P. anatina*, Salter; (3) *P. patula*, sp. nov.

Like *Aptychopsis*, *Peltocaris* is an Upper-Silurian British form, with some representatives in the Middle Silurian.

VII. *Pinnocaris Lapworthi*, Etheridge, jun., a rare Silurian form, is known in Ayrshire and Westmoreland.

VIII. Of the round subconical tests, undivided except by the triangular nuchal notch, *Discinocaris* gives four species, all from the Upper or Middle Silurian of South Scotland and Westmoreland: 1. *D. Browniana*, H. W. 2. *D. ovalis*, sp. nov. 3. *D. undulata*, sp. nov. 4. *D. gigas*, H. W.

The British specimens here referred to belong to—(1) the British Museum; (2) the Museum of Practical Geology and Geological Survey of Great Britain; (3) Museum of the Geological Survey of Scotland; (4) Museum of the Geological Survey of Ireland; (5) Woodwardian Museum, Cambridge; (6) Museum of the Owens College, Manchester. The authorities of these institutions have courteously given us facilities (by loan or otherwise) for studying the specimens. For the loan of a large series we owe thanks to Mr. J. D. Brown, of Moffat, and for others to Dr. C. Lapworth, of Birmingham. The late Mr. James Dairon, of Glasgow, also obligingly lent us some specimens.

The *Pinacaridæ* (*Dithyrocaris*, etc.) have next to be described and figured in detail; and further descriptions and figures are required of the *Ceratiocaridæ*, for which the Committee have accumulated much material. Mr. J. G. Williams, F.G.S., of Ffestiniog, has lent the Committee a large series of North-Welsh Phyllocarids, including *Hymenocaris* and other genera, which will require careful study.

The chief additions since 1889 to published information about the Palæozoic *Phyllopoda* are—

1. Some notes on the Devonian *Estheria membranacea*, with a figure and description of an oblong variety, showing the concentric riblets and interstitial ornament, in the Geological Magazine, 1890, Pl. XII. Fig. 9, and 1891, p. 50.

2. In his Mémoire sur la Faune du Grès Armoricain (Annales Soc. Géol. du Nord, vol. xix. 1891), Dr. C. Barrois, after noting (pp. 147 and 149) that the little fossil, quoted by MM. de Tromelin and Lebesconte as *Cytheropsis subtestis* (Report Assoc. Franç. Congrès de Nantes, 1875 [1876], p. 23) is a *Primitia*, near *P. debilis*, Barrande, proceeds to treat of *Myocaris lutraria* at pp. 220 and 221, pl. v. fig. 4; and describes a small caudal spine, probably of a *Ceratiocaris*, p. 221, pl. v. fig. 3; also an abdominal segment and caudal appendages (style and stylets) of a new Ceratiocarid, namely, '*Trigonocarys*' [*Trigonocaris*] *Lebescontei*, nov. gen. et sp., pp. 222–226, pl. v. figs. 5 and 6; all from Guichen.

3. Description of Fossils from the Palæozoic Rocks of Ohio, by R. P. Whitfield (Annals New York Acad. Science, vol. v. December, 1890):—

Page 562. Phyllopoda, p. 563, *Echinocaris*, Whitfield (Amer. Journ. Sci. 1880).

At pp. 564–5, seven groups of ***Ceratiocaridæ*** are defined, according to their segments, etc.

Page 565. *Echinocaris sublevis.* Whitfield, 1880, pl. xii. figs. 12–14.

Page 567. *E. pustulosa,* Whitfield, 1880, pl. xii. fig. 13.

Page 568. *E. multinodosa,* Whitfield, 1880, pl. xii. fig. 16.

From the Erie shales of Ohio (=Portage and Chemung groups of New York State). See Amer. Journ. Science, third series, vol. xix. p. 36, etc., 1880.

At p. 572. *Aristozoe canadensis,* Whitfield, 1880, pl. xii. figs. 17 and 18, from the Trenton formation in the Ottawa basin of Canada. Locality unknown. Introduced for comparison.

See also Report British Association for 1885 [1886], p. 35.

4. The illustrated description of *Discinocaris Dusliana,* by Prof. O. Novák, in the Geological Magazine, 1892, p. 148. This is one of three specimens found by Herr Dusl in the strata of the "Colonie Haidinger," Bohemia, and referred to by Mr. J. E. Marr, F.G.S., in the Quart. Journ. Geol. Soc., vol. xxxvi. 1880, p. 617.

5. The fauna of the Lower Cambrian, or Olenellus Zone, by Charles D. Walcott (Tenth Annual Report of the U.S. Geological Survey, 1891 ?); *Protocaris Marshi,* Walcott, p. 629, pl. lxxxi. fig. 6 (Bull. U.S. Geol. Surv., No. 30, 1886, p. 148, pl. xv. fig. 1):—an obscure subquadrate test (?), with a many-segmented body and a furcate caudal appendage (see our Seventh Report for 1889 [1890], p. 64).

IV.—On some *Dicynodont* and other Reptilian Remains from the Elgin Sandstone. By E. T. Newton, F.G.S., F.Z.S.

At the Aberdeen meeting of the British Association, in 1885, Dr. Traquair called attention to the skull of a *Dicynodont* which had been discovered in the Elgin Sandstone of Cutties' Hillock (=New Spynie). Since that time several other specimens have been obtained from the same place, some of which are the property of the Elgin Museum, while others belong to the Geological Survey of the United Kingdom. These specimens are now being worked out by the author, and this communication is a preliminary note on the interesting results which have been obtained.

All the reptile remains obtained from Cutties' Hillock are in the condition of hollow casts, the bones themselves having been dissolved away; this, it will be remembered, was the case with some of the examples of *Stagonolepis* from the Elgin Sandstone, described by Prof. Huxley, and the method of taking casts from the hollow cavities, which was adopted in that case, has been found of great advantage in the present instance. The blocks when brought from the quarry were more or less split open, exposing portions of the specimens. In some cases these cavities were traced out and developed with the chisel, while in others they were farther split open, thus allowing casts to be taken. In many cases these casts had to be made in several parts and afterwards fitted together. The time and labour involved in this task have been repaid by the restoration of the skulls and parts of skeletons of several *Dicynodonts*, and one or two other equally remarkable forms of reptiles.

In most of these specimens, including that noticed by Dr. Traquair, the skulls are similar in form, although differing in minor details, and have a general resemblance to the South African *Dicynodon* and *Oudenodon*, some of them having small tusks in the maxiliary bones. With most of these skulls parts of the skeleton have been found. Two or three show the position of the vertebral column and ribs, but up to the present no definite centra have been traced; besides this there is evidence of scapula, clavicle, humerus, radius, and ulna, the humerus having the characteristic anomodont expansion of the two extremities. In two specimens the ilia are preserved. These forms appear to be distinct from *Dicynodon*, and probably represent at least two or three species.

Another skull presents most of the characters of *Ptychognathus*, but has a short muzzle and no teeth. The last, and by far the most remarkable skull of this series, is about six inches in length, and has the outer surface completely covered in by bony plates, the nostrils, eyes, and pineal fossa being the only aperatures. The chief feature of this skull is the extreme development of horns upon the face and cheeks, there being about thirty of these formidable defences varying from a fourth of an inch to nearly three inches in length, besides some smaller bosses. The dentition is pleurodont, and resembles very closely that of the living *Iguana*; the palate is lacertilian, but with the pterygoids united in front of the pterygoid vacuity. This skull reminds one very strongly of the living *Moloch* and *Phrynosoma*, but it probably finds its nearest ally in the *Pareiasaurus* from the south African Karoo Bed. The detailed description of these specimens is nearly completed, and will, it is hoped, be shortly published.

REVIEWS.

I.—The Paddles and Fins of Ichthyosaurus.

Ueber einen neuen Fund von *Ichthyosaurus* in Würtemberg. By Dr. Everhard Fraas. Neues Jahrb. 1892, vol. ii. pp. 87–90.

TRACES of the skin have long been known to occur with the remains of the skeleton of *Ichthyosaurus* in the fine-grained limestones and indurated shales of the Lias; and the descriptions of the integument of the paddle by Sir Richard Owen, Dr. Everhard Fraas, and Mr. Lydekker, are now familiar to most students. Hitherto, however, well-preserved specimens showing the precise contour of the animal, have been a desideratum; and we therefore note with especial pleasure the recent discovery by Dr. Everhard Fraas of an *Ichthyosaurus* with the nearly complete integument in the Upper Lias of Würtemberg. Through the courtesy of Dr. Fraas we are enabled to reproduce his drawing of the fossil, accompanied by an outline-restoration based upon the facts it makes known.

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