and for which omission I gladly apologise; but at the same time it is also right to add that as early as 1841 both Mr. Bouchard and myself were well acquainted with the internal characters of the ventral valve of this species, as well as of *C. Demarlii*, for we had found specimens showing the position of the septum and dental plates in an excellent state of preservation in the Devonian quarries of Ferques in the Boulonnais, and it was from those specimens that the figures given in my Monograph were drawn. I was not, consequently, indebted to Professor King for the information I possessed upon this subject; but am exceedingly glad to learn that he has discovered vestiges of spiral coils in *Cyrtina heteroclita*, as I had not hitherto been so fortunate as to see them in any of the many specimens of the species I had obtained. I may also here repeat that I still adhere to the opinion expressed in my Monograph, namely, that, until sufficient proof to the contrary can be adduced, I must continue to consider *C. carbonaria* and *C. septosa*, as referable to the same group as that typified by *C. heteroclita* and *C. Demarlii*, and that they apparently all possess a perforated shell-structure.

EXPLANATION OF PLATE XIV.

Figs. 1–5. *Syringothyris typa*, from drawings communicated by Professor Winchell. 1. Dorsal valve (cast). 2. D. dorsal, V. ventral valves, *l.* line indicating the length and position of the dental plates. 3. Dorsal and part of the ventral valve seen in profile. 4. Beak of ventral valve partly destroyed; *a.* area, *l.* dental plates or lamellæ, *t.* tube incomplete, *r.* mesial ridge. 5. Section through A.B. The same letters refer to same parts.

Figs. 6–9. *Syringothyris ? distans*, Sow., from the Carboniferous limestone of Visé, in Belgium. 6. Part of the beak of ventral valve, seen from the back, and after Professor L. de Koninck's original figure, published in 1859. 7, 8, 9. My drawings from the same specimen, enlarged. 7. Area and pesudo-deltidium. 8. The same viewed from the opposite side, the shell forming the back of the ventral valve being removed so as to show the shape and position of the dental plates, as well as the position of the transverse plate and tube. 9. The same seen in front; the area and pesudo-deltidium being foreshortened.

Fig. 10. *Syringothyris cuspidata*, or *typa*? from Millecent, Ireland.

Fig. 11. " " from same locality. A transverse section of the beak having been cut through by Dr. Carpenter to show the position of the dental plates, transverse plate, and incomplete tube, as seen in the American specimens of *Syringothyris typa*. In this specimen portions of the shell were perforated, while other parts were free. Indications of the spiral coils may here also be perceived.

NOTICES OF MEMOIRS.

I.—On the Punctate Shell-structure of *Syringothyris*. By F. B. Meek, (from *Silliman's American Journal of Science and Arts*, May, 1867, p. 407).

HAVING recently examined Professor Winchell's types of his genus *Syringothyris*, which he was so kind as to loan me, I find them all, with the exception of two silicified specimens (showing no structure), *distinctly punctate*. It is probable that Professor Winchell had hap-

pened to examine chippings from specimens not in a condition to show the punctures. I have likewise ascertained, since the publication of my former paper on this subject, that *Spirifer propinquus*, Hall, and *S. Hannibalensis*, Swallow, both nearly like *S. cuspidatus*, have a clearly punctate structure, and hence, probably belong to the group *Syringothyris*.

I have just read a letter from Mr. Davidson, written to Mr. Worthen, in which he quotes, from a letter to him from Dr. Carpenter, a paragraph giving the results of his examinations of specimens of *Syringothyris*, and of the same Irish shell examined by me (and at one time supposed to be *Spirifer cuspidatus*). These chippings were sent over by Mr. Worthen, at Mr. Davidson's request, some little time back. Dr. Carpenter says he finds the *Syringothyris* (that from Floyd Co., Indiana, I suppose), *distinctly punctate*, the punctures being, as I stated, small and scattering. The chippings from the Irish specimen sent over to Mr. Worthen, with the name *S. cuspidatus* attached, Dr. Carpenter also found to be punctured, though the punctures are not so clearly seen as in the other. Chippings of *S. subcuspidatus*, Hall, sent by Mr. Worthen, he says are not in a condition to show the structure.

At the time of writing Dr. Carpenter had evidently not received a package of chippings I had sent him, containing specimens of *S. subcuspidatus*, showing the punctures clearly. He says these examinations of the structure of *Syringothyris* confirm its generic or subgeneric differentiation, established upon other characters, and that the Irish specimen, he believes, belongs to this group. He is still confident, however, that the true *S. cuspidatus* is not a punctate shell, which you will remember I had not supposed to be the case. I never doubted or questioned the accuracy of Dr. Carpenter's conclusions on that point, and there is no microscopist living in whose results I have more confidence than in his.

II.—On the Tertiary Volcanic Rocks of the British Islands.

By Archibald Geikie, Esq., F.R.S., F.G.S.

[Abstract from the Proceedings of the Royal Society of Edinburgh, 1866-67, vol. vi. p. 71.]

THIS paper was in continuation of the series of memoirs on the volcanic rocks of Scotland previously read by the author before the Society,[1] and contained the first portion of the results of a survey of the western region, extending from the south of Antrim to the north of Skye. The districts more especially dwelt upon were the islands of Mull, Eigg, and Staffa. After alluding to the writings of previous geologists upon these tracts, more particularly to the discovery by the Duke of Argyll of Tertiary leaves under basalt at Ardtun Head, in Mull, the author remarked, that up to this time the great mass of volcanic rocks in the Western Islands has been usually regarded as of Oolitic age—an opinion in which he himself had shared. His object in the present communication was to show that

[1] See Proceedings, iv. 309, 453, 582, and Transactions, vol. xxii. 633.

as regards Mull and the adjoining islets this opinion was erroneous, that the enormous volcanic accumulations of these islands belonged in reality to the Miocene period, and that, in all likelihood, the long chain of basaltic masses, extending from the north of Ireland along the west coast of Scotland to the Faroe Islands, and beyond these to Iceland, was all erupted during the same wide interval in the Tertiary period.

The nature of the volcanic products was first sketched. It was shown that the two great classes of recent lavas—the basaltic and the trachytic—were well represented among the Western Islands, and that the basaltic series was on the whole the older, since it was found to pass under massive sheets of pale grey and blue claystones, clinkstones, and porphyries belonging to the trachytic group. In addition to these lava-form rocks, masses of coarse volcanic agglomerate occurred, along with beds of tuff and peperino.

The manner in which these various volcanic rocks occur in Mull and Eigg was next described. It was shown that the leaf-beds of Ardtun, which are known by their fossil contents to be of Miocene age, lie near the bottom of the whole volcanic series, and that above them comes a series of trap-beds between 3,000 and 4,000 feet in thickness. Throughout this enormous mass of bedded igneous rock, layers of ash, often abounding in Chalk-flints, are interstratified, and in one part of the cliffs of Inimore of Carsaig a bed of flints twenty-five feet thick lies between the dolerites. Thin lenticular seams or nests of coal likewise occur, but these only occupy small pond-like hollows of the original surface of the trap beds, and are overlaid directly with trap. They are sometimes excellent in quality, and occasionally three feet in thickness; but they rapidly die out in every direction. There is thus no probability that the Tertiary coal of the Western Islands will ever come to be of commercial importance.

Proofs of the long continuance of volcanic action among these islands are afforded by the great thickness of the successive sheets of igneous matter, which in one mountain alone—Ben More—reach a depth of 3,185 feet without revealing either the actual bottom or top of the series. Another and striking piece of evidence on this subject is given by the well-known Scuir of Eigg. That island consists of nearly horizontal sheets of dolerite, like those of Mull, resting unconformably upon Oolitic rocks. After their eruption, they must have been long exposed to the wasting agencies of the atmosphere. A valley was cut out of them, and its bottom was watered by a river, which brought down coarse shingle and sand from the distant Cambrian mountains of the north-west. These changes must have demanded a lengthened lapse of time, yet they took place during an interval in the volcanic history of the island. The igneous forces which had been long dormant broke out anew, and poured several successive *coulées* of vitreous lava down the river-bed. In this way the channel of the stream came to be sealed up. But the same powers of waste which had scooped out that channel continued their operation. The hills which had bounded the valley

crumbled away, and the lava-currents that filled the river-bed, being much harder than the surrounding rocks, were enabled in great measure to resist the degradation. Hence the singular result now appears that the former hills have been levelled down into slopes and valleys, while the ancient valley occupies the highest ground in the neighbourhood, and its lava-current stands up as the well known precipitous ridge of the Scuir of Eigg. The gravel and drift-wood of the old river are still to be seen under the rock of the Scuir.

The author then proceeded to point out the possible connection between these Tertiary volcanic rocks and the metamorphism of different parts of the West Highlands. He showed that in Mull, under Ben More, the volcanic rocks themselves give signs of having been subjected to a process of metamorphism, and that they are associated there with masses of syenite, like those of Raasay and Skye. Macculloch pointed out that the syenite of the two latter islands was later than the Secondary rocks of that district; and there now seems to be a strong probability that it will turn out to be of Miocene age. Parts of that syenite are true granite, while the Lias around it has suffered an extensive metamorphism. It will be an important addition to our knowledge of the history of metamorphic action, if the alteration of the Secondary rocks of the Hebrides is eventually shown to be connected with the evolution of volcanic rocks during the Miocene period.

The wide extent to which the British Islands were affected by the Miocene volcanos of the west was then referred to. That extent is not to be measured by the area at present covered with Tertiary volcanic rocks, nor even by the area which these rocks may have originally overspread; but from which subsequent denudation has removed them. From the great volcanic ridge running through Antrim and the Western Islands, thousands of trap-dykes diverge in a south-easterly direction. They become fewer as the distance from that bank increases, yet they extend as far as the coast of Yorkshire. No single dyke, indeed, has been traced across the country from sea to sea; but there can be little doubt that they all belong to one series. They cut through all the formations up to and including the Chalk, and they likewise traverse the older portions of the Tertiary volcanic rocks. They must thus be of Tertiary age, and belong to that series of igneous masses described in the present paper. They do not usually run along lines of fault; on the contrary, they are found to cross faults of fifty fathoms and upwards without being deflected. Their evenness and parallelism show that they must have ascended through fissures prepared for them by subterranean movements. Thus we learn that in Tertiary times the greater part of Scotland, the north of England, and the north of Ireland, were cracked by earthquakes, and that liquid lava rose through the hundreds of parallel rents, perhaps in some cases actually reaching the surface.

The last section of the paper was devoted to an account of the denudation of the Tertiary volcanic rocks. It was shown that wide, deep, and long valleys have been excavated out of the horizontal

trap-beds; that these rocks have sometimes been so wasted away that only huge detached pyramids of them are left, as in the case of Ben More, Mull; that the volcanic bank has been worn down into detached islands often miles apart; and that from the fact of so many trap-dykes reaching the surface, even at a distance of more than two hundred miles from the main mass of volcanic rock, the general superficies of the country must have undergone a very extensive amount of denudation since the Miocene period. These changes point to the passing of an enormous lapse of time, and help to teach us that, though in a geological sense, the Miocene age belonged to a recent part of the earth's history, it is nevertheless separated from our own period by an interval too vast to be realised by the mind.

III.—Description de la Flore Fossile du premier étage du Terrain Crétacée du Hainaut, par Eugene Coemans. Bruxelles, 1866.

THIS short but interesting memoir on the fossil flora of the Cretaceous strata of Hainault is well deserving the attention of the student of fossil botany. The remains found at La Louvière consist of many cones, generally well preserved, fragments of wood, pieces of resin, and masses of lignite and small roots, completely carbonized; and their arrangement indicates a tranquil deposit. The striking feature of this flora is that it appears composed almost exclusively of *Coniferæ* and *Cycadeæ*, and like other Cretaceous floras does not possess any species common to other floras of the same period, and differs entirely from that of Aix-la-Chapelle, only thirty leagues distant; not one of the twenty species of *Coniferæ* found there being identical with any of the eight species described from La Louvière,—the flora of Aix-la-Chapelle presenting, according to M. Coemans, a younger aspect, in containing some species of *Sequoia*, and not any Cycad. The recent addition of a Cycad to the British Cretaceous flora is interesting.

M. Coemans considers that the fossil flora of Hainault contains types or intermediate forms which connect certain genera of *Coniferæ*; thus, his *Pinus Corneti* is intermediate to *Abies* and *Cedrus*; the *P. Andrai* connects *Strobus* with *Pinaster*; and the *Pinus Heeri* and *depressa* form a transition from *Cembra* to *Strobus*. At page 17 M. Coemans retains *Zamites macrocephalus* and *Z. ovatus*, both which Mr. Carruthers has shown to belong to *Pinites* (Geol. Mag., Vol. III. p. 536), and are not Cretaceous, but Lower Eocene fossils.—J. M.

IV.—Notes on some Triassic Crustacea from Styria. By Professor A. E. Reuss, For. Corr. G. S.

[Proceed. Imp. Geol. Instit., Vienna, January, 15th, 1867.]

ASPIDOCARIS TRIASSICA, Reuss, from the inferior Triassic limestone west of Aussee, north-west of Styria, occurs as impressions with fine concentric striæ, not unlike the leaves of *Sagittaria*, with a triangular notch produced by the separation of a

rostral portion originally limited by furrows, as in the genera *Peltocaris*, Salt., and *Discinocaris*, Woodw. It must be remarked that all other forms of *Phyllopods*, the actually living genus *Apus* excepted, are Palæozoic. *Aspidocaris*, Reuss, stands next to *Discinocaris*, Woodw.

Halycine elongata, Reuss, from the same limestone,—a dorsal carapace badly preserved. The three or four species of the Pœcilopod genus *Halycine* at present known, all belong to the Conchiferous Limestone, or to the Inferior Keuper.

Cythere fraterna, Reuss, from the shales of Raibl Carinthia, which also abound in plants, Decapod Crustacea, and fishes. Isolated valves of an Ostracod, nearly related to *Cythere Richteriana*, from the Zechstein, are of some interest as being the earliest remains of this Crustacean stated to occur in the Alpine Trias.—[Count M.]

V.—Die Bivalven und die Echinodermen des Braunen Jura von Balin. By Dr. Gustav C. Laube. Wien, 1867.

THESE two papers by Dr. Laube are in part a continuation of the palæontological researches commenced by Professor E. Suess, on the fossils of the Brown Jura of Balin, in Poland. The papers contain descriptions and carefully prepared illustrations of the *Echinoderms* and bivalve shells found in the Lower Oolite of that locality, and are interesting as showing the wide range of some species of the Oolitic fauna. Five species of *Echinoidea*, belonging to the genera *Clypeus*, *Collyrites*, *Echinobrissus*, *Hyboclypus*, and *Holectypus*, are common to Balin and the Lower Oolites of England. Of the *Conchifera* about seventy species from Balin have been identified by Dr. Laube as occurring in the Inferior and Great Oolite and Cornbrash of England. The curious genus *Elignius* of Deslongchamps is represented by two species, and under *Cardiodonta* of Stoliczka, are included certain forms placed by Sowerby and Münster in *Isocardia*. The genera *Tancredia*, *Sowerbya*, and *Gresslya* are also represented.

J. M.

VI.—Notes on a New Genus of Fossil Crustacea. By F. B. Meek.

A NEW Crustacean, from the Coal-measures of Illinois, was described in 1865, by Messrs. Meek and Worthen, under the name of *Belinurus Danæ;* it differs, however, in some respects from the characters usually assigned to that genus. Having since seen the paper by Mr. H. Woodward on the Structure of the *Xiphosura* (Quart. Journ. Geol. Soc., Vol. xxiii.), in which that group is now divided into three genera—Mr. Meek has been led to refer his *Belinurus Danæ* to a new genus, holding an intermediate position between *Belinurus* and *Prestwichia*; for this he proposes the name *Euproops*, in allusion to the anterior position of its eyes. This form is at once distinguished from the now restricted genus *Belinurus*, by its anchylosed abdominal segments and the anterior position of its eyes, as well as by the more oval or sub-circular outline of its abdomen. From *Prestwichia*, with which it more nearly agrees in general

form, as well as in its anchylosed segments, it differs remarkably in having the area enclosed by its eye-ridge (glabella) comparatively small, and of a quadrangular form, with the eyes situated far forward at its anterior lateral angles.—*Amer. Jour. Science, and Arts, May*, 1867.

REVIEWS.

I.—Reliquiæ Aquitanicæ: Being contributions to the Archæology and Palæontology of Périgord, and the adjoining Provinces of Southern France. By Edouard Lartet and Henry Christy, Edited by Professor T. Rupert Jones, F.G.S., etc., etc. (Third Notice.)

IN referring again to this important work we have only to state that Part IV. maintains the high character for which the three previous Numbers were distinguished. The six plates now issued are devoted to figures of stones, used as mortars, to flint cores from which flakes have been struck, and to a further series of cleverly-carved Reindeer-horn weapons. The figures of animals, engraved upon some of these remains, possess great merit; especially we would notice the carving of a deer on B. Pl. vii. et viii., fig. 6.

Chapter III. is devoted to a notice of the chief Geological features of the valley of Vezère, and the bordering country, accompanied by a sketch-map and section of that valley.

As suggestive of the origin of flint in the Chalk of the Dept. de la Dordogne, the Editor considers (p. 32) that it is only so much of the Cretaceous stratum silicified.

"The particles of *Polyzoa*, the *Orbitoides*, and other organic remains being still in place, and retaining their characteristic structures. Even fish-teeth (*Otodus*) have been altered into flint except a thin external pellicle." "There is also flint showing a further progress of mineralization, in which the constituent organic remains of the limestone have been more and more removed from sight by the increased homogeneity of the pseudo-amorphous silex, as is usually the case with the flint of Northern France and England."

That some flint may have been so formed is possible, but it is equally probable that many, if not all, the flint nodules and bands occurring in the Chalk and even chert, owe their origin to a segregation of silicia, previously held in solution—around some nucleus—such as a silicious sponge, or other organic remain, which almost invariably accompanies these bodies.

We imagine the author would not include in his list of pseudomorphic silicious replacements, the fissures filled with flint in the Chalk as at Pegwell Bay, in Kent, and Rottingdean, near Brighton, and many other localities, which are not unfrequently lines of fault. These veins of flint seem to justify one in attributing their occurrence to the simple infiltration (*without replacement*) of the Silica.