

19. *Cypris* ? *fasciculata*, E. F.
 20. ——— ? *granulata*, E. F. (? *C. granulosa*, Dunker.)
 c.—LOWER PURBECK.
 21. *Cypris* ? *Purbeckensis*, E. F.
 22. ——— ? *punctata*, E. F.

These are figured in Sir C. Lyell's "Manual of Geology," see *GEOL. MAG. I.c.* p. 105.

NOTE ON THE DISTRIBUTION OF THE SPECIES.

- Nos. 1, 11, and 13. Very common throughout the Wealden and in some Purbeck beds; also in Germany.
 2 and 12. Rather rare. Figured by Fitton from some unmentioned locality; Peasemash, Surrey; Shotover.
 3 and 16. Not uncommon in the Wealden Beds. In the Upper Purbeck.
 4. Accompanies *C. tuberculata* in some places.
 5. Hastings beds of Sussex; Purbeck beds of South Wilts.
 6. Not uncommon in the Wealden beds.
 7. Shotover; Oberrkircha, Hanover.
 8 and 9. Shotover.
 10. Shotover.
 14 and 20 ? Subwealden Boring, Sussex; Hanover; Middle Purbeck of Dorset!

Addenda et Corrigenda.—At page 101, line 25, *add*: It occurs throughout a bed about 15 feet thick, and is very characteristic of the zone. At p. 101, *add*: *Estheria tenella* (Jordan), "Monogr. Foss. Estheriæ," 1862, p. 31, etc., has been found abundantly by the Geological Surveyors of Scotland in the Coal-measures near Airdrie; and, in one instance (at Glenmavis Burn), it constitutes a bituminous shale, so thickly are the individuals massed together. From Palacraig, near Airdrie, where *E. tenella* has lately been obtained, I remember to have seen specimens of a much larger *Estheria*, since lost. At p. 102, line 16 from bottom, *for* Fred. *read* Ferd. At p. 105, line 23, *for* on *read* in. Line 32, *after* figured specimen, *add*: = *Cypridea Austeni*. At p. 109, line 8 from bottom, *add*: Mr. H. Caudell has also found *Cypridea Valdensis* in the Ironstone of Wheatley, two miles S.E. of the other locality.

NOTICES OF MEMOIRS.

I.—ON THE GRAPTOLITE SCHISTS OF KONGSLENA IN WESTROGOTHIA, SWEDEN.¹ By Dr. G. LINNARSSON, Director of the Geological Survey of Sweden.

IN the Upper Graptolite schists of Westrogothia two divisions are recognizable—a lower division characterized by *Monogr. lobiferus* (McCoy) and *Rastrites peregrinus* (Barr.); and a higher division characterized by *Monograpt. priodon* (Bronn) and *Retiolites Geinitzianus* (Barr.). The same divisions, well separated, appear in other parts of the country, and Törnquist has already proposed for them the respective titles of the *Lobiferus Schists* and *Retiolites Schists*.²

Among the localities in Westrogothia where the Upper Graptolite Schist is most accessible is Strommen in the parish of Kongslena. These schists, as well as the immediately underlying strata, the Brachiopod Schists and the Trinucleus Schists, are locally cut into by a considerable stream. The Lobiferus Schist is here a black

¹ Abstract of a paper published in the *Geologiska Föreningens i Stockholm Förhandlingar*, 1877, Nr. 41; Bd. III., Nr. 13.

² Törnquist, *Ofvers. af K. Vet. Akad. Förhändl.*, 1875, p. 57.

thinly laminated straight-cleaving schist crowded with Graptolites, which appear as thin shining films of iron-pyrites. It rests upon the Brachiopod Schists, and is surmounted by a grey flag-like rock, which has not hitherto yielded fossils, but possibly represents the *Retiolites Schist*.

At the time the author described the sequence of the Silurian rocks of Westrogothia some years ago,¹ a very small number of species only had been detected at Kongslena. In the summer of 1876, in a fresh visit to this locality, he was fortunately able to add greatly to his former discoveries. In specific richness the *Lobiferus Schist* at this spot now exceeds that of all other known Swedish localities. The description of several forms which appear to be new is best deferred till more and better material has been obtained; and the state of preservation of others which are already named does not admit of their certain identification. The following list is therefore far from complete.

Graptolites from the *Lobiferus Schist* of Kongslena.

<i>Monograptus lobiferus</i> , M'Coy.		<i>Rastrites peregrinus</i> , Barr.
————— <i>sagittarius</i> , His.		<i>Diplograpt. palmatus</i> , Barr.
————— <i>Sandersoni</i> , Lapw.		————— <i>cf. modestus</i> , Lapw.
————— <i>Sedgwicki</i> , Portlk.		————— <i>cometa</i> , Geinitz.
————— <i>spiralis</i> , Geinitz.		————— <i>tamariscus</i> , Nich.
————— <i>triangulatus</i> , Harkn.		<i>Climacogr. rectangularis</i> , M'Coy.

Schists with a similar fauna occur not only in Westrogothia, but in many other districts in Sweden, as in Dalarna and Scania.

In the island of Bornholm it is probable that the *Lobiferus Schist* is paralleled by the lower portion of the graptoliferous schists which are denominated by Johnstrup² the Uppermost Graptolite Schists. In Norway and the Russian Baltic Provinces no precise equivalents of the *Lobiferus Schist* are known. It is not improbable that beds of the same age may exist there, but if so, they have so wholly different a facies that it is impossible to compare them. Very different however is their correlation with the Silurian rocks of Britain. If we examine a list of the fossils of the latter, we recognize almost all the above-mentioned Graptolites. Notwithstanding this, however, it was formerly impossible to parallel the *Lobiferus Schist* with any special portion of the English succession as arranged by Murchison. This was mainly owing to the circumstance that these Graptolites had not been discovered in the districts whence Murchison drew the types for his Silurian system. In other parts of the country, as in the Coniston and Moffat Groups of the Lake District and the South of Scotland, they have long been known; and it has already been shown by the author³ that these include equivalents of the Upper Graptolite Schists. But respecting these, and the other British graptolitic deposits relatively older, we have always had very

¹ Linnarsson, Om Vestergötlands Cambriska och Siluriska aflagringer, K. Vet. Akad. Hand., Bd. 8, Nr. 2, 1869.

² Johnstrup, Oversigt over palæozoiske Dannelser paa Bornholm, Forh. v. d. Skandinav. Naturf. 11te. sid 307.

³ See, for example, Linnarsson, "On the Vertical Range of Graptolites in Sweden," *Geol. Mag.* Dec. II. Vol. III. 1876.

incorrect ideas. In the Catalogue of the Silurian Fossils given by Murchison (Siluria, 4th edition), several of the above-mentioned fossils are included, such as *Monogr. lobiferus* (= *Becki*) and *M. sagittarius*, *Rastrites peregrinus* and *Diplogr. cometa*, but all are placed under the head of the Llandeilo formation. In his description of the Silurian succession in Westrogothia, the author was therefore compelled to parallel the Upper Graptolite Schists with a part of Murchison's Llandeilo, though with an intimation that Murchison's arrangement must somehow have been erroneous, in thus assigning them a systematic position inferior to the Chasmops Limestone and Trinucleus Schist, which of all Swedish beds most nearly resemble the Caradoc, and actually *underlie* these Upper Graptolite Schists. In the list of British Graptolites given by Nicholson in his Monograph¹ he includes many of the Graptolites of the Lobiferus Schist. The majority, such as *M. lobiferus* and *sagittarius*, *Ras. peregrinus* and *Diplogr. tamariscus*, are said to occur both in the Upper Llandeilo and in the Caradoc. *Diplo. cometa* is given from the Upper Llandeilo only. To judge from this, the Lobiferus Schist ought best to be compared with the transition beds between the Llandeilo and Caradoc. Even this, however, conflicts with the above-mentioned fact that the Lobiferus Schist reposes upon strata, the fauna of which most nearly corresponds to that of the Caradoc.

For the first time, through Lapworth's accurate researches in the South of Scotland, has the Graptolite-bearing series in Great Britain been developed in a satisfactory manner. He divides the richly graptolitic Moffat group into three parts—the Lower or Glenkiln Shales, the Middle or Hartfell Shales, and the Upper or Birkhill Shales—of the fossils of which he gives a catalogue.² According to this, we find that the Upper Moffat (Birkhill Shales) completely parallelizes with the Lobiferus Schist. Nearly all the Graptolites we find at Kongslena are found in the Upper Moffat, and none of them are mentioned from either of the underlying divisions. The Middle Moffat, again, is the equivalent in time of the Schists with *Dicranograptus Clingani* and *Diplogr. foliaceus*, which occur in Scania, as at Fogelsang, Josterup, and Jerrestad. This close concordance with the Swedish succession shows that we may, without doubt, look upon Lapworth's classification of the Scottish series as being correct. As regards the systematic relations of the Scottish rocks to the typical English series again, Lapworth holds totally different views from those of preceding authors. In the Moffat group, for example (which Murchison and Nicholson—the latter at least in 1872—regard wholly as Llandeilo), Lapworth considers that the Lower Moffat only belongs to the Llandeilo, the Middle Moffat to the Caradoc; while of the Upper Moffat it is said that it “seems to belong almost wholly to the Lower Llandoverly.” This last-mentioned comparison at least does not conflict with the Swedish relations. That is to say, in several of the rock divisions, which

¹ A Monograph of the British Graptolitida, Edin. & Lond. 1872, p. 97, et seq.

² A Catalogue of the Western Scottish Fossils, Glasgow, 1876, p. 97, et seq.

precede the Lobiferus Schist, the fauna has already appeared, which is most nearly to be compared with that of the Caradoc group.

In the North of England again we meet with the Graptolites of the Lobiferus Schists in that group of shaly strata called the Coniston Mudstones.¹ According to the lists of their fossils given by Harkness and Nicholson, they include a Trilobite fauna having a thoroughly Lower Silurian aspect, and which can best be compared with that of the Trinucleus Schiefer. Till this abnormal relationship has been confirmed, the author is of opinion that we ought to be allowed to believe that some mistake has been committed.

Several of the fossils of the Lobiferus Schist, such as *M. lobiferus*, McCoy, *M. spiralis*, *Rastrites peregrinus* and *Diplograpt. palmeus*, are found also in Bohemia, partly in Barrande's Etage Ee1, and partly in the Colonies in his Etage D.² On both stratigraphical and palæontological evidences, the author had already paralleled the Lobiferus Schists, in common with the Upper Graptolite Schists, with the Etage Ee1. Törnquist, on the contrary, has suggested that the Upper Graptolite Schists are rather contemporaneous with the Colonies.³ This last view is chiefly founded upon the supposed English succession; but now, since this has been more accurately determined, the facts give force, on the other hand, to the author's opinion. It was formerly supposed that the fauna which characterized the Swedish Upper Graptolite Schists belonged to the Llandeilo and Caradoc. It is now proved that they belong to the Middle and Upper Silurian strata. As regards the equivalents of the Lobiferus Schist—the Birkhill Shales and the Coniston Mudstones—the former are believed by Lapworth to belong to the Lower Llandovery; the latter by Harkness and Nicholson to the Uppermost Bala or Lowest Llandovery.

The Coniston Flags, which in their strata and fossils may be compared with the Retiolites Schists, are now regarded by English authors as an Upper Silurian formation. In England, therefore, as well as in Sweden and Bohemia, these special Graptolite faunas thus stand in near relation to the Upper Silurian formations. Their appearance in true Lower Silurian formations is, on the contrary, peculiar to Bohemia. The Leptena Limestone, which overlies the Upper Graptolite Schists, can scarcely be mentioned as true Lower Silurian; while the Brachiopod Schist, which underlies the Lobiferus Schist, has already a far greater Upper Silurian aspect than even the very highest strata of Barrande's Etage D. These last-mentioned beds agree nearest with the lower part of the Trinucleus Schists of Sweden. Naturally, perfect synchronism between the Swedish Upper Graptolite Schists and the Bohemian Etage Ee1, can hardly be said to be actually demonstrated. They are, however, at any rate,

¹ See, for example, the list given by Harkness and Nicholson, Quart. Journ. Geol. Soc., London, vol. xxxiii. 1877, p. 473. The Coniston Mudstones are not, as asserted by these authors, equivalent to the whole of the Swedish Upper Graptolite Schists. The Retiolites Schists are clearly older and are related to the Coniston Flags.

² Vide Barrande, *Defense des Colonies*, 1870, vol. iv. p. 125.

³ Törnquist, Om Siljanstraktens paleozoiskas formationsled, Öfvers. af K. Vet. Akad. Förhandl., 1874, Nr. 4, p. 24.

homotaxeous, and for the present nothing is known which would lead us to suppose that one was older than the other.

It has long been the general opinion that the Graptolites which characterize Barrande's Colonies and his Etage Eel, had originally their home in the N. of Europe, and that from thence they made excursions into the Bohemian basin. In their earlier migrations they could not find complete footing there, and consequently formed a colony which soon died out. Later, viz. at the time of the formation of Barrande's Etage Eel, they established themselves in permanent occupation of the Bohemian basin.

Formerly, when it was thought that the Graptolites of the Upper Graptolite Schists were co-existent with the Trilobites of the Trinucleus Schists, and that their equivalent English Graptolite-bearing beds belonged to the Llandeilo and Caradoc, such a view was very natural. Now, however, the better insight we have attained of the English and Swedish succession has robbed it of all its force. There is now no reason to believe that the Graptolites which inhabited Barrande's Colonies had emigrated from the ocean of the north. Where they came from is, at least for the present, impossible to determine; but probably the Bohemian Colonies are older than all the Swedish and English beds in which the same fauna is found. Instead of the emigration having taken place as believed hitherto, if we may judge from the facts already obtained, it would rather have taken place in the opposite direction.—CARL FAYE.

II.—PROF. J. WOLDRICH—ON PLEISTOCENE CANIDÆ.

(Imper. Acad. Vienna, Meeting April 4, 1878.)

The remains found in the Loess of Lower Austria and in the Caves of Franconia, Württemberg, and Moravia prove the family of *Canidæ* to have been represented in Europe during the "Diluvial" (Pleistocene) period. in its Lupine or Wolf type by the genera—*Cyon* (2 species), *Lycorus* (1 sp.), *Canis* (1 sp.), *Lupus* (4 sp.); and in its Vulpine or Fox type by the genera—*Vulpes* (4 sp.) and *Leucocyon* (1 sp.): altogether 13 species. A nearly complete skeleton of *Lupus Suessi*, now in the University Museum at Vienna, was found some years ago in the Loess of Nussdorf, N.W. of Vienna, overlying the plastic clay of Hernals. This species was characterized by a powerful and not very large head, a very strong neck, and a vigorous muscular system. It was more robust than *Lupus spelæus*; and intermediate in size between that species and the existing Wolf. The structure of its extremities shows that it was fleet enough to pursue even the larger Herbivores and strong enough to overpower them.—COUNT MARSHALL.

REVIEWS.

I.—REVUE DE GÉOLOGIE POUR LES ANNÉES 1875 ET 1876. Par M. DELESSE et M. DE LAPPARENT. (Paris, 1878.)

THE constantly increasing numbers of geological papers published in the various Journals, Proceedings, and Memoirs of Societies, renders it difficult, at the present time, for the student of the science