THE GEOLOGICAL MAGAZINE.

No. LIII.—NOVEMBER, 1868.

ORIGINAL ARTICLES.

I.—ON A NEWLY-DISCOVERED LONG-EYED *CALYMENE* FROM THE WENLOCK LIMESTONE, DUDLEY.

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[PLATE XXI.]

IT is more than a century since the “Dudley Locust,” or ‘Trilobite,’ was first figured and described,¹ and the locality where it is found, is rendered famous by the researches and writings of Sedgwick, Phillips, Forbes, Murchison, Salter, Davidson, and a host of other geologists and palæontologists, who have been attracted thither at various times by the grand geological features of the district or by the matchless beauty and endless diversity of its well-preserved organic remains.

Nor have the advantages, which this locality offers, been lost sight of by the members of the Dudley and Midland Geological Society, whose well-stored cabinets attest the earnest interest they all take in procuring and preserving the choicest Corals, Mollusca, Crinoids, and Trilobites, which the Wenlock Limestone and Shale so abundantly afford.

To one of these gentlemen, Mr. E. Hollier, of Dudley, I am indebted for the opportunity of examining and describing the remarkable Trilobite which forms the subject of this communication.

From the time of the establishment of the genus *Calymene* by Brongniart in 1822,² the “Dudley Trilobite” may be said to have been very well known, described, and figured, and its portrait has appeared in almost every geological work in which fossils have been noticed from that time down to the present day.

For the best description and illustration of this and many other genera of British Trilobites we are indebted to Mr. J. W. Salter. (See Geological Survey, Memoirs, 1849-53; and Monographs of the Palæontographical Society³ for 1862-66), to Part II. of which latter work we refer the reader for a full description of the genus *Calymene*.

¹ Lyttelton, Phil. Trans. 1750, vol. xvi. p. 598, pl. i. and ii.; Mortimer, *ibid.* p. 600; Mendez da Costa, *ibid.* 1753, vol. xlviii. p. 296; also Guettard, Wilckens, Klein, Walch, Beckmann, etc., 1757 to 1773.

² Brongniart and Desmarest, Hist. Nat. Crust. foss. 1, pl. i.

³ Four parts have already appeared, with upwards of 30 plates and above 700 figures, together with descriptions of 114 species of Trilobites.

At page 90, Mr. Salter writes of *Calymene* as follows: "One of the most graceful and compact of all the Trilobite group; the head and tail well developed, but not extravagantly so; the former with a three-lobed glabella, very convex and narrowed in front, *and with prominent supine eyes, which have evidently a very thin cornea, in which, only very rarely, the lenses are visible*;¹ a thick margin to the head, the suture being in front submarginal and subtending a broad rostral shield, etc., etc." The passage we wish to call attention to is printed in italics.

All collectors of Trilobites can corroborate the above observation of Mr. Salter's; nay, more, it is rarely, if ever, that the *cornea* itself is preserved in *Calymene*.

Out of the numerous specimens which have come under my own notice, I have seen but one. The specimen consisted of part of the head of a small *Calymene Blumenbachii*, carefully worked out by that veteran collector of Dudley fossils, Mr. John Gray, of Hagley, some of whose choicest specimens of Crinoids and Trilobites (beautifully developed with his own hands) now adorn the Geological Gallery of the British Museum.²

The aspect which the eye ordinarily presents in *Calymene* is that of a lenticular aperture, with a thickened and often considerably raised margin, the smoothness of the edge of which depends—(certainly in some out of the many specimens which I have lately examined)—upon the skilful finish put upon it by the Dudley "Fossilists," who have for many years pursued fossil-development as an important branch of native industry.³

Knowing these things, it will not seem surprising that I looked with mingled feelings of interest and distrust at the "carte de visite" of the remarkable Trilobite figured in the centre of our plate, and desired, before all things, to see the original specimen. This was duly sent me up, and I looked at it still more earnestly, and appealed to other eyes than mine to examine it critically, and I am glad to say that my colleagues all confirmed me in my decision of its genuineness.

In all points, except in the remarkable eye-peduncles, the specimen appears to be a true *Calymene Blumenbachii* (see Plate XXI. Fig. 1). Indeed, there are specimens in the Museum collection which match Mr. Hollier's Trilobite most exactly, save in this one particular.

I could only call to mind one other instance of a Trilobite having

¹ "Hall, in his 'Palæontology of New York,' has figured the lenses. I have never seen any traces of them."—J. W. S.

² This little specimen was sent me privately in a letter by Mr. Gray, some long time since, and, to my regret, I am unable at this moment to light upon it, or I should have figured it on the accompanying plate.

³ Mr. Gray informs me that for fifty years the miners have not only collected and developed Trilobites, but even *made them* when they did not turn up in sufficient abundance. He adds, "New and undescribed species are still to be purchased, composed of parts of *Calymene* and *Phacops* united together, either by accident or by the aid of a knife and a little gum." I have myself seen (in the possession of Dr. Grindrod, of Malvern) an *Ampyx nudus* cleverly made out of the limestone with the help of the tail of a *Phacops Downingia*.

equally long eye-stalks, the *Asaphus Kowalewski* from the Silurian of Russia (see Plate XXI. Figs. 4 and 5).¹

But the sessile or pedunculated form of the eyes in the *Crustacea* cannot be held as peculiarly characteristic of any one order. If this were insisted upon, we must classify such forms as *Squilla*, *Mysis*, *Phyllosoma*, belonging to the *Stomapoda*, with the true Decapod *Crustacea*.²

It must, however, be borne in mind that *the eye itself* (and not the *peduncle*, or its exact form), is the essential organ, the peduncle being merely a form of stand or support for the more convenient adjustment of the lens which conveys, by the optic nerve to the brain, the impressions of external objects coming within its range.

If we turn, for a moment, to recent *Crustacea* we find among the Crabs (*Decapoda-Brachyura*) the greatest possible variation in the development of the eye-peduncle. Thus in the Common Crab (*Cancer pagurus*), the Pea-Crab (*Pinnotheres*), and in *Ixa*, *Arcania*, *Ebalia*, and *Philyra* (among the *Leucosiadæ*), the peduncle is scarcely, if at all, elongated beyond the orbit, in the concavity of which it is articulated.

In *Gonoplax* (one of the "Quadrilateral" Crabs) Pl. XXI. Fig. 9, it is half an inch in length, and the eye is placed at its extremity. In *Podophthalmus vigil*, one of the very active pelagic forms of Indian Crabs, the eye-stalks are of prodigious length, and are furnished with a second articulation near the summit, enabling the eye to be directed more readily upon any special object. In *Ocypoda ceratophthalma* (Pl. XXI. Fig. 10) the eye is placed midway upon the peduncle, the eye-stalk itself being developed beyond the cornea in the form of a somewhat blunt spine. The same spine-like prolongation of the eye-peduncle beyond the eye itself is seen in *Gelasimus platydactylus*, one of the "Calling-crabs" common on the sea-shores of China and Japan (see Pl. XXI. Fig. 8). This character is not however, of more than specific value in either *Gelasimus* or *Ocypoda*, species occurring in both genera (all but identical in other respects), in which the eyes are really terminal in position.

In all these higher forms the eye-peduncle has an articulation at its base, and is protruded from or withdrawn into the orbital fossa at the will of the animal by the action of the peduncular muscles.

In the recent sessile-eyed forms no such provision exists, the *cornea* being but slightly raised above the surface of the head-shield, as indeed in most of the Trilobites. The *Trilobita* alone offer an example of a fixed eye raised upon an immoveable eye-stalk.

Among the *Isopoda* there is an interesting living form, the *Ceratocephalus Grayianus* (White MS.)³ from Flinder's Island, Bass's Straits (Pl. XXI. fig. 7), in which pseudo-eye-stalks (*p.p.*) are developed, but the eyes (*o.o.*) are at their bases on the sides of the

¹ For the original figures and description of this remarkable species of *Asaphus*, see Article XI. "Zwei Neue *Asaphus*-arten aus dem Silurischen Kalksteine des Gouvernements St. Petersburg," von N. Lawrow. Taf IV. and V., p. 239, in the *Verhandlung. der Russisch-k. Mineral. Gesell. zu St. Petersburg, Jahrgang, 1855-56.*

² In Bell's *British Stalk-eyed Crustacea* this has actually been done, but of course the *Stomapoda* are a perfectly distinct group.

³ The original specimens are preserved in the British Museum.

head-shield, not upon these horn-like prominences which have, however, a strong resemblance to the eye-pedicels of Trilobites. (Compare Figs. 1, 4, and 7, Plate XXI.)

Turning once more to the *Trilobita*, we have in our Plate, Figs. 3 and 5, illustrations of two species of *Asaphi*, *A. expansus* (Fig. 3), and *A. Kowalewskii* (Figs. 4 and 5), in which the specific difference appears to consist in the development of the eye-stalks in the one case and their suppression in the other.¹

Mr. Hollier's specimen of *Calymene* (Fig. 1) and the old *Calymene Blumenbachii* (Fig. 2) offer a perfectly parallel case to that of the two Russian forms of *Asaphi* (Fig. 3-5). I am, of course, assuming that some out of the many specimens of *Calymene Blumenbachii* (perhaps by far the larger proportion) had sessile eyes placed upon the cheeks of the glabella; but I feel equally certain that so soon as Mr. Hollier's discovery is made known, many long-eyed *Calymene* will be discovered at Wenlock; perhaps they already exist in the cabinets of some of our Dudley friends, *quien sabe?*

It will be for Mr. Salter to reconsider this genus when, with a fresh stock of health, which he has been accumulating at Malvern and in Wales, he again vigorously takes up his pen and pencil and completes his admirable Monograph on the British Trilobites.

In order however to protect Mr. Hollier's discovery from being overlooked for want of a distinctive appellation, I propose to christen his specimen *Calymene ceratophthalma*,² which (although a rather long name) expresses well its specific peculiarity.

In consequence of the terminations being somewhat cut away by the man who developed the specimen, I am unable to define well the extremities of the eye-pedicels, but I have used dotted lines in the Plate to indicate what their perfect outline appears to have been. With respect to the formation of the eye-stalk it will be observed, by referring to Fig. 4, that it is partly composed of the glabella and partly of the cheek, or "facial" portion of the head-shield, the suture, which divides these regions, being clearly seen in the figure passing up each eye-stalk; the extension of the border of the glabella, forming what may be aptly called the "superciliary border" above the cornea of the eye, whilst the prolongation of the cheek or "facial" border forms the lower and exterior portion of the pedicel.

If we compare the two forms of eye-stalks we shall perceive that in *A. Kowalewskii* (Figs. 4 and 5) the eyes are very erect, and diverge but slightly from each other; in *Calymene ceratophthalma* (Fig. 1) the eyes-pedicels are directed forwards, being little raised from the plane of the body, and diverge widely from each other, curving outwards and forwards. I am inclined to the opinion that the depressed plane of the eye-stalks is partly due to compression, and that, normally, they

¹ In the 4th edition of Murchison's "Siluria" (p. 357), a figure is given of the ordinary form of *Asaphus expansus*, Wahl., in which the eyes are quite sessile, and not at all elevated above the glabella, as represented at Fig. 3 in our Plate. Another example there figured, called variety *cornutus*, has its eyes more elevated than in our Fig. 3, but less so than in Figs. 4 and 5, Pl. XXI. The eyes in this front view are seen to diverge laterally, as in our *Calymene ceratophthalma*.

² From *κέρας*, a horn: and, *ὀφθαλμός*, the eye = horn-eyed.

would have been rather more elevated above the body; but they never could have occupied the same erect position which they do in *A. Kowalewskii*.

In glancing at the structure of the eyes in Insects we find only two genera with pedunculated eyes in the whole Class. These occur among the *Diptera*; *Diopsis subfaciata*, and *Achias oculatus*, having their eyes placed upon the extremities of long-fixed eye-stalks.¹

Further investigation will no doubt afford additional information on this interesting discovery, meanwhile I have thought it so important that I have at once recorded it, that those best able may add fresh evidence in correction or corroboration thereof.

EXPLANATION OF PLATE XXI.

Fig. 1. *Calymene ceratophthalma*, sp. nov. Wenlock Limestone, Dudley. Figured of the natural size. (The cheeks and tail slightly restored.) From the collection of Mr. E. Hollier, Dudley.

„ 2. *Calymene Blumenbachii*, Brong. Wenlock Shale, Dudley. Coiled-up specimen; natural size. Figured to show the usual condition of the eyes (o).

„ 3. *Asaphus expansus* (natural size) from the Lower Silurian, Pulkowa, Russia. Side-view of a coiled-up specimen preserved in the British Museum.

„ 4. *Asaphus Kowalewskii*, (natural size), Lower Silurian, Pulkowa, near St. Petersburg (front-view of a coiled-up specimen; natural size).

„ 5. *Asaphus Kowalewskii*, (side-view of same; natural size).

„ 6. *Encrinurus variolaris*, side-view of a specimen from Dudley, in the British Museum, showing the somewhat prominent form of the eyes. (Nat. size.)

„ 6a. One of the eyes of the same enlarged to show the position of the suture and the cornea of the eye.

„ 7. *Ceratcephalus Grayianus* (White, MS.) (enlarged three times) from Flinder's Island, Bass' Straits. Coll. Brit. Mus.

Showing the sessile eyes (o, o) and the pseudo-eye-stalks (p, p).

„ 8. Eye-peduncle of *Gelasimus platydactylus*, showing the prolongation of peduncle beyond the cornea of the eye.

„ 9. Eye-peduncle of *Gonoplax angulata*, showing eye at the extremity of same.

„ 10. Eye-peduncle of *Ocyropoda ceratophthalma*, showing prolongation of peduncle beyond the cornea of the eye.

II.—ON THE ELEVATION OF MOUNTAIN CHAINS,² WITH A SPECULATION ON THE CAUSE OF VOLCANIC ACTION.

By REV. O. FISHER, M.A., F.G.S.

IT is some months since I read a paper at the Cambridge Philosophical Society, to which reference has been made in your pages by Mr. Maw.³ I do not think that I shall be out of order in sending you a short outline of the substance of it.

Mr. Maw's letter in the March number of the MAGAZINE⁴ led me to calculate what the horizontal pressure at any point of a thin, outer spherical shell of the earth might be, and the result I obtained was that which Mr. Maw has already communicated to you from a private letter of mine. If you take into consideration a spherical shell of a few miles thickness, and conceive it for a moment unsupported by the matter within, then the horizontal pressure upon each

¹ Among the *Arachnida* there is a little spider in the genus *Walckenaera* (*W. acuminata*), the male of which has a tall and slender central fixed peduncle, upon which the eyes are placed, two at the summit and four midway on either side.

² See also Mr. Shaler's Article at p. 511.

³ Vol. V. p. 294.

⁴ Vol. V. p. 149.