

owing to the contortions of the strata in which these two zones occur, their precise relations are not clearly understood.

I append a list of the fossils of Dumfriesshire, in which a few species, not previously recorded, are included. It will be seen that there are a greater number of Llandeilo species than of Caradoc, many being common to the two formations elsewhere; and that there are very few Arenig (or Lower Llandeilo) forms. Many species have not, as yet, been found elsewhere.

<i>Graptolitidæ</i> HYDROZOA.	<i>Diplograpsus palmæus</i> , Barr.
<i>Corynoides calicularis</i> , Nich.	" <i>penna</i> , Hopk.
<i>Reticolites perlatus</i> , Nich.	" <i>pristis</i> , His. sp.
<i>Graptolitidæ</i> .	" <i>pusillus</i> , Hall, sp.
<i>Rastrites capillaris</i> , Carr.	" <i>tamariscus</i> , Nich.
" <i>Linnæi</i> , Barr.	" <i>tricornis</i> , Carr.
" <i>maximus</i> , Carr.	" <i>vesiculosus</i> , Nich.
" <i>peregrinus</i> , Barr.	" <i>Whitfieldi</i> , Hall, sp.
<i>Graptolithus convolutus</i> , His. sp.	<i>Cephalograpsus cometa</i> , Gein. sp.
" <i>Clingani</i> , Carr.	<i>Climacograptus bicornis</i> , Hall.
" <i>Halli</i> , Barr.	" <i>minutus</i> , Carr.
" <i>Hisingeri</i> , Carr. [Linn.]	(= <i>C. innotatus</i> , Nich.)
(= <i>G. sagittarius</i> , His. sp. non	" <i>scalaris</i> , Linn.
" <i>intermedius</i> , Carr.	(= <i>C. teretiusculus</i> , His. sp.)
" <i>lobiferus</i> , M' Coy.	" <i>tuberculatus</i> , Nich.
(= <i>G. Becki</i> , Barr.)	<i>Dicranograptus Clingani</i> , Carr.
" <i>Nilssoni</i> , Barr.	" <i>ramosus</i> , Hall.
" <i>Sedgwickii</i> , Portl.	ACTINOZOA ?
<i>Didymograpsus elegans</i> , Carr.	<i>Protovirgularia dichotoma</i> , M' Coy.
" <i>Forchhammers</i> , Gein. sp.	BRACHIOPODA.
" <i>Maffatensis</i> , Carr.	<i>Lingula attenuata</i> , Sby.
(= <i>D. anceps</i> , Nich.)	" <i>brevis</i> , Portl.
<i>Gladograpsus capillaris</i> , Carr.	<i>Siphonotreta micula</i> , M' Coy.
" <i>linearis</i> , Carr.	ANNELIDA.
<i>Helicograpsus gracilis</i> , Hall, sp.	<i>Crossopodia Scotica</i> , M' Coy.
<i>Diplograpsus angustifolius</i> , Hall, sp.	<i>Dexolites gracilis</i> , Hopk.
" <i>bimucronatus</i> , Nich.	<i>Neretes Cambrensis</i> , M' Coy.
" <i>dentatus</i> , Brong. sp.	<i>Tentaculites</i> , sp.
(= <i>D. pristiniiformis</i> , Hall.)	<i>Trichooides ambiguis</i> , Harkn.
" <i>folium</i> , His. sp.	CRUSTACEA.
" <i>minutus</i> , Carr.	<i>Discinocaris Browniana</i> , Woodw.
" <i>micronatus</i> , Hall, sp.	<i>Peltoecaris aptychooides</i> , Salt.
" <i>insectiformis</i> , Nich.	" <i>Harknessi</i> , Salt.

NOTICES OF MEMOIRS.

I.—NOTES ON THE OPHIURIDÆ.

By Dr. C. F. LÜTKEN, of the Zoological Museum in the University of Copenhagen.

[*Additamenta ad historiam Ophiuridarum*. Part 3. 1869. From the Transactions of the Royal Danish Academy of Science. Communicated by the Author.]

IN this paper I have given a general synopsis of all hitherto established genera of recent *Ophiuridæ*, with their chief characters in Latin, and a critical essay on the genera of fossil *Ophiuridæ*. This section of Palæontology is yet in a very unsatisfactory condition, owing partly to the unscientific manner in which D'Orbigny characterized his genera. Thus the genus *Ophiurella*, Ag., is established on *O. speciosa*, Münst. (from the Lithographic Limestone), and is

characterized chiefly by “un disque à peine distinct;” but this fossil is evidently a true species of *Ophiocoma*, having lost its disc, a very common accident with *Ophiuridæ*, especially when the disc is more or less soft. D’Orbigny’s *Ophiurella bispinosa* is only known from a short diagnosis, and should be more fully described. *Ophiura Griesbachii*. Wright (with a very distinct disc), has nothing in common with the typical species of the genus; its true position I cannot decide, it has the general aspect of an *Ophioglyphæ*, Lyman, (*Ophiura*, Forbes). The genus *Ophiurella* must of course be eliminated from the catalogue. The genus *Acrura* is based upon the *A. prisca*. Münt., of the Trias, a species that appears to be closely related to *Amphiura*, Forbes; and if it be retained as the type of a peculiar genus, it cannot be clearly defined. The best preserved fossil, *Ophiuridæ*, almost always want those organs of the superficial tegumentary system,—teeth, papillæ of the mouth and arms, spines, spinules, granulations, etc.,—which are so important for the determination of the recent species; they can therefore be referred but exceptionally to their true genera. Nor, if they belong to extinct types, can they be properly characterized, owing to their imperfect preservation. In some instances also the true arm-plates are more or less completely lost, and then all that can be said, is, that the fossil is a typical Ophiuroid, but of its affinities hardly a guess can be made; cases will be cited further on. *Acrura Cottaldina* and *A. subnuda*, D’Orb., are only known from insufficient diagnoses, and are therefore at present indeterminable. *A. Cornuelana*, and *A. serrata*, Roem., are probably best placed in the recent genus *Ophioglyphæ*, Lym.

Acrura Brodiei, Wr. is one of those very imperfectly known forms that might well be placed provisionally in the old genus *Ophiura*. Possibly *Aspidura loricata*, Goldf. is really the type of a peculiar genus, but I do not know how to characterize it satisfactorily. The characters given to all these genera by D’Orbigny are really valueless, and are based on no knowledge whatever of the characters of the recent Brittle-Stars. Count Münster’s figure of the same form is also incorrect; the star of small scales, filling up the aperture of the mouth, does not exist in nature; the animal had the typical mouth of an ordinary Ophiuroid. If Hagenow’s figure of *Aspidura Ludeni* (copied by D’Orbigny and Vogt as that of *Palæocoma Furstenbergii*!) be compared with the preceding species, a certain general resemblance of aspect will be found, but no evidence of generic identity. Picard’s *Aspidura squamosa*, and *A. coronæformis* would have been better placed with *Amphiura* or with *Acrura*. *Aplocoma* (*Haplocoma*?) *Agassizii* is quite indeterminable. I do not deny that *Geocoma carinata* and *libanotica* have some characters apparently in common: they somewhat recall badly preserved specimens of *Ophiothrix*, but I do not see any likeness between them and *Geocoma elegans* of Heller.

Three species have been referred to *Palæocoma*:—(1) *P. Cunliffei*, Forb., based upon some indeterminable fragments; (2) *P. Furstenbergii*, tolerably well known, nevertheless I dare not decide on its

true affinities; (3) the typical species, *P. Milleri*, Phill. (= *P. loricata*, Williamson), referred by such distinguished palæontologists as Forbes and Wright to *Ophioderma*. I have vainly sought for the cause of this arrangement, which is directly contradicted by the great radial plates, never to be found in *Ophioderma*. The same must be said of the other Liassic and Oolitic *Ophioderma* (*O. Egertoni*, *O. tenuibranchiata*, *O. Gaveyi*, *O. carinata*, and *O. Escheri*). I see no reason at all why they should not be referred to *Ophioglypha*; they must at least belong to a very closely allied genus; perhaps I should except *O. Egertoni*, specimens of which, in the museum at Copenhagen, have the general aspect of *Ophioderma*. *Ophi(y)coma granulosa*, Roemer, is quite indeterminable, but has nothing to do with *Ophiocoma*.

Of D'Orbigny's genera, some are identical with living genera (*Palæocoma* = *Ophioglypha*, *Ophiurella* = *Ophiocoma*), some must be rejected because their characters are based on the absence of some part of the external skeleton, owing to the imperfect state of preservation (as *Hylocoma*, *Ophiocoma*), while others may be retained (*Acrura*, *Aspidura*), but without definite limits or satisfactorily established characters.

So much for the genera of D'Orbigny! I shall briefly notice the other species of fossil Ophiuridæ, that I have found described or enumerated by the authors. *Ophiura Murravii* and *Wetherelli*, Forb. are justly referred to *Ophioglypha*; and perhaps also *Ophiolepis Ramsayi*, Wright, when it is more fully known. *Ophiura granulosa* and *subcylindrica* of Hagenow, and *O. olifex* of Quenstedt are quite indeterminable. *O. Bonnardi*, Oppel, is, I believe, undescribed.

Amphiura Pratti, Forbes, I formerly regarded as correctly determined, judging from the original figure and description; but after having seen those of later date by Dr. Wright, I do not know what to make of it. I cannot identify *Ophiolepis gracilis*, Allmann, with any recent species: if completely known in all its details, it would perhaps be the type of a peculiar genus. It is closely allied to *Amphiura*, but the long arm-spines are an aberrant character: they are, however, described as "rather short" by Mr. Walker. *Ophiura Gumælii*, Lindström, from the Jurassic strata of Spitzbergen, is referred by its describer to *Ophioglypha*, and especially compared with *O. affinis*, but it has some remarkable characters of its own, e.g. the deep fissures in the back of the disc between the radial scutes, and the peculiar club-like form of the arms.

From the formations older than the Trias, we only know some Silurian species, described under the names of *Protaster*, *Tæniaster*, *Eugaster*, and *Ptilonaster*. With the exception of a single very fine specimen of *Protaster Miltoni*, I can only judge of these genera from the descriptions and figures, but I am convinced that they are all true typical *Ophiuridæ*, having no affinities with the *Euryalidæ*, nor with the *Asteridæ*, as has been supposed. I do not believe that *Eugaster* and *Tæniaster* are separable from *Protaster*; the characters given are either of a slight value, generally, for the distinction of genera, or their real existence in nature appears rather doubtful.

With *Ptilonaster* the case is different, as this genus is stated to have a quadruple series of ventral (ambulacral) arm-plates in place of the double series in *Protaster*, etc. But after an examination of specimens of *P. Miltoni*, I have some suspicion that the superficial (dorsal and ventral) arm-plates, and the internal true ambulacral ossicles have sometimes been confounded together. In the *P. Miltoni* before me I can detect the scaled disc, the stellate mouth, the ophiura-like arms, the lateral arm-plates with the spines, and the internal ossicles (which are certainly neither bifid nor alternate, as stated in other species), and I believe that these true internal ambulacral ossicles have sometimes been described in *Protaster*, *Tæniaster*, etc., as double dorsal or ventral arm-plates. The characters of *P. Miltoni* are those of a true ophiuroid, and though the other species may be in some respects enigmatical, I have no doubt that they are, after all, true Ophiuroids. The "madreporite" is stated to lie on the back of the disc in *Protaster*, a position that certainly would be very aberrant. I can see nothing of this kind on the specimen before me, and do not think the statement to be confirmed by the figures published. In regard to Salter's *Palæocomma* (not to be confounded with D'Orbigny's genus), and the very analogous Devonian genus, *Aspidocomma*, Goldf., I am incapable of deciding whether they are *Ophiuridæ* or *Asteriadæ*, though I have studied specimens of the latter genus.

I venture to publish these remarks in the hope that a critical review of the fossil *Ophiuridæ*, from the pen of a Zoologist, who for several years has made the recent ones the subject of his studies, may be of some use, though the materials at my disposal are not rich. In order that this part of Palæontology may advance, more attention must be paid to the recent forms than has hitherto been the case. I will only add, that in an additional chapter I have discussed the intricate question whether *Harlania Halli* (*Arthropycus*, Göppert), from the Silurian beds of North America, is really a Fucoid, as supposed by most authors (compare the *Rhysophycus embolus* of Eichwald), and I have stated that I did not know any natural objects with which this fossil has a greater external likeness than the lower arm-branches of *Asterophyton*—leaving it to be decided, by those having plenty of specimens at hand, if this presumed cryptogamous plant should possibly turn out to belong to the animal kingdom, and to the tribe *Euryalæ*.

C. F. L.

REVIEWS.

I.—THE GEOLOGY OF ST. HELENA. By CAPT. J. R. OLIVER, R.A., 8vo., pp. 32, Jamestown, St. Helena, 1869. With a lithographed Plate of Sections, printed at the Royal Artillery Institution, Woolwich.

WE have in this pamphlet the results of a geological examination of St. Helena, by a Staff Officer lately residing there, who had not seen Mr. Darwin's work on "Volcanic Islands," chapter iv. of