

Lycett J. Note on the generic distinctness of Purpuroidea and Purpura, with remarks upon the purpuroid shells figured in the *Geol. Mag.* Plate VIII. Decade II. Vol. VII. 1880.// The geological magazine, 1881.- Dec. 2, vol. 8, №11.- p. 498-502.
<11.1881>

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latter is much the closer. The green chlorite schists, which are so marked a feature in Anglesey, are almost equally conspicuous in the Carnsore area; while the gneissose and granitoid types are also similar in both localities. In Anglesey, however, granitoid rock forms a thick band at the summit of the series, while, in Wexford, granitoid seams, usually of no great thickness, are intercalated with the green schists. It is also to be observed that if the strike of the Anglesey schist were produced to the south-west, it would pass through the Carnsore district. The massive, highly crystalline character of the Lewisian gneiss, together with the predominance of hornblende and micaceous constituents, strongly distinguishes it from the Carnsore schists.

These four types, Ordovician, Cambrian, Pebidian, and (?) Dimetian, are represented in this narrow band. All the groups have a prevailing strike to the west-south-west, but wherever observed, and sections described as critical were selected, there were no indications of a passage between any two of the formations.

I have recognized the Pebidians in other parts of Leinster, but their description lies beyond the scope of the present paper. It may perhaps be hoped that the discovery of this new series in Ireland will clear up some difficulties. The lithology of these rocks has obviously perplexed Irish geologists, and they have been referred to more than one formation. Their distinct mineral characters should, however, enable their distribution to be determined.

I had not intended to publish anything on Irish Archæan geology until I had visited other districts, but Mr. Kinahan's challenge seemed to call for reply, and I have ventured to contribute from my notes such facts as bear upon his views.

VII.—NOTE ON THE GENERIC DISTINCTNESS OF *PURPUROIDEA* AND *PURPURA*, WITH REMARKS UPON THE PURPUROID SHELLS FIGURED IN THE GEOL. MAG. PLATE VIII. DECADE II. VOL. VII. 1880.

By JOHN LYCETT, L.R.C.P.E., and M.R.C.S. Engl.

THE genus *Purpuroidea* was described by me in 1848 from three species in the Great Oolite of Gloucestershire, and published in the Annals and Magazine of Natural History, accompanied by woodcuts representing one of the species. Before that period M. Buvignier had described and figured three species of the same genus from the Coral Rag of France, Mem. Soc. Philomath. Verdun, 1843, accompanied by plates illustrating the species, which he assigned to the genus *Purpura*; these figures were for the most part insufficient for the purposes of generic discrimination, and founded upon specimens more or less imperfect; one of them was believed by me to be identical with the species figured in my woodcut, and was accordingly named by me *Purpuroidea nodulata*, the name of the species having been adopted from the *Murex nodulatus* of Young and Bird, which was also believed to be identical with the Gloucestershire species. At the period in question (1848) only one other Jurassic species attributed to the genus was known, viz. the *Murex tuberosus* of Sowerby's Mineral Conchology, tab. 578,

figured in 1827 from the Pisolite of Malton, a specimen so imperfect that it was stated by Mr. Sowerby to be but little better than a cast, and accordingly he did not venture to determine the genus with any certainty. I had, however, a conviction that Sowerby's shell (tab. 578) was identical generically, and perhaps as a species also, with the *Murex nodulatus* of Young and Bird, whose figure in the first edition of their work (1822) was assigned to the genus *Buccinum*. My description of the genus *Purpuroidea*, given in the Annals and Magazine of Natural History in 1848, was perfectly correct in definition, but had one disadvantage, that it did not include a close comparison of all the features which separate it from the living and Tertiary *Purpuræ*; at the period in question it was impossible to prove that all the species of *Purpuroidea*, represented by the few and for the most part imperfectly developed fossils then known, were destitute of an important generic feature possessed by *Purpura*, which I will now allude to. The shells of *Purpura*, both living and Tertiary, have a posterior respiratory excurrent or anal canal, forming an internal groove at the postæal junction of the outer lip with the columella; the groove is always well defined, and in none more clearly than in the little *Purpura lapillus* so common upon our coasts. The shells of the Jurassic *Purpuroidea* are all destitute of this feature, which is possessed also by some other recent genera of the *Siphonostomata*.

In 1852 appeared the splendid Atlas of Buvignier illustrating the Jurassic fossils of the Meuse, and containing finely executed figures of the three *Purpuræ* previously figured by him, and fully proving their distinctness from the Great Oolite species of England. Several years subsequently M. E. Piette described and figured three other species of our genus from the Great Oolite of the Ardennes and l'Aisne, Bull. Soc. Géol. France, tom. 13, pl. 12, 13, 14, pp. 290, 296; these also were all assigned to the recent genus *Purpura*, and one of them to the Gloucestershire Great Oolite species *P. glabra*. This I believe to be an erroneous identification. To these must now be added the figures of two species of *Purpuroidea* by Mr. Hudleston, occupying Plate VIII. in this MAGAZINE for 1880. There are therefore now known, described, and figured, six species of *Purpuroidea* in the Great Oolite, three in England and three in France; five species in the Corallian rocks, three in France, and two in England, to which may be added not less than two other species hitherto undescribed, but noticed by Mr. Hudleston, one in the Coral Rag of Yorkshire, and a small one in the Portland formation in the limestone of Portland; the eleven species already described are believed to be all separate forms. In mentioning three Great Oolite British species, I purposely omit the *Purpuroidea insignis*, Lyc., figured and described from a single specimen in my supplement to the Great Oolite, Monograph, p. 6, pl. 31, figs. 2, 2a, as I am now convinced that the specimen upon which that species was founded possesses only individual peculiarities common to an exceedingly variable form, one of which is not unfairly represented by the woodcut given in the Annals in 1848 above alluded to.

The figures of the French Great Oolite species given by M. Piette are very well executed. They are all more nearly allied to the British Great Oolite forms than are those of the Corallian rocks figured by M. Buvignier, and I will now also add, than the two Corallian forms previously figured by Sowerby, and by Young and Bird; they are, however, perfectly distinct forms, and will be readily admitted as such by any one conversant with the British Great Oolite species.

I will now offer some remarks upon the *Purpuroidea* shells figured by Mr. Hudleston upon Plate VIII. of this MAGAZINE for 1880. The figures 1, 2, and 4 are assigned by Mr. Hudleston to the *Murex nodulatus* of Young and Bird. These figures are fairly well executed. I have also the advantage of possessing a large specimen of the same form kindly forwarded to me by Mr. Hudleston; this example possesses a large portion of the test of the last volution, exhibiting the pattern of the ornamentation. I have also succeeded in developing the aperture, and especially the postéal portion, and thus prove that it does not possess the internal groove of *Purpura* above alluded to. Having also a recollection of the type specimen of *Murex nodulatus* of Young and Bird, in the Whitby Museum, examined by me many years ago, I am enabled to form an opinion upon that specimen, and to arrive at the conclusion that the brief description appended to the specimen in the second edition of that work (1828) is sufficiently accurate for general purposes, and that the perpendicular undulations upon the dorsal surface, each with its two nodes or tubercles, are very characteristic of the species, and sufficiently distinct from the handsome and elaborately ornamented shell represented by the Figures 1, 2, and 4, Pl. VIII. of this MAGAZINE, and by the specimen received from Mr. Hudleston. Holding this opinion, I submitted the specimen and figures to an old friend of mine, an eminent palæontologist, who was about to visit Whitby, and gladly accepted his offer to examine for me Young and Bird's type specimen; he also has the advantage of possessing a perfect knowledge of the Gloucestershire *Purpuroidea*. In sending to me a careful tracing of the *Buccinum flammæum* (so-called in the first edition of Young and Bird's book), he says, "I saw the original specimen at Whitby, it is a rough customer, and quite distinct from the beautiful shell you showed me, the undulations are so marked in Young and Bird's specimen." I would suggest, therefore, that the materials we possess relating to the remarkable specimens of *Purpuroidea*, Plate VIII. Figs. 1, 2, and 4, are scarcely sufficient to determine the species with certainty, but that apparently they represent a new, very handsome, and very variable example of that genus to which Mr. Hudleston's name might appropriately be attached.

I will also state that I have become convinced of the distinctness of all the Yorkshire Corallian forms of *Purpuroidea* from those of the same genus in Gloucestershire, and therefore that the Great Oolite *Purpuroidea* ascribed to the *P. nodulata* of Young and Bird was an erroneous identification, excusable I think, when the great variability of the Great Oolite species is considered, and due

allowance also made for the opposing difficulties to a correct knowledge of *Purpuroidea* which existed thirty or more years ago.

The front and back views of the shell upon the same Plate, 3, 3a, are, I am inclined to believe, correctly attributed to *Murex? tuberosus*, Sow. The supposed identity, however, rests upon the single specimen now figured, which was acquired by the late Mr. Leckenby only a short time before the transfer of his collection to Cambridge; the near resemblance which the surface ornaments bear to the *Murex nodulatus* of Young and Bird suggests the necessity for caution in deciding upon the separation or identity of those forms as species. Judging from the materials at present possessed by our museums and private collections, I am inclined to believe that the Corallian rocks of Yorkshire possess three species of our genus already figured and described: *Firstly*, the *P. tuberosa*, Sow., having a spire apparently as long as the aperture, and a subcylindrical figure of the last volution, exemplified by the very imperfect figure in the Min. Con. tab. 578, and by the shell in the Leckenby Collection, figured by Mr. Hudleston in this MAGAZINE, Pl. VIII. Figs. 3, 3a. *Secondly*, by the shorter spired species *P. nodulosa*, Young and Bird, of which the Whitby Museum has the type, and of which a cast may sometimes be discovered, named *Natica nodulosa*. *Thirdly*, the newly figured three specimens in this MAGAZINE, Pl. VIII. Figs. 1, 2, 4, a more ventricose species than either of the former, the spire more produced than in *P. nodulata*, and its surface more elaborately ornamented than either of the other species. The Jurassic *Purpuroidea* are limited to limestone formations. Its lowest known position is the Great Oolite of England and of France, we next discover it in the Corallian rocks of England and France, it has also lately been found in limestone of the Portland formation. The species were gregarious and appear to have occupied very limited areas both in their horizontal and vertical range. With much regret I find that at the quarry on Minchinhampton Common, which has been the most productive site for *Purpuroidea* in England, the genus is now exceedingly rare and a good specimen of any of its species has become a thing of the past generation. In the Corallian rocks a few miles to the southward of Malton, *Purpuroidea* has always been difficult to obtain excepting in the condition of internal moulds which retain no portion of the exterior surface.

After examining the figures of *Purpuroidea* already published, I would warn authors and artists to be more careful of the position of the specimen when it is intended to figure the aperture. The original woodcut (right-hand figure) published by me in 1848, although a somewhat rude engraving, exemplifies the figure of the aperture fully and accurately; it directly faces the spectator, and proves that the specimen was entirely without the groove of *Purpura*. The figure of the aperture of *Purpuroidea tuberosa* in GEOL. MAGAZINE, Pl. VIII. Fig. 3b, is equally satisfactory, but the aperture of the specimen, Fig. 2, upon the same Plate, has been so placed by the artist as to make the rounded columellar lip face the spectator, and conceals the more important postéal extremity of the aperture.

Of the Great Oolite of France, M. Piette's figures are similarly defective; of the three species, two apertures are given: one is decidedly without the groove of *Purpura*, the other has the postéal extremity of the aperture out of the view of the spectator. The Corallian species figured by M. Buvignier represent splendid specimens all of which are destitute of the *Purpura* groove. The apertures of *Purpuroides* in the Great Oolite Monograph by Professor Morris and myself are not so distinct as could be wished, but exhibit nothing opposed to the views here stated.

Upon reconsideration of the Figure 2, Plate VIII., in the absence of all knowledge of the dorsal surface of the last volution and the small portion of the ornamentation exhibited upon Figure 2, I wish to limit my remarks upon the presumed new species, to the shells figured 1 and 4, also to the large specimen in my possession.

VIII.—FURTHER REMARKS ON THE ORIGIN OF THE VALLEY SYSTEM OF THE SOUTH-EASTERN HALF OF ENGLAND, PROMPTED BY THE RESULT OF A BORING NEAR WITHAM IN ESSEX.

By SEARLES V. WOOD, F.G.S.

IN a paper in the *Phil. Mag.* for March, 1864, "On the Formation of the River and other Valleys of the East of England," I endeavoured to show by the aid of a rough map that the whole of the hill and vale system of that part of England which lies east and south of a line drawn from the Humber to the Cotteswold Hills originated in a series of concentric arcs spreading from two centres, one of which was near Canterbury, and the other just south of the western end of the Isle of Wight; the features thus produced having been rendered more apparent by the denudation to which the disturbances gave rise, and to which both at the time, and subsequently also, these gave direction. With that map I gave hypothetical lines of section along a radius of each of these systems of concentric arcs to show the fold which, if my view of the subject was correct, should be present throughout the whole line of each arc; though of course this fold was concealed from observation, except the chance occurred of there being an open section over it; and some two years afterwards I extracted from the one mile to the inch Ordnance sheets of this part of England, and reduced upon the ten miles to the inch map, the whole of these systems of arcs in minute and accurate detail. This map was bound up along with a Geological map which I had made of South Essex in a MS. memoir on the Glacial Beds of the East of England, which I presented to the Library of the Geological Society of London, where I presume it still is.

Though in various papers subsequent to that of 1864, both in the *Journal of the Geological Society* and in this *MAGAZINE*, I have incidentally endeavoured to direct attention to the subject, the only notice with which it has met, so far as I am aware, has been an incredulous smile from geological acquaintances if I ventured to allude to it; but between five and six years ago the Committee