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ON RHYNCHONELLA ACUTA AND ITS AFFINITIES.

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ONE of the most remarkable fossils assumed to be distinctive of a particular geological horizon, and which, from its very striking outline, most readily impresses itself upon the mind, is the *Rhynchonella acuta* of the Lias-marlstone, a Brachiopodous shell common at Stinchcombe, Churchdown, and other localities of this district, and well known elsewhere. Having paid considerable attention to the class to which it belongs, I have long abandoned the common practice of placing in the cabinet only those specimens which chance to accord with the forms figured and described as *typical*. Instead of doing this, I have selected, as good examples, those which manifestly have not been crushed or injured prior to their entombment and petrification; and these I have arranged in series illustrative of specific development.

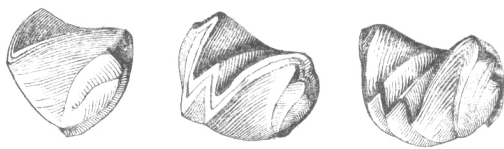
This mode of procedure has taught me that the species under consideration assumes forms varying from that under which it is most generally known; and it has led me to believe that several so-called species of various authors are, in reality, mere varieties of this.

All who have attentively studied the numerous Terebratulidæ of the Cotteswolds will have experienced the difficulty of assigning satisfactorily certain anomalous forms, occurring in beds ranging vertically from the Pisolite, or even lower, to the Cornbrash, to such well-established species as *Terebratula maxillata*, *T. perovalis*, *T. globata*, or *T. intermedia*, and will remember the remarkable varieties of individual character presented by other species, as, for example, *T. plicata*, *T. simplex*, *T. fimbria*, and *T. carinata*, sufficiently striking when studied in solitary examples, but, in an

extensive series, not suggestive of good and stable specific differences. The variability of character within recognized specific limits, then, being well known, I proceed to lay claim for *Rhynchonella acuta* to as great an amount of indulgence, in this respect, as for any of its congeners, referring in evidence to the specimens figured with this paper.

Its most common form is indubitably that figured by Sowerby, and other authors, which occurs in the Lias-marlstone of Gloucester and Somerset, in the Lias-marlstone and ironstone-series of Yorkshire, in France, part of Germany, in the Macigno d'Aubange, the equivalent of those deposits in Belgium, &c. ; but this I shall endeavour to show in the sequel to be an immature form, and that, in the succeeding stages, the species to which it belongs attains much larger dimensions, and a higher degree of development, than in the marlstone, although in that stratum it occasionally assumes characters of importance, as regards our present inquiries, which have not hitherto been formally noticed.

For example, it sometimes presents two mesial folds, as in Pl. IX. Fig. 3, from Churchdown ; and three mesial folds, as in Pl. IX. Fig. 2, from Stinchcombe. The scarcity of similar examples is, probably, not so much attributable to their rarity as to the intractable nature of the matrix in which they are imbedded, which renders the extraction of its most simple organic forms sufficiently difficult and laborious, and that of the more complicated still more so. A cursory examination will suffice to show that the examples referred to cannot be assigned to any other species than *R. acuta*, as they agree perfectly with the typical form in lateral outline, and differ from it in no other respect than in the number of mesial folds.



1.

2.

3.

1. *Rhynchonella acuta*.2. *Rhynchonella bidens*.3. *Rhynchonella triplicata*.

(Copied from Plate XIII., Phillips's Geology of Yorkshire.)

On comparing these with the figures of *R. acuta*, *R. bidens*, and *R. triplicata*, of Phillips, from the marlstone and ironstone-series of Yorkshire, it appears to me that that author has merely represented more aged examples of the two varieties before us as species distinct from the first-named.

Professor Morris, in the last edition of his "Catalogue of British Fossils," treats the difference of a plication, more or less, between *R. bidens* and *R. triplicata* as unimportant, although, instead of uniting these to *R. acuta*, and assigning to the three forms one specific name, he records them as synonyms of *R. variabilis*, one of the most widely-diffused brachiopods of the Lower Lias, and of which I doubt the occurrence in the marlstone of England, at least.

In certain localities, as at Frocester, a young or dwarfed form of *R. tetrahedra* constitutes the principal bulk of large masses of marlstone, and has, I think, been mistaken for *R. variabilis*; but in neither of these species can I discover any features at all suggestive of affinity with that under consideration. That Professor Morris may be mistaken is not improbable, from the fact that the two most recent writers on the Jurassic formations of England and the continent, Oppel and Quenstedt, have both found themselves somewhat perplexed as to the true affinities of these forms, perhaps, to some extent, in consequence of having adopted, without due examination, his views. Oppel, in his observations on *R. variabilis* ("Juraformation," p. 187), after stating that it is found in the Middle as well as in the Lower Lias, remarks, pertinently enough as regards the object of the present paper, that, "in Suabia it occurs particularly under the form of the biplicated variety (*R. bidens* of Phillips), which is found also at the base of the Middle Lias at Boll, Metzigen, Hinterweiler, and Balingen, with specimens possessing a greater number of folds (*R. variabilis* of Zieten, p. 42, f. 6, and *R. triplicata* of Phillips.)

Bearing in mind the fact that *R. variabilis* of Zieten is not the typical form recognized by Schlotheim or Davidson, it is clear that Dr. Oppel considers the forms just described as belonging to one species, and, in his observations on *R. variabilis* of the Lower Lias (p. 121), he appears disposed to limit its stratigraphical range to the Lower Lias only, in which case, of course, they are not varieties of the latter.

Professor Quenstedt, in like manner, in his recently-published "Jura," treating of *R. bidens*, Phillips, seems disposed to consider it and *R. triplicata* as varieties of *R. acuta*, distinctly pointing out their general resemblances; although German authors generally agree in stating that this species does not occur in the Suabian Alps.

Not to needlessly multiply quotations, I may yet briefly state that Davidson, in his Monograph on British Jurassic Brachiopoda, figures what he considers to be the *R. bidens* and *R. triplicata* of Phillips as varieties of *R. variabilis*, which he believes to range through the Lower and Middle Lias;* but, unless his figures are taken from the original specimens of Professor Phillips (and these were very ill drawn by the last-named gentleman), I discover nothing in his observations upon either species to modify the conclusions at which I have arrived from a comparison of the observations of all these authors.

Labyrinthine as appears to be the confusion of ideas in the statements cited, the clue appears to me to lie within grasp. Let us remember that the three forms, in one case, occupy the same zone, occasionally occurring together, at other stages or places one or other numerically preponderating; that the difference between *R. acuta* and *R. bidens*, in the opinions of authors and observers in every way entitled to respect, is no greater than between the latter and *R. triplicata*, being one of degree only and not of kind. The suggestion, therefore, naturally arises that they may really pertain to one species. Assuming that we are justified in arriving at this conclusion, all difficulties vanish. We simply learn the not uninteresting facts in its natural history—that the geographical distribution of one of the most characteristic shells of the stage to which it belongs was co-extensive with that of many of its usual companions, from which it would otherwise appear to be somewhat unaccountably separated; and that, in particular portions of the area which it occupied, it attained to degrees of development denied to it in others.

Having pointed out instances of the confusion of these varieties with species of lower stratigraphical range, I will now direct attention to one instance of *R. bidens* having been recorded as occurring in a bed higher than that in which it is usually looked for.

* In this monograph, Mr. Davidson gives his reasons from considering *R. bidens* and its synonym *R. triplicata*, as specifically different from *R. acuta*. His statements on this subject should be referred to.—ED. GEOL.

In Phillips's "Geology of Yorkshire," this marlstone shell, there first figured and described, is stated, at page 157, in the list of organic remains of the Inferior Oolite, to have been found by Mr. Ripley in the Dogger, at Glazedale. I have little doubt that, had Mr. Ripley's specimens been submitted to Cotteswoldian geologists, they would have been named *R. cynocephala*, and the close resemblance of certain forms of this shell to the former, which induced a practised observer to consider both specifically identical, suggests the expediency of inquiring whether they may not really be so.

Mr. Lycett finds *R. cynocephala* in the marly beds lying at the base of the sands which, in this district, usually rest upon the upper Lias, as at Nailsworth and elsewhere, although it has long been considered peculiar to the "Cephalopoda-bed" above those sands. It abounds at the Horsepools, Haresfield, and Frocester, where it presents three similar degrees of variety, attained to by those *R. acuta* in the marlstone. From the thin ferruginous earthy band dividing, at Haresfield, the "Cephalopoda-bed," into two portions, they are most readily extracted; the specimens are all more or less stunted in growth as compared with those from above or below; and there principally I have found the acute variety. The only recognizable feature of distinction between this and *R. acuta* is, that in the former the apex is not so much elevated, and is formed by a less acute angle than in the latter, approximating more nearly to its younger forms; although this difference of outline may partly be accounted for, by the fact that the marlstone, in the one case, only affords us casts, through the intractable nature of the matrix, while, in the other, the shells are exceedingly well preserved, exhibiting clearly lines of growth and perfect details of the states of maturity at which they had arrived.

With so great a constancy of form to a limited set of specific types as to perplex us, and to render essential the considerations of stratigraphical position in separating them, and with these derived from beds almost immediately following each other, it is not clear that valid grounds exist for their separation. All these forms indisputably have the same vertical range; they differ in no greater degree from each other than do the varieties of other universally acknowledged species. They appear and disappear simultaneously in strata of which they are everywhere some of the most remarkable fossils, and in which they are not associated with others that resemble them so much as to

justify the confusion of nomenclature which has hitherto prevailed with regard to them. Why, then, should we make four, if not five, species of that which is one only? It is not pretended by naturalists that the difference of a fold or two in shells of this genus marks more than a difference of age or of development; hence, assuming the foregone conclusions to be correct, I venture to state that neither of the forms noticed by the authorities cited, represents the full and perfectly developed condition of this species.

In a certain portion of the usually unfossiliferous sands near Painswick, intermediate to those beds in which *R. acuta* first becomes known to us and those in which *R. cynocephala* disappears, specimens occur with the latter, by no means rare, which, on the principles I have endeavoured to elucidate, must be referred to the same species. These specimens not only attain to a much greater size, but assume three or four mesial folds as their most common number. I have not found them elsewhere, nor have I seen them in any other collection than my own; but this happens probably from their having been considered unworthy of retention, on account of the imperfect state in which they are usually found.

I would remark, in conclusion, as lending additional force to my observations, that Mr. Hull considers the Terebratulina which occurs so abundantly in the Frocester and Haresfield beds* with *R. cynocephala* to be identical—and Mr. Davidson has, I believe, adopted this view—with *T. punctata*, a shell which occurs in the marlstone associated with *R. acuta*; we cannot, therefore, be surprised, from their manifest community of habit, that these two species should have gone through time together, from the period of their first creation to that of their final extinction.

I trust that these observations on the natural history of an extinct Brachiopod may not have seemed tedious: but I believe every true geologist will appreciate any endeavours to clear up errors or confusion, however small, with regard to any of his "time and tide" marks; while the possible demonstration of the wide divergence of varieties from their assumed types, as exemplified in this ancient species under varied conditions of existence, may not be devoid of interest to the physiologist in his investigation of phenomena of a similar nature.

* *R. rimosa* and *R. furcellata*, also middle Lias shells, have been found in these beds by Dr. Wright, of Cheltenham, and myself.