

XXV. *On Fossil Shells.* By LEWIS WESTON DILLWYN, *Esq.*
F. R. S. In a Letter addressed to the Right Honourable Sir
 HUMPHRY DAVY, *Bart. Pres. R. S.*

Read June 5, 1823.

MY DEAR SIR,

As fossil shells are more numerous, and generally occur in a better state of preservation than any other of the organic remains, they have become one of the most interesting objects for geological research, and there is such an exact conformity in the structure of many of these fossils with the living genera, as to render it in the highest degree probable, that the habits of their animals were also similar. By availing ourselves of these analogies, some circumstances attending the distribution of fossil shells may be observed which have hitherto escaped notice, and if you should find them to be sufficiently interesting, or likely to open a new door for enquiry, I beg that you will submit to the Royal Society the following observations on the fossil remains of the Molluscæ.

PLINY, in describing the shell fish which was supposed to yield the Tyrian die, has observed, ‘*lingua purpuræ longitudine digitali, qua pascitur perforando reliqua conchylia;*’ and LAMARCK says, that all those molluscæ whose shells have a notch or canal at the base of their apertures, are furnished with similar powers, by means of a retractile proboscis; and in his arrangement of invertebral animals they form a section of the Trachelipodes, with the name of ‘*Zoophages.*’ Whether all these Trachelipodes are possessed of the same predaceous powers of boring into hard substances, and whe-

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ther some of them may not subsist chiefly on dead animals, my own observations have led me greatly to doubt; but this notch or canal is made for the protrusion of a trunk, which is formed to answer the same purposes as the respiratory organs of a *Gastrobranchus*,* and may serve at once to distinguish a carnivorous species. The following fossil genera belong to this section of the Trachelipodes—*Conus*, *Oliva*, *Ancilla*, *Terebellum*, *Seraphs*, *Cypræa*, *Ovula*, *Volvaria*, *Marginella*, *Voluta*, *Mitra*, *Terebra*, *Buccinum*, *Harpa*, *Monocerus*, *Purpura*, *Cassis*, *Cassidaria*, *Strombus*, *Rostellaria*, *Triton*, *Murex*, *Ranella*, *Pyrula*, *Fusus*, *Cancellaria*, *Potamides*, and *Cerithium*.

In all the other genera of turbinated univalves, the lower margin of the aperture, instead of being either notched or channelled, is entire; and ADANSON, in his *History of Senegal*, so far back as 1757, has shown that the Molluscæ of these shells have jaws which are formed for feeding on vegetable substances; and they have been proved, by subsequent observations, to be entirely herbivorous, i. e. the marine genera feed on algæ, and the fresh water and land genera on the leaves of vegetables. These together constitute the other section of the Trachelipodes, which LAMARCK has called ‘Phytiphages,’ and it comprises the following genera of fossils—*Turritella*, *Turbo*, *Cirrus*, *Euomphalus*, *Trochus*, *Solarium*, *Delphinula*, *Scalaria*, *Natica*, *Nerita*, *Ampullaria*, †*Vivipara*, *Paludina*, *Melania*, *Planorbis*, *Cyclostoma*, *Auricula*, *Tornatella*, *Bulimus*, *Helicina*, and *Helix*.

* See Sir E. HOME’s observations on this animal under the name of *Myxine*, in the *Philosophical Transactions* for 1815, p. 261.

† I am unable to distinguish this genus from *Paludina*; and the name of *Vivipara* is calculated to mislead, for none of the species are more than ovi-viviparous.

Every turbinated univalve of the older beds from transition lime to the lias, which I have been able to procure, or of which I can find any record, belongs to these herbivorous genera, and the family has been handed down through all the successive strata, and still inhabits our land and waters. On the other hand, all the carnivorous genera abound in the strata above the chalk, but are comparatively extremely rare in the secondary strata, and not a single shell has been detected in any older bed than the lower oolite. As a proof of this rarity it may be remarked, in the list of British fossils which Mr. PARKINSON has given in his Introduction to the Study of Organic Remains, that not one single species of either of the carnivorous genera has been referred to any stratum below the London clay, and only the few following species appear in any of the numerous lists of the secondary strata which are given in CONYBEARE and PHILLIPS' Outlines of Geology, viz. a *Murex** and *Pleurotoma rostrata* in the green sand, *Cerithium melanoïdes* in chalk marle, and a few species of *Rostellaria* in various strata from chalk marle to the lower oolite. For the *Pleurotoma* and the *Cerithium*, a reference to the Mineral Conchology is given; and Mr. SOWERBY there only says that he has seen an imperfect cast, very like the former, from the canal at Devizes; and of the latter, that it was found in the London clay, and in the clay above the chalk at Newhaven. It is also worthy of remark, that all the above-mentioned *Rostellariæ* which have been found in secondary strata are nearly allied to the Linnæan

* Mr. GEORGE SOWERBY has sent me this shell with the name of *Murex calcar*, and if I am not much mistaken, I have seen another species of *Murex* from the green sand in the extensive collection of Mr. J. S. MILLER.

Strombus Pes Pelecani; and it may be observed that this species, when fully grown, has not any open canal at its base; and that in the figure which MULLER has given of the animal there is no appearance, nor in MONTAGU's description is any mention made, of that retractile proboscis or respiratory trunk, which are the distinguishing characters of a carnivorous Trachelipode. I therefore propose to remove these Rostellariæ of the secondary strata, which are readily distinguished by the remarkable expansion of their outer lips, to form a separate genus with PETIVER's name of Aporrhais and the other fossil Rostellariæ which have the recent *Strombus fissus*, for their type are only to be found in strata above the chalk.

Small circular holes, which have been bored by the predaceous Trachelipodes, are frequently found in recent shells, and I have seen exactly similar holes in many fossils, but they have all been taken from the London clay or crag; nor have I been able to find any such appearance in any fossil of the older formations. If this observation should be confirmed by a more extended examination of other cabinets, it will prove that neither the Aporrhaides, or any of those few undoubtedly carnivorous species which have been found in the secondary formations, were furnished with any such predaceous powers as PLINY has described, and that they belong to a subdivision of the Trachelipoda zoophaga, which feed only on dead animals. Without attempting to distinguish the more predaceous from these other genera, I shall however at present content myself with proving, and for this I have adduced sufficient evidence, that the whole family of the carnivorous Trachelipodes are extremely rare in all those strata where the Ammonites and other Nautilidæ abound.

In describing the Ammonites, DE MONTFORT, in his *Conchologie Systematique*, observes, that they are found of all sizes, “ depuis la grandeur d’une Lentille jusqu’a celle de 8 pieds de diametre ;” and, as a proof of their great abundance, LAMARCK says, “ La route d’Auxerre à Avalon, en Bourgogne, est ferrée avec des Cornes d’Ammon.” These Ammonites, as well as most of the other principal multilocular genera, appear to have become extinct in our northern latitudes when the chalk formation was completed ; but a few of the Nautilidæ still inhabit the southern ocean, and their molluscæ belong to the carnivorous order which LAMARCK has described under the name of Cephalopodes. From the occurrence in such great numbers of the carnivorous Trachelipodes in the formation above the chalk, it therefore appears, that the vast and sudden decrease of one predaceous tribe has been provided for by the new creation of many genera, and a myriad of species possessed of similar appetencies, and yet formed for obtaining their prey by habits entirely different from those of the Cephalopodes.

It may be farther observed, that all the marine genera of the herbivorous Trachelipodes to which either of the fossil species belongs, are furnished with an operculum, and that the few carnivorous species which have been found in the secondary strata, agree with them in this particular, although the unoperculated genera are very abundant in the London clay. LAMARCK, of the fresh water Trachelipodes says, that those which are not furnished with an operculum are formed for the occasional respiration of air ; but I believe that this observation is not applicable to the marine genera ; and it was ADANSON’S opinion, that the operculum is intended for the

protection of the animal ; nor can I imagine any thing against which such a shield would be more necessary than the long and pliable fingers of the Cephalopodes, when they abounded in the seas, as they must formerly have done. It is, therefore, at least a curious coincidence, that all the marine Trachelipodes of the transition and secondary strata, of which I can find any record, belong to genera which are furnished with an operculum, and that none of the numerous unoperculated genera should have been found in any other than the tertiary formations where the Ammonites disappear. For the protection of the testaceous Gasteropodes no such shield would be wanting, and including this order it may be generally observed, that none of the marine unoperculated Molluscæ, except the Cephalopodes, are to be found in the lias, or in any of its older strata ; and it appears to me that a much greater approach towards the same variety of testaceous animals which now inhabits our seas is to be found in the adjoining bed of lower oolite.

The foregoing observations are confined chiefly to British fossils ; for as a few of the testaceous Cephalopodes still live in the warmer climates, it is possible that the Ammonites, as well as some others of the extinct genera may have existed longer, and that their remains may be found in the tertiary formations of the more southern latitudes. Although fossil Nautilidæ are common in the secondary strata of the United States, they are said not to have been found in South America ; and it may therefore be queried whether the Cephalopodes were not confined to the more northern latitudes when the chalk formation was completed, and whether a decrease in the earth's temperature at that period may not have occa-

sioned the entire destruction of some genera, and a migration of others to the southward.

It is highly probable, when a more perfect knowledge of the testaceous animals has been obtained, that the line of enquiry which I have now suggested may be greatly extended, and the collected tendency of such analogies between the habits of living animals and the organic remains of the different strata, may serve to throw some light on the nature of the changes which the surface of our planet has undergone.

I am, my dear Sir,

Yours very sincerely,

L. W. DILLWYN.

*Penllergare,
May 19, 1823.*