

On the SPHEROIDAL BODIES, resembling SEEDS, from the LUDLOW BONE BED. By JOSEPH HOOKER, M.D., F.R.S. F.G.S.

THE fossils in question consist of spherical bodies varying in size from 1 line to $\frac{1}{4}$ of an inch ; they have suffered no compression nor mutilation during their conversion into mineral matter. The surface is nearly smooth and uniform to the naked eye, but seen under the microscope to be covered with circular or hexagonal areolæ, placed in contiguity in the latter case.

Fractured specimens show them to be hollow spheres, whose walls are fully twice as thick as the cavity they enclose. Their contents consist of a little loose white powder, of mineral matter, displaying no organic structure.

The walls (or integument) consist of a single series of narrow hexagonal cells, placed side by side, radially. The cell-walls are very thin, and exhibit no markings, nor are there any intercellular spaces. No vascular tissue is observed in any part, nor remains of any outer integument.

This simple structure of spore-case is very characteristic of the natural order *Lycopodiaceæ* and of the allied fossil genus *Lepidostrobus*, and I am not aware of any other order to which these fossils may more safely be referred. In their spherical form they differ from any known spore-case of this alliance, but mere form is a character of very minor importance in such organs, suggestive of specific only and not of generic difference.

In the great thickness of the walls and consequent length of the radiating cells forming the latter, they differ conspicuously from any recent or modern spore-case with which I am acquainted.

The great difference in size of the specimens, unaccompanied by any other character, is remarkable, as is the apparent absence of any point of attachment. The latter is probably due to contraction of the tissues, and cannot be regarded as any evidence of these fossils having been seeds or spores rather than the cases in which such are contained ; for in some of the best specimens of *Lepidostrobus* which I have examined, there is no evident attachment between the spore-case and the modified leaf or scale which supports it, and through which it was nourished in its progress to maturity.

The accompanying fossil-wood presents very obscure traces of structure, and none on a cursory examination that throw any light upon the origin of the spherical bodies ; but I have not had time to adopt the usual means for making a satisfactory examination.

3. *On the SUPPOSED FISH REMAINS figured on Plate 4 of the 'SILURIAN SYSTEM.'* By Prof. F. M'COY, F.G.S.

HAVING pointed out to Sir Roderick Murchison, about two years ago, the great resemblance which the so-called *Onchus Murchisoni* (fig. 10 of the above plate) bore to the slender didactyle pincers of a

Silurian Crustacean which I have figured in the first Fasciculus of the 'Cambridge Palæozoic Fossils,' Pl. 1. E. fig. 7, under the name *Pterygotus* (*Leptocheles*) *leptodactylus*, it occurred to him that examination might prove some of the other remains described by Prof. Agassiz as fishes in the 'Silurian System' to belong to the same class, and he accordingly sent me all the specimens, now accessible, figured on that plate, to examine and report upon. The specimens sent to me only belonged to the *Thelodus parvidens* and *Onchus tenuistriatus*, together with a fragment called on the plate "an Ichthyodorulite" (figs. 63 & 64), but I venture a few observations on all.

Figs. 1, 2, & 3, supposed to be shagreen of *Sphagodus*, I cannot determine without seeing the specimens.

Figs. 4 & 5; although these scale-shaped markings are stated to belong to a fish called *Pterygotus problematicus*, still M. Agassiz, in his volume on the Fishes of the Old Red Sandstone, very properly removes this genus from the class of Fishes and places it in its true class, *Crustacea*. I have suggested, in the work on the Cambridge Fossils, that *Pterygotus* belonged, not to the Macrurous Crustacea, but to the group *Pæcilopoda*, allied to the recent *Limulus* or King-crab, and recent discoveries published in this Journal confirm this opinion*: the supposed fish-tooth (fig. 6) called *Sphagodus pristodontus* would in this case, almost certainly, be not a fish (to no known tooth of which has it any accurate analogy), but the masticating, serrated edge of the basal joint of one of the feet surrounding the mouth of the same *Pterygotus*, the sculpturing of whose carapace is represented by figs. 4 & 5.

The genus *Pterygotus* is divisible into two subgenera: 1. *Pterygotus* proper, in which the didactyle claws are very thick and armed with powerful teeth; 2. *Leptocheles* (M'Coy), in which the pincers are very slender and unarmed. As before mentioned, figs. 9, 10, & 11, representing the so-called *Onchus Murchisoni*, Ag., are almost identical in form, size, sculpturing, and all other characters (as far as they are represented in these drawings), with the distinctly didactyle pincers which I have figured (Brit. Pal. Foss. pl. E. fig. 7) from Leintwardine, under the name *Lept. leptodactylus*, in which the two fingers occur, *in situ*, removing all doubt as to its true nature. If this approximation prove correct, the fossil should in future be called *Leptocheles Murchisoni* (Ag. sp.); and I might add, that the number and relative position of the fragments on the stone figured, instead of being singular, as supposed, would thus be nearly natural. I might further remark, that the drawing shows no attenuation at the base of these supposed fish remains, nor any of the other distinguishing characters of Ichthyodorulites. As this specimen unfortunately cannot now be referred to, great importance attaches to the fragment (fig. 64) called simply "an Ichthyodorulite" on the plate, the right-hand extremity of which so exactly coincides with the sup-

* See Mr. Salter's observations on *Pterygotus*, Quart. Journ. Geol. Soc. vol. viii. p. 387.

posed *Onchus Murchisoni* in diameter, sculpturing, and number of ridges, that it is exceedingly probable they are the same. Now this specimen I have examined, and have no hesitation in stating decisively that it is not an *Ichthyodorulite*, and that it is one of the fingers of the claw of a *Leptocheles*; for in the first place, the base, instead of being abruptly attenuated like the dorsal ray of a fish, is dilated, and both it and the longitudinally grooved portion are merely the internal cast of a hollow, fragile, cretaceous crust, only equalling the lower dark outline of the drawing (or stout paper) in thickness, as in the legs of ordinary Crustacea. These two characters are decisive against the fossil being a fish-defence.—Fig. 63, called an “*Onchus*,” is on the same stone with the last specimen, and from the analogy of the second pincers which I have figured as above of *Leptocheles leptodactylus*, I have no doubt it is the last or moveable joint of a smaller pair of claws of the same *Leptocheles Murchisoni*, for the analogy pointed out between the *Pterygoti* and the *Limuli* prepares us to expect several pairs of didactyle pincers of different sizes and proportions in the one individual.

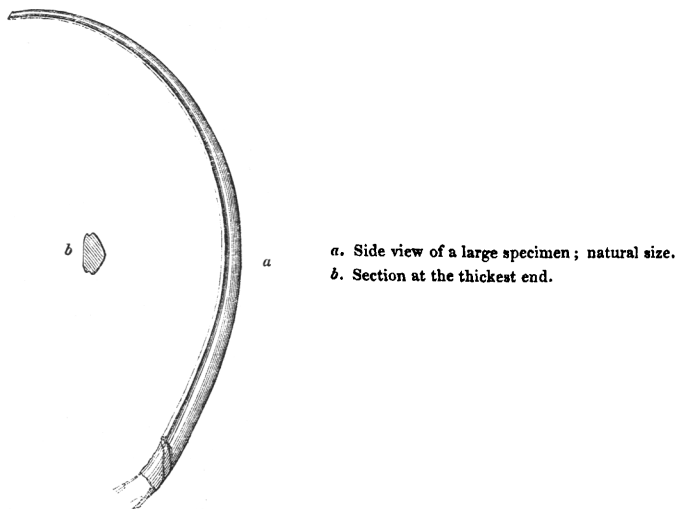
I have mentioned that the typical *Pterygotus* had the claws armed with strong teeth, as in the common lobster; this is well seen in Agassiz' figure of the pincers of the *Pterygotus Anglicus* of the Old Red Sandstone, and to the genus as thus restricted I have no doubt the supposed fish teeth and jaws belong, figured under the numbers 14, 15, 16, 17, 18 to 32, and 60, 61, 62, under the names *Plectrodus mirabilis*, *P. pliopristsis*, and *Sclerodus pustuliferus*. Why separate generic names should have been given to fragments so identical as *Plectrodus mirabilis* (figs. 15 & 16) and *Sclerodus pustuliferus* (fig. 62), I cannot divine. As one of these specific names expresses a character distinguishing this *Pterygotus* from the large one of the Scotch Old Red Sandstone, it should have the preference, and these fossils might stand in future lists as *Pterygotus pustuliferus* (Ag. sp.) = *Plectrodus mirabilis* + *P. pliopristsis* + *Sclerodus pustuliferus*, Ag. Any reflecting comparative anatomist looking at fig. 14, will agree, I think, in the opinion that no known fish-tooth, recent or fossil, has the slightest structural analogy to warrant comparison with it for a moment; and on the other hand, the most casual observer can trace identity with the tooth-like tuberculation on the claws of the common lobster.

Having disposed of the spurious fish-remains, I may state that the *Onchus tenuistriatus* (figs. 12, 13, 57, 58, 59) is an undoubted *Ichthyodorulite*. Not only all the external characters indicate this, but on submitting a transparent section of one of the fragments scattered through the rock to a high magnifying power (with the kind aid of Mr. Carter), I am able to state positively the existence of the Purkinjian bodies and true microscopic structure of bone therein. This example of a Silurian Fish is, therefore, perfectly correct; and it only remains to add, that all the specimens of the Downton Castle rock which I have examined, impress me strongly with the conviction that the last name on the list, the *Thelodus parvidens*, should be considered not as that of a fish-tooth, but of granules of the skin or

shagreen of the same fish, in all probability, of which fragments of the bony dorsal rays (*Onchus tenuistriatus*) are so common intermingled in the same mass. M. Agassiz, judging only from the drawing (figs. 34, 35, 36), supposed these magnified and isolated specimens to resemble teeth of the general character of *Lepidotus*; but one glance at the specimens would dissipate this notion, when we find that they are square and not rounded, that they are as small as grains of fine sand, and occur in such abundance over large patches of rock as to resemble thick layers of sand. All these points speak against their being teeth, but are in accordance with the supposition of their being the earthy grains or shagreen of the skin of large cartilaginous fishes; and, finally, having made an examination of transparent sections in a powerful microscope, I found, instead of the close dentine of the teeth of *Lepidotus*, only the loose divaricating tubular structure usually found in such dermal armature as has no grinding duty to perform.

Postscript.—The specimens forwarded to me, from the Collection of the Geological Society, as supposed *Ichthyodorulites* from the Wenlock limestone of Whitfield, Tortworth, are the nacreous, shelly tubes of a new species of *Serpulites*, which I name *S. perversus* from the singular character of the general curve of the fossil being in a plane at right angles to that in which the tube is compressed. The average length is 3 inches, and width $2\frac{1}{2}$ lines at the large end.

Serpulites perversus (M'Coy), from Whitfield Quarry, near Tortworth, Gloucestershire. Collected by T. Weaver, Esq., F.G.S.



a. Side view of a large specimen; natural size.
b. Section at the thickest end.