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VII. *An Account of some minute British Shells, either not duly observed, or totally unnoticed by Authors. In a Letter to Sir Joseph Banks, Bart. P. R. S. by the Rev. John Lightfoot, M. A. F. R. S.*

Read January 26, 1786.

DEAR SIR,

AS you were pleased to think a few shells, which I lately submitted to your inspection, might not be unworthy the notice of the Royal Society; encouraged by so respectable an opinion, I shall now beg leave to lay before you some Drawings which I have caused to be made of them, together with such remarks concerning them as may tend, in some degree, to illustrate their natural history.

The first I shall mention is an univalve, coiled up into a spiral form, the cavity of which is divided into three, four, or more distinct chambers or apartments by solid transverse *septa*, which communicate with each other by a *triradiated* aperture.

These characters accord with no genus of shells, hitherto established, so well as the *Nautilus*. It is true, it has not so many chambers as others of that genus, nor are the apertures of the *septa* of a *tubular* form; but as these, according to the laws of method, are to be considered as marks of a *specific* rather than *generic* nature, so I shall not hesitate to refer the shell under consideration to the family of *Nautilus*, at least till

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we are authorized, by the discovery of many more of a similar structure, to rank it under a new genus.

That I may give a more full and specific description of this singular shell, it must be observed, that its figure is a flattened spiral, umbilicated on one side, convex on the other, but yet slightly depressed in the centre, measuring in diameter about a quarter of an inch; that it is generally coiled up into four volutions, which are convex above, and so nearly plane beneath as to form an acute or carinated margin; and that each of these volutions, on the upper side, has a narrow thread-like border or fillet on the interior edge. The front view of the mouth is obliquely semioval, the upper edge projecting farther than the lower.

The substance of the shell is very brittle and pellucid, and, when alive, of a reddish brown or chestnut colour throughout, except about three or four faint white lines, which appear like rays running from the central umbilicus to different and nearly equidistant parts of the circumference. These white lines are not straight, but shaped each like a short curve, or comma, on the upper side, and are nothing else but the shades of the *septa* in the cavity of the shell.

Such is its *external* appearance. The internal structure is extremely curious; for the whole cavity is divided into three, four, or five chambers or compartments (according to the age of the shell) at nearly equal distances, by transverse *septa* of a hard white brittle semipellucid substance, resembling agate or enamelled glass. Each of these *septa* has a triradiated aperture not unlike the Greek capital upilon, or the Roman Y, inverted, (X) through which the animal, by means of its soft compressible and extensible nature, easily contrives to extrude

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itself,

itself, as much as is necessary, when in search of food, or in the act of moving from one place to another.

It may not be amiss here to observe, that the *septa* above-mentioned are totally foreign, both in *use* and *structure*, from what are called *opercula* in other shells: I mean those temporary covers or stoppers, made use of by many testaceous animals to close up the mouths of their shells, and defend them from injury in their quiescent state.

The *opercula*, however various in substance, are always observed to be *single*, *imperforate*, *moveable* at the will of the animal, and constantly placed, as a security, in the *mouth*, never in any *other part* of the cavity of the shell; whereas the *septa*, in the subject now before us, are repeatedly constructed in several parts of the cavity, are all of them *perforated*, intimately connected with the substance of the shell, and consequently *fixed* and *permanent*, as in all the *Nautili*.

And as to the *use* of these *septa*, though I dare not say what might be the real intention of nature in their formation, yet it will be no presumption to affirm, that they could not be designed for the same purpose as *opercula* in other shells; not only because they are placed where they cannot answer the same end, but more especially on account of their open structure, which intirely excludes them from the possibility of affording a proper defence to the enclosed animal.

Should it be said, that they only serve to point out the different *periods* or *stages* of the shell's growth, and are nothing else but the *limits* or *terminations* of the animal's periodical increase, I will not dispute the opinion; it may perhaps be very true; but supposing it to be so, is it not equally probable, that the transverse *septa* in *all* the *Nautili* are nothing else?

But

But I must not conclude my remarks without taking some notice of the *inhabitant* of this singular shell. It appears to be of the *slug kind*, but differs from the common *land* sorts in this respect, that the *Antennæ* are *filiform*, and the eyes not placed upon their *summits* and *retractile*, but fixed upon the *bead* near their bases, as is probably the case in all the truly *aquatic* kinds, at least in all such as I have hitherto examined. The animal is of a soft and flexible nature, and grey brown colour, and has a power of extending itself out of the shell through the aperture of the exterior *septum*; at which time it assumes a *triradiated* shape, not very dissimilar from the aperture itself, or like an inverted Y ( $\lambda$ ), the thickest ray of which is the head and body; one of the lines which form the angle is the tail, and the other is a kind of dorsal ligament, which extends from the back of the animal, through one of the rays of the aperture, and through the whole cavity of the shell, and all its *septa*, to the centre, as may be seen by placing the shell between the eye and the light (see fig. 3. Tab. I.).

In the concise LINNÆAN mode of description this shell may be named,

*Nautilus (lacustris)* testa spirali compressâ umbilicata carinata, anfractibus tribus supra convexis contiguis, apertura femiovata, septis triradiato-perforatis.

The Fresh-water *Nautilus*.

I find no author who has taken any notice of this shell, except Mr. WALKER, who, in his late curious publication on *Minute Shells*, has described it under the name of

*Helix lineata* dorso convexo umbilicata margine acuto; and has given a figure of it in the same work, Pl. I. fig. 28.

But this ingenious gentleman is free enough to confess, that its *chambered structure* had entirely escaped his notice;

otherwise he would doubtless not have ranked it among the *Helices*.

The place where the shell is to be found, is in deep ditches of clear water, adhering to the roots of *Carices*. It was collected near Upton Church, not far from Eton, in Buckinghamshire, in the spring season. Mr. WALKER reports it to be found on flags in Hornhill Brooks, in Kent, but very rare.

The figures annexed will explain what I have been describing much better than words.

Fig. 1. (Tab. I.) The shell of its natural size, with the umbilicated side uppermost.

2. The same with the depressed side uppermost; the dark shade in both shewing how far the cavity of the shell is occupied by the dead animal included.

3. The shell magnified with the *depressed* side uppermost, shewing the live animal within it, its head and *antennæ* protruded. Here the white lines appear double, being the shade of the *septa* on both sides of the shell.

5. The same magnified with the *umbilicated* side uppermost, the head and under side of the animal appearing to view.

4. The same magnified in a perpendicular view, with the mouth in front, but cut away down to the first *septum*, in order to shew not only the *carina* or keel of the shell, but more especially the exact appearance of the triradiated *septum* nearest the mouth, and in what manner the animal contrives to extrude itself through the aperture, the head and tail being accommodated to pass through two of the parts of the inverted Y ( $\lambda$ ), while the *dorsal ligament* occupies the third.

8. The animal's excrement.

6. 7. Horizontal sections of the shell, in order to shew the internal structure, or the appearance of the *septa*, when the shell

shell is ground down or divided in that direction. Fig. 6. shewing the shell ground away in part, with its umbilicated side uppermost. Fig. 7. the same more deeply and evenly ground, with the depressed or more convex side uppermost.

The *second* shell I shall take notice of has much of the same external face with the preceding, and is nearly of the same size and colour, but materially differs from it in having an uninterrupted cavity from the mouth to the center; that is, *no divided chambers or compartments*. This therefore evidently belongs to the genus of *Helix*.

It is strongly umbilicated on one side, and almost plane on the other, the central wreaths being nearly of equal height, or but slightly depressed, and destitute of that narrow border or fillet mentioned in the preceding shell. It consists most commonly of three volutions, convex on both sides, with an obtusely carinated margin, and semioval mouth.

It may be named,

*Helix (fontana) testâ compressâ obtusè carinata, hinc umbilicata, anfractibus tribus utrinque convexis, apertura semiovata.*

Fountain Helix.

The figures here given represent this shell, on both sides, in its natural and magnified state, so that more words to describe it are needless.

Fig. 1. (Tab. II.) The shell of the natural size, with the most convex side uppermost.

2. The same, with the umbilicated side uppermost.

3. The shell magnified, the most convex side uppermost.

4. The same magnified, the umbilicated side uppermost.

I do not find that it has been noticed by any author.

It was found in the bottom of a spring of clear water, adhering to the under side of rotten leaves, near Bullstode, in Buckinghamshire, in the month of April. It has also been found in some other clear waters in the same neighbourhood, but not common.

A *third* shell I have to mention is a very minute but curious *Helix* of a subconical form, consisting of about five convex wreaths, gradually diminishing towards the apex. The shell is umbilicated at the base, and the wreaths are transversely surrounded with numerous sharp-edged rings, which are produced in the middle or back of each wreath into a kind of spur, formed of compressed and very tender spines. The mouth is a segment larger than a semicircle, but not round enough to constitute the shell a *Turbo*, to which it is nevertheless nearly allied. The colour of the whole shell is brown.

It may be named,

*Helix (spinulosa)* testa subconica umbilicata, anfractibus 5 convexis, annulis membranaceis acutis cinctis, dorso spinuloso-carinatis, apertura suborbiculari.

Tender prickly *Helix*.

The figures here given represent this shell in different positions, in its natural and magnified state.

Fig. 1. 2. (Tab. II.) The shell, in different positions, of the natural size.

3. 4. 5. The same magnified.

I know no author who has hitherto noticed it.

It was found near Bullstode, at the foot of pales, upon old bricks and stones, after rainy weather, in June and July.

A *fourth*

A *fourth* is a minute shell of the *Turbo* kind.

It strongly resembles the depressed *Helices*; but its circular mouth forbids its being ranked in that *genus*.

It consists of four cylindric or rounded volutions, of nearly equal height on one side, but sunk or umbilicated on the other. These volutions are transversely surrounded with numerous sharp-edged membranaceous rings, which are very fragile and deciduous. The mouth, when perfect, is bordered with a compressed erect margin. The colour of the shell is uniformly brown.

It may be named,

*Turbo (helimus)* testa depresso-plana, hinc umbilicata, anfractibus 4 torosis, annulis numerosis acutis membranaceis cinctis.

The fine-ringed *Turbo*.

The figures herewith exhibit both sides of the shell, in its natural and magnified state.

Fig. 1. 2. (Tab. III.) The shell, on both sides, of the natural size.

3. 4. The same, on both sides, magnified.

No author, that I know of, has described it.

It was found near Bullstode, upon bare stones, in the spring season, and at other times in moist weather.

The *fifth* and *last* shell I have to mention, is a small thin oblong compressed *Patella*, of a horn colour, about a quarter of an inch long, and one-tenth of an inch wide, having a pointed vertex nearest to the lower end, turned downwards, and leaning to one side.

It may be called,

*Patella*.

*Patella (oblonga) testa integerrima oblonga compressa membranacea, vertice mucronato reflexo obliquo.*

Oblong fresh-water Patella.

It is perfectly distinct from the *Patella lacustris* of LINNÆUS both in shape, and flexure of the vertex, as well as being destitute of radiated streaks.

Fig. 1. 2. 3. and 4. (Tab. III.) The natural size in different attitudes.

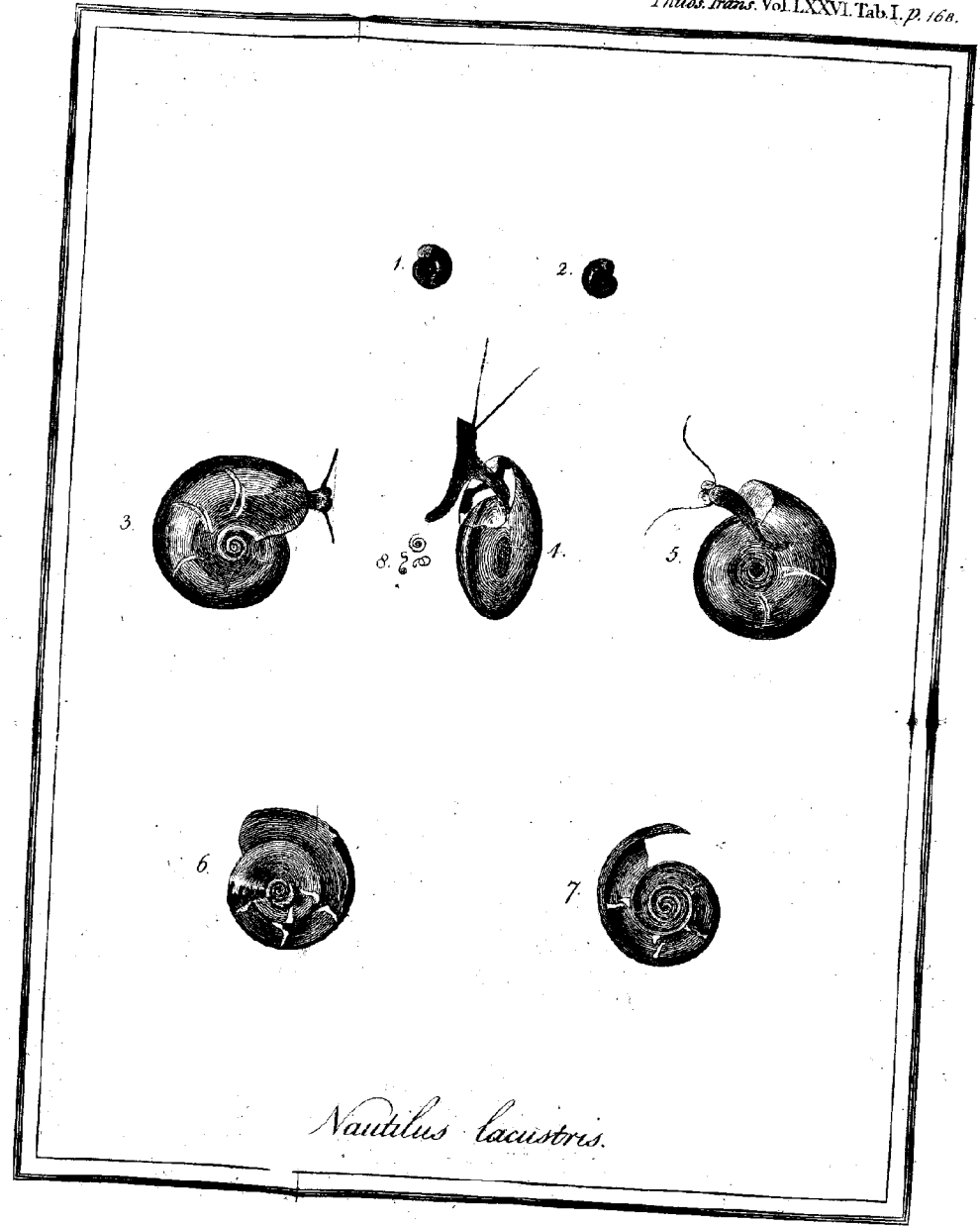
5. A shell magnified, with its vertex upward.

6. *Patella lacustris* LIN. shewing the plan of the two different species.

It has escaped the notice of all the authors I am acquainted with.

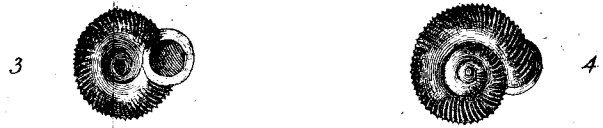
It was found adhering to the leaves of the *Iris Pseudacorus* in waters near Beaconsfield, in Buckinghamshire, by Mr. AGNEW, Gardener to the late Duchess Dowager of PORTLAND; by whose sagacity all the preceding shells were discovered, and by whose faithful pencil they were drawn.

I have now done with describing the shells I intended; but before I conclude, it may not be thought, perhaps, quite foreign to my present subject, to remove, in some degree, an error which has been almost universally adopted by the dealers and collectors in shells, respecting certain subjects, brought from Jamaica, and other parts of the West-Indies, commonly known by the name of *Gold Shells*. They are yellow glossy substances, of an obtusely conical figure, and size of tares or vetch-seeds, composed of several concave brittle imbricated scales, closely compacted, so as to resemble the foliaceous gem or bud of some tree, and have generally a hole or perforation in some part. These are commonly supposed to be shells, or the embryos



*Nautilus lacustris.*

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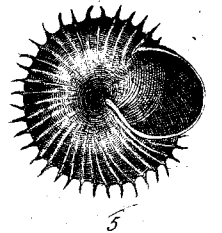
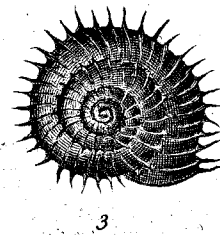
*Turbo helacinus.*



*Patella oblonga.*



*Helix fontana.*



*Helix spinulosa.*

embryos of shells taken out of some bag or ovary. It is certain, however, that this is a mistake; for having collected a few of the largest and most opaque of these *supposed shells*, and such as had no perforation to be found in them, I immersed them for a few minutes in hot water, and then carefully developing the scales of which they were composed, I found in the centre of all the largest and most perfect a small insect, enveloped in a mealy substance, about the size of a small bed-bug, of a roundish oval figure, dark brown colour, convex on the back, slightly concave beneath, and in every instance, except *one* (out of at least fifty which I opened), all without wings. The body was composed of about eight imbricated segments or rings; the head was very short, and almost concealed under the margin of the thorax; however, I plainly discerned, in some of the specimens, that it was furnished with two short filiform *antennæ*. The trunk had six legs; the feet terminated each with a sharp red claw. The body of the *single* specimen which had *wings* was oblong, and narrower than the *apterous* ones. The wings appeared to be glued down to the body, just as in a bee or wasp, when it is almost ready to emerge from the *Pupa* state. Whether they were two or four wings I am not absolutely certain; but they appeared to be of the filmy transparent kind, at least near the extremities; for I clearly perceived the nerves as in the wings of a fly. From hence it evidently appears, that these *Gold Shells* are really no other than the *cases* or cells of an insect in its *Pupa* state; and from considering the *form of its body*, the *difference of the sexes*, the one being *apterous*, the other *winged*, I have no doubt but it is a species of cochineal or *coccus*, and probably one not hitherto described by naturalists. The *cases* do not effervesce with acids, therefore they are not of a *testaceous* nature. They seem to be a vegetable

table substance of the *resinous* kind; for they bubble a little on being burnt on a hot iron, and when triturated dissolve slowly in a warm spirituous menstruum to a sweet-smelling viscid matter. But we must wait for a better elucidation of the subject from those who collect these substances in their native place.

I have the honour to be, with the utmost respect, &c.

JOHN LIGHTFOOT.

