PHILOSOPHICAL
TRANSACTIONS:

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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

we

we are authoriſed, 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 flatted 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 cheſnut 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 upſilon, or the Roman Y, inverted, (⅄) through which the animal, by means of its ſoft compreſſible and extenſible nature, eaſily contrives to extrude

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 *head* 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 *triradriated* ſhape, not very diſſimilar from the aperture itſelf, or like an inverted Y (Y), 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 compreſſa umbilicata carinata, anfractibus tribus ſupra convexis contiguis, apertura ſemiovata, 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 (λ), 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*) teſta compreſſa 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

It was found in the bottom of a ſpring of clear water, adhering to the under ſide of rotten leaves, near Bullſtrode, 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 Bullſtrode, 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 (*helicinus*) 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 Bullſtrode, 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 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 effervеſce with acids, therefore they are not of a *teſtaceous* nature. They ſeem to be a vege-

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.