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LIX.—On some new or little-known Goniatites from the Carboniferous Limestone of Ireland

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THE ANNALS

AND

MAGAZINE OF NATURAL HISTORY.

[SEVENTH SERIES.]

No. 18. JUNE 1899.

LIX.—*On some new or little-known Goniatices from the Carboniferous Limestone of Ireland.* By G. C. CRICK, F.G.S., of the British Museum (Natural History).

MOST of the specimens described in the present paper are in the collection of Dr. A. H. Foord, F.G.S., of Dublin, who has already devoted much attention to the Cephalopoda from the Carboniferous Limestone of Ireland; a few are in the British Museum collection; some belong to the Geological Survey of Ireland, and a few to the Museum of Science and Art, Dublin. To Dr. Foord, to the authorities of the Geological Survey of Ireland and of the Museum of Science and Art, Dublin, I am greatly indebted for the loan of the specimens in their respective collections.

During a visit to the Museum of the Geological Survey of Ireland I was fortunate enough to identify the type specimens of de Koninck's *Goniatices* [= *Pericyclus*] *plicatilis* and *G.* [*Branoceras*] *ornatissimus*. In order to facilitate comparison, I have redescribed them in the same manner as the other species which are described in the present paper.

The plan adopted for the descriptions of the species is that given in the Introduction (pp. xviii and xix) to part iii. of the 'Catalogue of Fossil Cephalopoda in the British Museum

(Natural History),¹ with only a few alterations. The term "umbilical zone"* has been substituted for the somewhat ambiguous expression "inner area of whorl"; and since in some species this zone slopes towards the centre of the umbilicus, I have thought it advisable in the measurements of these species to give the width of the umbilicus both at its margin and at the suture of the shell. The term "peristome" is used for the margin of the aperture, and in describing the aperture Prof. Hyatt's terms have been adopted—"crest" for projecting parts and "sinus" for inflections of the outline; also the same author's term "hyponomic sinus" for the ventral sinus of the aperture and of the lines of growth, it being due to the hyponome or motor organ, usually called the "fleshy funnel" in the recent *Nautilus* *.

Excepting figs. 6 and 15 and the drawings of the suture-lines, I have to thank Dr. Foord for the original drawings of the illustrations accompanying this paper.

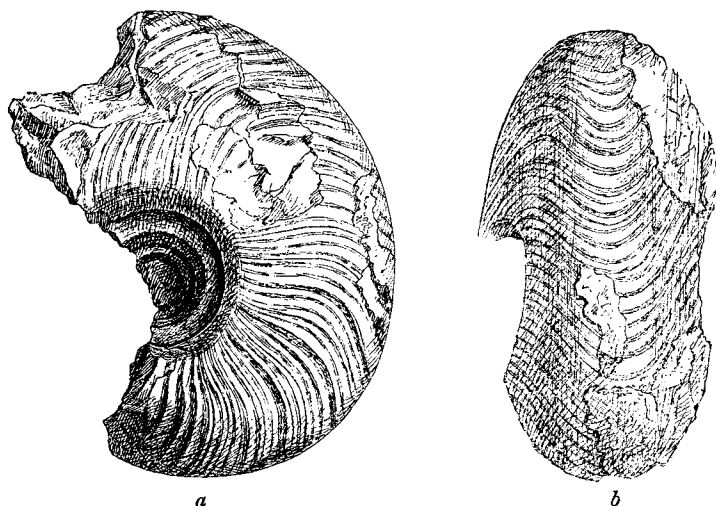
Pericyclus Foordi, sp. n. (Fig. 1.)

Sp. char. Shell discoidal, somewhat compressed and rather widely umbilicated; greatest thickness at the margin of the umbilicus, rather more than two fifths of the diameter of the shell; height of outer whorl a little more than three sevenths of the diameter of the shell. Whorls eight or nine; inclusion fully three fourths; umbilicus rather deep, displaying the umbilical margins of all the inner whorls, about three tenths of the diameter of the shell in width. Whorl semielliptical in cross-section, a little higher than wide; indented to about two fifths of its height by the preceding whorl; periphery convex, imperfectly defined; sides feebly convex; umbilical zone well-defined, sloping towards the umbilicus, and making an obtuse angle with the sides, rather narrow. Body-chamber not fully seen, but occupying at least one half of the outer whorl; aperture not seen, but the peristome probably (judging by the ornaments and the lines of growth) with a feeble lateral crest at about the middle of the lateral area and a deep and wide hyponomic sinus. Depth of chambers not seen; suture-line only imperfectly known. Test ornamented with fine, backwardly directed, and somewhat irregularly spaced riblets, which form a rather low crest at about the

* See A. Hyatt, "Phylogeny of an acquired Characteristic," *Proc. Amer. Philos. Soc.* vol. xxxii. no. 143, pp. 422 *et seqq.*; and "Carboniferous Cephalopods," 4th Ann. Rep. Geol. Surv. Texas for 1892, pp. 380 *et seqq.* (1893).

middle of the lateral area and a deep and wide hyponomic sinus on the periphery, where some of them are thicker than the rest and somewhat regularly placed. Up to a diameter

Fig. 1.



Pericyclus Foordi.—*a*, lateral view; *b*, peripheral view of the same. Carboniferous Limestone: St. Doulagh's, Co. Dublin, Ireland. Drawn from an example in the collection of Dr. A. H. Foord, F.G.S. About three fifths natural size.

of about 56·0 millim. the test is ornamented with rather coarse regularly placed ribs, which are separated by interspaces a little wider than themselves and have the same direction as the ornaments of the adult.

Dimensions.

| | (i.) | (ii.) |
|---|-------------------|------------------|
| Diameter of shell | 106·5 mm. (100·0) | 49·0 mm. (100·0) |
| Width of umbilicus (at suture of shell) | 32 " (30·0) | ? |
| Width of umbilicus (at its margin) | 42 " (39·4) | 25·0 mm. (51·0) |
| Height of outer whorl | 47 " (44·1) | |
| Ditto above preceding whorl.. | 28 " (26·2) | |
| Thickness of shell | 46 " (43·1) | 33·0 " (67·3) |

As the larger specimen is broken transversely across I
32*

am able to give also the following measurements at different diameters :—

| | | | |
|--|------------------|------------------|------------------|
| Diameter of shell .. | 79.5 mm. (100.0) | 56.0 mm. (100.0) | 40.0 mm. (100.0) |
| Width of umbilicus (at suture of shell) | 25.5 „ (32.0) | 21.0 „ (37.5) | 16.0 „ (40.0) |
| Width of umbilicus (at its margin) .. | 33.5 „ (42.1) | 26.0 „ (46.4) | 22.0 „ (55.0) |
| Height of outer whorl | | | |
| Ditto above preced- ing whorl | | | |
| Thickness of shell .. | 43.0 „ (54.0) | 33.5 „ (59.8) | 29.5 „ (73.7) |

Remarks. I have seen only two examples of this species; they are both in the collection of Dr. A. H. Foord, F.G.S., of Dublin; their dimensions are given above. The larger specimen is broken transversely across, so as to display the inner whorls; the innermost whorls are much wider than high, but as the shell grows the whorl increases in height more rapidly than in width. This is very apparent from the dimensions of the inner whorls that are given above.

I have much pleasure in naming the species after Dr. A. H. Foord, who has already made known many new Cephalopoda from the Carboniferous Limestone of Ireland.

Affinities and Differences. This species can be readily distinguished from *Pericyclus trapezoidalis* by its feeble ornaments, its relatively more inflated whorls, and the sloping umbilical zone of its whorls; and from *Pericyclus rotuliformis** by its less distinct ornaments and the absence of pronounced constrictions.

Horizon and Locality. Both specimens are from the Carboniferous Limestone of St. Doulagh's, Co. Dublin, Ireland.

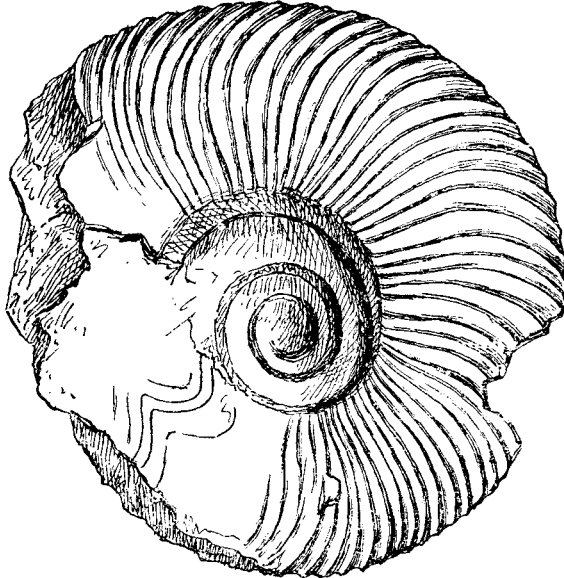
Pericyclus trapezoidalis, sp. n. (Fig. 2.)

Sp. char. Discoidal, flattened, rather widely umbilicated; greatest thickness at the margin of the umbilicus, nearly four elevenths of the diameter of the shell; height of outer whorl about four elevenths of the diameter of the shell. Whorls fairly numerous (exact number not known); inclusion rather more than one half; umbilicus shallow, displaying the edges of all the inner whorls, about three eighths of the diameter of the shell in width, with subangular margin and nearly vertical sides. Whorl subtrapezoidal in cross section, about as high as wide; indented to about one fourth of its height by the preceding whorl; periphery narrowly convex, imperfectly

* See *infra*, p. 434.

defined; sides feebly convex, a little flattened near the umbilicus, and becoming more flattened and convergent on the body-chamber; umbilical zone well defined, narrow, almost perpendicular to the plane of symmetry of the shell. Body-chamber occupying nearly a complete whorl; aperture not seen, but the peristome (judging by the lines of growth) probably with a broad feeble lateral crest and a fairly deep

Fig. 2.



Pericyclus trapezoidalis.--Lateral view of the type specimen, showing the ornaments of the shell, as well as some of the septa of the earlier portion of the outer whorl. Carboniferous Limestone: St. Doulagh's, Co. Dublin, Ireland. Drawn from an example in the collection of Dr. A. H. Foord, F.G.S. About three fifths natural size.

hyponomic sinus. Depth of chambers not seen; suture-line only imperfectly seen. Test ornamented with narrow prominent ribs, which pass obliquely backward from the umbilical margin, cross the lateral area in a feeble anteriorly convex curve, and form on the periphery a fairly deep and wide (hyponomic) sinus; interspaces flat, nearly twice as wide as the ribs; the whole surface of the ribs and interspaces (when well preserved) with fine close-set lines of growth, especially on the body-chamber. The outer whorl with numerous (nine or ten) constrictions, following the course of the ornaments

of the test. "Wrinkle-layer" composed of fine, regular, close-set longitudinal lines.

Dimensions.

| | |
|---|-------------------|
| Diameter of shell | 141 mm. (100.0) |
| Width of umbilicus (at suture of shell) | 49 " (34.7) |
| Width of umbilicus (at its margin).... | 53 " (37.5) |
| Height of outer whorl | 51 " (36.1) |
| Ditto above preceding whorl..... | about 30 " (21.2) |
| Thickness of outer whorl | 50 " (35.4) |

Remarks. I have seen only one example of this species—the type specimen—which is in the collection of Dr. A. H. Foord, F.G.S., of Dublin.

An unsuccessful attempt has been made to display the suture-line, the whorl having been ground away too deeply to show the precise form of this important character.

The "wrinkle-layer" is particularly well shown on the first portion of the last whorl.

The trivial name *trapezoidalis* refers to the form of the transverse section of the whorl of the adult shell.

Affinities and Differences. This species can be readily distinguished from all the other species of *Pericyclus* from the Carboniferous Limestone of Ireland that are known to me by the flattened trapezoidal form of the cross-section of its whorls and by their very distinct ornaments, which appear to be continued quite to the aperture of the shell.

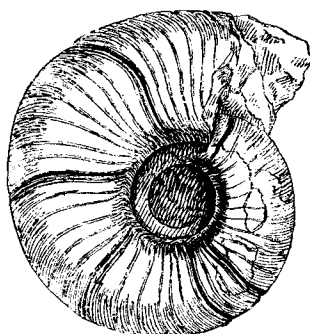
Horizon and Locality. Carboniferous Limestone: St. Douglagh's, Co. Dublin, Ireland.

Pericyclus rotuliformis, sp. n. (Fig. 3.)

Sp. char. Shell discoidal, somewhat compressed, rather rapidly increasing, with a moderately wide umbilicus; greatest thickness at the margin of the umbilicus, ranging from about three eighths to about three sevenths of the diameter of the shell; height of outer whorl ranging from about two fifths to about three eighths of the diameter of the shell. Whorls few (exact number unknown); inclusion two thirds; umbilicus shallow, with sloping sides and subangular margin, ranging from a little less to a little more than one third of the diameter of the shell in width, exposing the edges of all the inner whorls. Whorl subordinate in cross-section, a little higher than wide; indented to about one third of its height by the preceding whorl; periphery narrowly convex, imperfectly defined, continuous with the sides; sides feebly convex, somewhat flattened; umbilical zone fairly well defined, narrow, sloping towards the centre of the umbilicus

and making an obtuse angle with the sides. Body-chamber occupying rather more than an entire whorl; aperture not seen, but peristome (judging by the ornaments of the test) probably nearly straight on the lateral area and with a moderately wide and deep hyponomic sinus. Chambers (? depth); suture-line not seen. Test ornamented with feeble riblets

Fig. 3.



Pericyclus rotuliformis.—Lateral view of the type specimen, showing ornaments and well-marked constrictions of test. Carboniferous Limestone: St. Doulagh s, Co. Dublin, Ireland. Drawn from an example in the collection of Dr. A. H. Foord, F.G.S. About three fifths natural size.

crossing the whorl obliquely backward as far as the margin of the periphery, and then passing abruptly backward, becoming somewhat coarser and more prominent, and forming on the periphery a moderately wide and deep hyponomic sinus; the outer whorl with seven or eight constrictions extending from the margin of the umbilicus and having a similar direction to the ornaments of the test, these constrictions being faintly indicated on the surface of the test, but well marked on internal casts.

Dimensions.

| | (i.) | (ii.) | (iii.) | (iv.) |
|--|-----------|-----------|-----------|-----------|
| | mm. (100) | mm. (100) | mm. (100) | mm. (100) |
| Diameter of shell | 81 | 78 | 42 | 73·5 |
| Width of umbilicus (at suture of shell)..... | 24 | 23·5 | ? | 25 |
| Width of umbilicus (at its margin) | 29 | 29·5 | 16 | 31 |
| Height of outer whorl... | 32·5 | 28 | 17 | 27·5 |
| Ditto above preceding whorl | 22 | 19* | ? | 22 |
| Thickness of outer whorl | 32 | 30* | 20 | 32 |

* Approximately.

Remarks. The example in Dr. Foord's collection that is selected as the type specimen is figured in the accompanying figure (fig. 3) and its dimensions are given above (i.). This appears to be the usual form of the species and is the chief basis of the above diagnosis. But besides this there is a form so closely related that it is considered to be specifically identical, in which the whorls are somewhat more inflated (being a little wider than high) and the umbilicus relatively wider than in the type specimen. The dimensions of such an example are also given above (iv.).

There are five examples of this species in Dr. Foord's collection, all from St. Doulagh's, Co. Dublin, Ireland. There are also two fragments (the locality of which is not recorded) in the British Museum collection (nos. C. 255 *a* & *b*) that are referred to this species with some doubt, especially the example C. 255 *b*. The specimen C. 255 *a* may have come from St. Doulagh's, but the matrix of the example C. 255 *b* differs somewhat from the usual matrix of the St. Doulagh's specimens.

Affinities and Differences. This species is easily distinguished from *Per. trapezoidalis** by its feebler ornaments and very pronounced constrictions, and from *Per. Foordi*† by its less inflated whorls and the presence of constrictions.

Horizon and Locality. Carboniferous Limestone: St. Doulagh's, Co. Dublin, Ireland.

Pericyclus clanensis, sp. n. (Figs. 4, 5.)

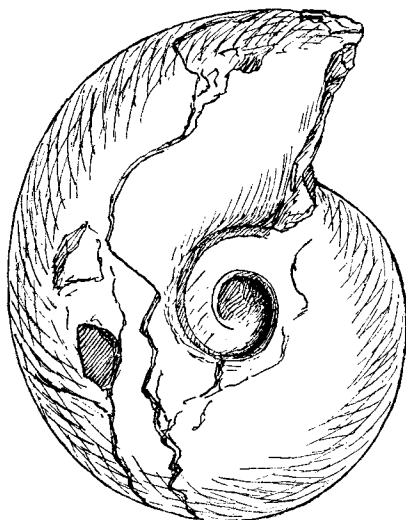
Sp. char. Shell discoidal, somewhat compressed, rather involute; greatest thickness at a short distance from the edge of the umbilicus, rather more than four elevenths of the diameter of the shell; height of outer whorl about three sevenths of the diameter of the shell. Whorls few (? number); inclusion nearly two thirds; umbilicus shallow, rather more than one fourth of the diameter of the shell in width, with rounded margin. Whorl semielliptical in cross-section, somewhat higher than wide; indented to rather more than one third of its height by the preceding whorl; periphery broadly convex, imperfectly defined; sides feebly convex, somewhat flattened near the umbilicus; umbilical zone narrow, convex, nearly perpendicular to the plane of symmetry of the shell, but sloping a little towards the umbilicus. Body-chamber occupying rather more than the last whorl; aperture not seen, but peristome (judging by the lines of

* See *supra*, p. 432.

† See *supra*, p. 430.

growth) probably with a feeble lateral crest and a broad and deep hyponomic sinus. Chambers shallow; suture-line as in

Fig. 4.



Pericyclus clanensis.—Lateral view of the type specimen. The specimen has been rubbed down so much, that there are only very slight indications of the ornaments of the test; these are not shown in the figure. Carboniferous Limestone: Clane, Co. Kildare, Ireland. Drawn from an example in the Science and Art Museum, Dublin. About three fifths natural size.

fig. 5. Test ornamented with coarse and rather irregular lines of growth, which pass from the umbilicus obliquely across the whorl, and at the margin of the periphery turn

Fig. 5.



Suture-line of *Pericyclus clanensis*.—Carboniferous Limestone: Clane, Co. Kildare, Ireland. Drawn of the natural size from the type specimen in the Science and Art Museum, Dublin.

abruptly backward, becoming somewhat more prominent and forming on the periphery a deep and fairly wide hyponomic

sinus ; the outer whorl with a few slight constrictions parallel to the lines of growth.

Dimensions.

| | |
|---|-------------------|
| Diameter of shell | 117·5 mm. (100) |
| Width of umbilicus (at suture of shell) | 31 " (26·3) |
| Width of umbilicus (at its margin) . . | 33·5 " (28·5) |
| Height of outer whorl | 49 " (41·7) |
| Ditto above preceding whorl | 32 " (27·2) |
| Thickness of outer whorl | about 44 " (37·4) |

Remarks. The example on which the present species is founded is in the Science and Art Museum, Dublin. It has been labelled *Goniatites Brownii*, M'Coy *, and there is just the possibility of its having been the type specimen. As it does not, however, agree either with M'Coy's figure or his description, I have entirely disregarded the name it bears. Since the example is from Clane, Co. Kildare, the name *Per. clanensis* is suggested for it.

Affinities and Differences. Compared with *Pericyclus rotuliformis* † and also *Per. Bailyi* this species has more inflated whorls and a much narrower umbilicus.

Horizon and Locality. Carboniferous Limestone: Clane, Co. Kildare, Ireland.

Pericyclus Bailyi, sp. n. (Figs. 6, 7.)

Sp. char. Shell discoidal, somewhat compressed, rather widely umbilicated; greatest thickness almost close to the umbilical margin, about four ninths of the diameter of the shell; height of outer whorl about three sevenths of the shell. Whorls about seven in number; inclusion three fourths; umbilicus deep, with subangular margin, nearly one third of the diameter of the shell in width. Whorl

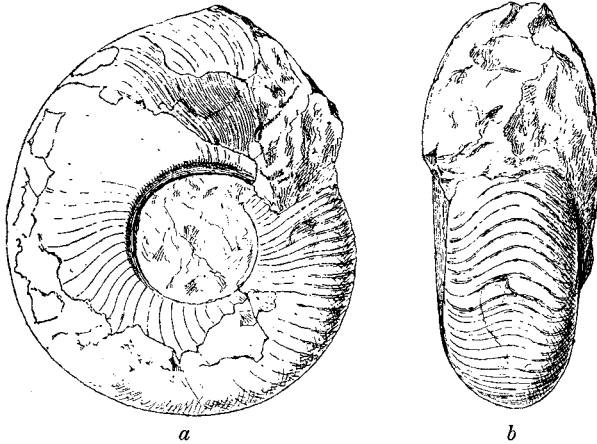
* F. M'Coy, Synopsis Carb. Foss. Ireland, p. 12, pl. iv. fig 17. M'Coy's description of this species is as follows:—"Discoid, subglobose, sides flattened; umbilicus large, acute-edged, exceeding one third the diameter of the shell; surface smooth; septa, dorsal lobe small, bifid; dorsal sinus acute; first lateral lobe slightly exceeding the dorsal in length, very wide, rounded; lateral sinus twice as long as the dorsal, acute, linguiform; second lateral lobe very wide, obtusely rounded.

"From the *G. striatus*, Sow., which the species most resembles, it is distinguished internally by its much shorter and wider first lateral lobe; the same character distinguishes it from the *G. sphaericus*, Sow., and from both it is distinguished externally by its smooth surface, and from all the species of the same form by the large size of the umbilicus. Diameter 2 inches 2 lines, thickness 1 inch 1 line."

† See *supra*, p. 434.

semielliptical in section, a little wider than high; indented to about three eighths of its height by the preceding whorl; periphery rather broadly convex, imperfectly defined; sides

Fig. 6.



Pericyclus Bailyi.—*a*, lateral view of the type specimen; *b*, front view of the same. Carboniferous Limestone: St. Doulagh's, Co. Dublin, Ireland. Drawn from an example in the British Museum Collection [C. 298]. About three fifths natural size.

feebly convex, flattened near the umbilical margin; umbilical zone well defined, narrow, feebly convex, sloping towards the centre of the umbilicus, and forming an obtuse angle with the side. Body-chamber occupying the whole of the last whorl; aperture not seen, but peristome (judging by the lines of growth) probably almost straight on the lateral area and with a deep and broad hyponomic sinus. Chambers (? depth); suture-line as in fig. 7. Test ornamented with

Fig. 7.



Suture-line of *Pericyclus Bailyi*.—Carboniferous Limestone: St. Doulagh's, Co. Dublin, Ireland. Drawn of the natural size from an example in the collection of Dr. A. H. Foord, F.G.S.

feeble somewhat irregularly spaced riblets, which in crossing the whorl pass obliquely backward from the edge of the

umbilicus to near the edge of the periphery, where they are bent abruptly backward and form on the periphery a deep and wide hyponomic sinus; on the periphery the ornaments are stronger and more regularly arranged, the ribs being narrow and the interspaces a little wider than the ribs; at the anterior end of the body-chamber the riblets almost disappear both on the sides and on the periphery; the whole surface also with very fine raised lines, having the same direction as the riblets and crossing the inner area in a feeble anteriorly convex curve. "Wrinkle-layer" with minute blunt tubercles, which have a tendency to arrange themselves in transverse striæ near the umbilical portion of the whorl, while near the periphery they tend to dispose themselves in longitudinal striæ.

Dimensions.

| | (i.) | (ii.) | (iii.) | (iv.) |
|---|----------------|----------------|----------------|----------------|
| Diameter of shell..... | 97 mm. (100) | 80 mm. (100) | 62.5 mm. (100) | 35 mm. (100) |
| Width of umbilicus (at suture of shell). | 30 ,, (30.9) | 23 ,, (28.7) | 17 ,, (27.1) | 13 ,, (37.1) |
| Width of umbilicus (at its margin)..... | 35 ,, (36.2) | 28 ,, (35.0) | 21 ,, (33.6) | 14 ,, (40.0) |
| Height of outer whorl | 41 ,, (42.2) | 32.5 ,, (40.6) | 26.5 ,, (42.4) | 14 ,, (40.0) |
| Ditto above preceding whorl..... | 26 * ,, (26.8) | 24 ,, (30.0) | 18 * ,, (28.8) | 10.5 ,, (30.0) |
| Thickness of outer whorl | 44 * ,, (45.3) | 39.5 ,, (49.3) | 31.5 ,, (50.4) | 19 ,, (54.2) |

Remarks. The present species is represented by four examples, the dimensions of which are given above. Three of these (ii., iii., and iv.) are in Dr. Foord's collection, the other (i.) is in the collection of the British Museum (no. C. 298). Compared with the adult, young examples have relatively wider whorls and a wider umbilicus in proportion to the diameter of the shell; they have also coarser ornaments. Up to a diameter of about 22 millim. the riblets pass over the margin of the umbilicus on to the umbilical zone of the whorl.

One of Dr. Foord's specimens (example ii. referred to above) shows the "wrinkle-layer" very clearly.

The example in the British Museum is labelled "*Goniatites Brownii*," apparently in Mr. Baily's handwriting, but the specimen agrees neither with M'Coy's figure nor with his description of that species †.

For this species the name *Pericyclus Bailyi* is proposed, after Mr. W. H. Baily, the late Palæontologist of the Geological Survey of Ireland.

* Approximately.

† See *supra*, p. 438, footnote.

Affinities and Differences. The present species is somewhat more inflated and more widely umbilicated than *Pericyclus clanensis* *; it is also more inflated than *Pericyclus rotuliformis* †, and lacks the constrictions characteristic of that species.

Horizon and Locality. All the examples of this species that I have seen are from St. Doulagh's, Co. Dublin, Ireland. Three of these are in Dr. Foord's collection, and one (the largest) is in the British Museum collection (no. C. 298).

Pericyclus plicatilis, L. G. de Koninck, sp.

Goniatites plicatilis, L. G. de Koninck, "Sur quelques Céphalopodes nouveaux du Calcaire carbonifère de l'Irlande," Ann. Soc. géol. de Belg. vol. ix., Mémoires, p. 55, pl. v. figs. 3 & 4 (erroneously stated to be pl. vi. figs. 3 & 4 (1881)).

Sp. char. Shell subglobose, rather widely umbilicated; greatest thickness at the umbilical margin, about two thirds of the diameter of the shell; height of outer whorl about two fifths of the diameter of the shell. Whorls (? number); inclusion five sixths; umbilicus deep, with angular margin and steep sides, about one third of the diameter of the shell in width, exposing the angular edges of the inner whorls. Whorl semilunate in cross-section, much wider than high; indented to about two thirds of its height by the preceding whorl; periphery broadly convex, imperfectly defined, continuous with the sides; sides feebly convex; umbilical zone well defined, fairly wide, nearly perpendicular to the plane of symmetry of the shell, but sloping a little towards the centre of the umbilicus. Body-chamber apparently occupying nearly the whole of the last whorl; aperture not seen, but (judging by the direction of the growth-lines) the peristome probably nearly straight on the lateral area, and with a very broad and fairly deep hyponomic sinus. Chambers (? depth); suture-line only partially seen. Test ornamented with narrow prominent riblets, which pass from the margin of the umbilicus in a nearly radial direction over about two thirds of the lateral area, and then turn backward somewhat abruptly, forming on the periphery a very broad and fairly deep hyponomic sinus; the interspaces are somewhat wider than the riblets; the whole surface with very fine growth-lines parallel to the riblets.

Dimensions. Owing to the distortion of the specimen I

* See *supra*, p. 436.

† See *supra*, p. 434.

give the dimensions at two diameters (A-B, C-D) as nearly as possible at right angles to each other:—

| | A-B. | C-D. |
|---|--------------------|--------------|
| Diameter of shell | about 96 mm. (100) | 74 mm. (100) |
| Width of umbilicus (at suture of shell) | 32.5 „ (33.8) | 22 „ (29.7) |
| Width of umbilicus (at its margin) | 40 „ (41.6) | 30 „ (40.5) |
| Height of outer whorl | about 33 „ (34.3) | 31 „ (41.8) |
| Ditto above preceding whorl . . | 20 „ (20.8) | 20 „ (27.0) |
| Thickness of outer whorl | about 64 „ (66.6) | 53 „ (71.6) |

The dimensions given by De Koninck are:—longitudinal diameter 85 millim.; transverse diameter 58 millim.; diameter of umbilicus 30 millim.; median height of aperture 21 millim.

Remarks. The only example of this species that I have seen is De Koninck's type specimen, which is in the collection of the Geological Survey of Ireland. It is there labelled "*Goniatites Wrightii*," but this appears to be only a manuscript name. There is, however, no doubt whatever about its being the type specimen of De Koninck's "*Goniatites plicatilis*." The locality of the specimen is not recorded on the tablet to which it is fixed; but De Koninck says:—"Un certain nombre [*sic*] de spécimens de cette espèce ont été recueillis dans le calcaire de Kilmacan." De Koninck's figure is somewhat restored, the specimen being of a more elliptical form.

Affinities and Differences. The present species is clearly allied to *Per. subplicatilis*, but that is a much less inflated shell. From *Per. Hauchecornei*, Holzapfel*, it differs by its coarser ornaments and its much more inflated whorls.

Horizon and Locality. Carboniferous Limestone: Kilmacan, Ireland (*vide* de Koninck).

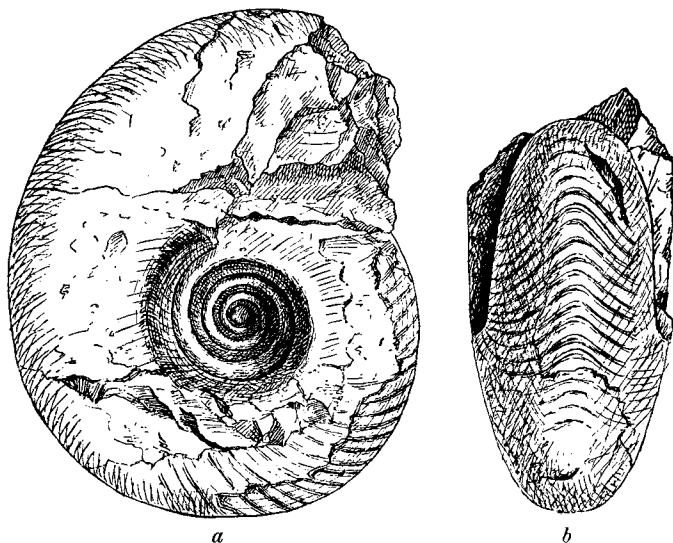
Pericyclus subplicatilis, sp. n. (Figs. 8, 9.)

Sp. char. Shell discoidal, somewhat compressed, moderately widely umbilicated; greatest thickness almost close to the margin of the umbilicus, about two fifths of the diameter of the shell; height of outer whorl about two fifths of the diameter of the shell. Whorls six or seven; inclusion four fifths; umbilicus rather deep, with subangular margin, exposing the edges of the inner whorls, about three tenths of the diameter of the shell in width. Whorl semielliptical in cross-section,

* "Die Cephalopoden-führenden Kalke des unteren Carbon von Erdbach-Breitscheid bei Herborn," Pal. Abhandl., Dames & Kayser, Bd. v. Heft 1, 1889, p. 36, pl. ii. figs. 8-11 (especially figs. 11 & 11 a).

about as high as wide; indented to about one fifth of its height by the preceding whorl; periphery broadly convex, imperfectly defined; sides feebly convex, somewhat flattened

Fig. 8.



Pericyclus subplicatilis.—*a*, lateral view of the type specimen; *b*, peripheral view of the earlier portion of the outer whorl of the same. Carboniferous Limestone: St. Doulagh's, Co. Dublin, Ireland. Drawn from an example in the collection of Dr. A. H. Foord, F.G.S. About three fifths natural size.

near the umbilical margin; umbilical zone narrow, well-defined, nearly perpendicular to the plane of symmetry of the shell. Body-chamber occupying the whole of the last whorl; aperture not seen, but (judging by the growth-lines and orna-

Fig. 9.



Pericyclus subplicatilis.—Suture-line. Carboniferous Limestone: St. Doulagh's, Co. Dublin, Ireland. Drawn from an example in the collection of Dr. A. H. Foord, F.G.S. Natural size.

ments) the peristome probably nearly straight on the lateral area, and with a deep and broad hyponomic sinus. Chambers (? depth); suture-line as in fig. 9. Test ornamented with

feeble somewhat inequidistant ribs, which, arising at the umbilical margin, pass thence obliquely backward as far as the margin of the periphery, where they bend somewhat abruptly backward, and form on the periphery a deep and wide hyponomic sinus; on the periphery the ribs become nearly equidistant, fairly coarse, and separated by interspaces of about their own width; the ornaments gradually disappear on the outer whorl, those on the lateral area disappearing first, and the ribs on the periphery at about the middle of the last whorl. The whole surface of the test with very fine growth-lines.

Dimensions.

| | |
|---|-------------------|
| Diameter of shell | 113·5 mm.* (100) |
| Width of umbilicus (at suture of shell) | 33 " (29·0) |
| Width of umbilicus (at its margin) .. | 40 " (35·2) |
| Height of outer whorl | 43·5 " (38·3) |
| Ditto above preceding whorl | about 35 " (30·8) |
| Thickness of outer whorl | 44 " (38·7) |

Remarks. I have seen only two examples of the present species; they are both in the collection of Dr. A. H. Foord, of Dublin. The larger of these is fairly well preserved and is regarded as the type specimen (see fig. 8 *a, b*). The smaller example has a very imperfect and somewhat distorted outer whorl, but exhibits the sculpture of the shell at a diameter of about 62 millim., and shows that the ribbing becomes obsolete on the body-chamber at a diameter of about 94 millim. I have been able to display the suture-line in this specimen where the diameter is about 51 millim., *i. e.* where the radius of the shell is about 29 millim. (see fig. 9).

Affinities and Differences. Of the Irish *Goniatites* that are known to me the sculpture of the present species (up to a diameter of about 70 millim.) closely resembles that of De Koninck's *Goniatites plicatilis* †; but that is a very much more inflated shell, and the umbilical zone of its outer whorl is wider and more sloping than that of the present species. This species appears to be also related to *Pericyclus clanensis* ‡,

* This specimen has been broken across and the fissure filled with calcite, so that the diameter of the shell and the height of the last whorl appear to be greater than they really are; the diameter appears to be 122 millim. and the height of the outer whorl 55·5 millim.

† L. G. de Koninck, "Sur quelques Céphalopodes nouveaux du Calcaire carbonifère de l'Irlande," *Ann. Soc. géol. de Belg.* vol. ix., *Mémoires*, p. 55, pl. v. figs. 3 & 4 (erroneously stated to be pl. vi. figs. 3 & 4). See *supra*, p. 441.

‡ See *supra*, p. 436.

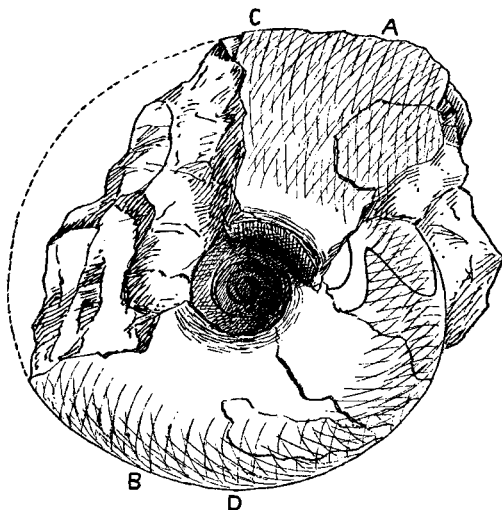
but its inner whorls are less inflated, its umbilicus wider, its umbilical margin more prominent, and the umbilical zone of its outer whorl wider than in that species.

Horizon and Locality. Both examples that I have seen are from the Carboniferous Limestone of St. Doulagh's, Co. Dublin, Ireland.

Glyphioceras cordatum, sp. n. (Figs. 10, 11.)

Sp. char. Shell discoidal, inflated, rather narrowly umbilicated; greatest thickness at a short distance from the umbilical margin, a little more than one half of the diameter of the shell; height of outer whorl a little less than one half of the diameter of the shell. Whorls (? number); inclusion about five sixths; umbilicus deep, with angular margin and steep sides, about

Fig. 10.



Glyphioceras cordatum.—*a*, lateral view of the type specimen; the last septum is seen near the commencement of the outer whorl. Carboniferous Limestone: Little Island, Cork, Ireland. Drawn from an example in the collection of Dr. A. H. Foord, F.G.S. About three fifths natural size.

one fourth of the diameter of the shell in width. Whorl cordate in cross section, a little wider than high; indented to nearly one half of its height by the preceding whorl; periphery narrowly convex and imperfectly defined by an obtuse ridge on each side, becoming acute near the aperture of the shell; sides feebly convex, with an obtuse ridge at

about three fifths of the width of the side from the edge of the umbilicus, that becomes obsolete on the anterior part of the body-chamber; umbilical zone well defined, rather narrow, nearly perpendicular to the plane of symmetry of the shell. Body-chamber occupying the whole of the last whorl; aperture not seen, but (judging by the growth-lines of the test) the peristome probably with a prominent lateral crest and a deep and rather narrow hyponomic sinus. Chambers rather shallow; suture-line as in fig. 11. Test nearly smooth,

Fig. 11.



Glyphioceras cordatum.—Suture-line drawn from the last septum of the type specimen in the collection of Dr. A. H. Foord, F.G.S. Carboniferous Limestone: Little Island, Cork, Ireland. Natural size.

apparently with only growth-lines which have a nearly radial direction on the inner portion of the lateral area and turn somewhat abruptly backward on the outer portion so as to form a deep and moderately wide hyponomic sinus on the periphery; internal cast nearly smooth.

Dimensions.

| | A-B. | C-D. |
|---|---------------------|---------------------|
| Diameter of shell | 116.5 mm. (100) | 109.5 mm. (100) |
| Width of umbilicus (at suture of shell) | 26 „ (22.3) | 24.5 „ (22.3) |
| Width of umbilicus (at its margin) | 28.5 „ (24.4) | 26 „ (23.7) |
| Height of outer whorl | about 51.5 „ (44.2) | about 48.5 „ (44.2) |
| Ditto above preceding whorl .. | about 27.5 „ (23.6) | about 25 „ (22.8) |
| Thickness of outer whorl .. | 56 „ (48) | 55.5 „ (50.6) |

Remarks. I have seen only two examples of this species. They are both from Little Island, Cork, and in the collection of Dr. A. H. Foord, of Dublin. As is usual with specimens from this locality, both are distorted, the one (the dimensions of which are given above) only slightly, but the other so much that its measurements are not given, since they would be misleading. There cannot, however, be any doubt as to the specific identity of the specimens.

The trivial name has been suggested by the form of the aperture of the shell.

Affinities and Differences. This species is evidently closely

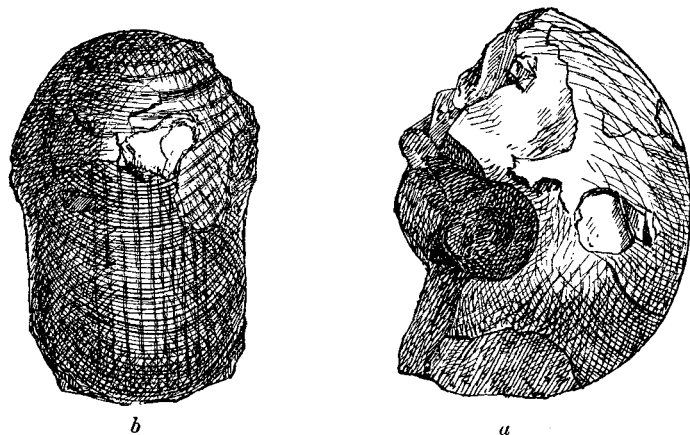
related to such forms as *Glyphioceras reticulatum*, J. Phillips, sp.*, and *Glyphioceras Davisi*, Foord & Crick †, but from the former it differs by its more inflated whorls, the form of its umbilicus, and the nature of its suture-line, and from the latter by its angular but not prominent umbilical margin and the form of its suture-line.

Horizon and Locality. Both examples that are referred to this species are from the Carboniferous Limestone of Little Island, Cork, Ireland.

Glyphioceras corpulentum, sp. n. (Figs. 12, 13.)

Sp. char. Shell subglobose, umbilicated, rapidly increasing; greatest thickness at the umbilical margin, about three fifths of the diameter of the shell; height of outer whorl about three sevenths of the diameter of the shell. Whorls

Fig. 12.



Glyphioceras corpulentum.—*a*, lateral view of the type specimen; *b*, peripheral view of the same, showing the longitudinal and transverse ornaments of the test. Carboniferous Limestone: St. Doulagh's, Co. Dublin, Ireland. Drawn from an example in the collection of Dr. A. H. Foord, F.G.S. About three fifths natural size.

few (? number); inclusion nearly complete; umbilicus deep, with subangular margin and steep sides, about three tenths of

* J. Phillips, Geol. Yorks. pt. ii. 1836, p. 235, pl. xix. figs. 26-32. See also A. H. Foord & G. C. Crick, Cat. Foss. Ceph. Brit. Mus. pt. iii. 1897, p. 193.

† A. H. Foord & G. C. Crick, Cat. Foss. Ceph. Brit. Mus. pt. iii. 1897, p. 198, fig. 95.

the diameter of the shell in width. Whorl lunate in cross-section, the height about three fourths of the width; indented to nearly one half of its height by the preceding whorl; periphery broadly convex, imperfectly defined; sides convex; umbilical zone well defined, narrow, almost perpendicular to the plane of symmetry of the shell. Body-chamber occupying nearly the whole of the last whorl; aperture not seen, but (judging by the growth-lines) the peristome probably with only a very feeble crest near the edge of the umbilicus, and with a very wide and shallow hyponomic sinus. Chambers shallow; suture-line as in fig. 13. Test nearly smooth, with

Fig. 13.



Glyphioceras corpulentum.—Suture-line drawn from an example in the collection of Dr. A. H. Foord, F.G.S. Carboniferous Limestone: St. Doulagh's, Co. Dublin, Ireland. Natural size.

fine subregular raised lines, which become more distinct in the adult; these pass obliquely backward from the umbilicus as far as the margin of the periphery, where they assume a nearly radial direction, and cross the periphery in a very wide and shallow hyponomic sinus; in the adult the periphery bears eight or nine obscure rather widely spaced longitudinal lines.

Dimensions.

| | (i.) | (ii.) |
|---|---------------------|-------------------|
| Diameter of shell | 64 mm. (100) | 95 mm. (100) |
| Width of umbilicus (at suture of shell) | 15.5 „ (24.2) | 22 „ (23.1) |
| Width of umbilicus (at its margin) | 21 „ (32.8) | 25 „ (26.3) |
| Height of outer whorl | 27 „ (42.1) | 45 „ (47.3) |
| Ditto above preceding whorl | about 16.5 „ (25.7) | about 20 „ (21.0) |
| Thickness of outer whorl | 40.5 „ (63.2) | 58 „ (61.0) |

Remarks. The two examples of this species that I have seen are in the collection of Dr. A. H. Foord. Their dimensions are given above. The larger specimen (ii.) shows the form of the inner whorls and is regarded as the type, the smaller example (i.) exhibits the suture-line.

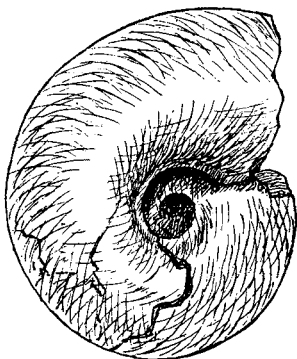
Affinities and Differences. This species can be readily recognized by the nature of its ornaments and by the inflation of its whorls.

Horizon and Locality. Both examples known to me are from the Carboniferous Limestone, St. Doulagh's, Co. Dublin, Ireland.

Glyphioceras ellipsoidale, sp. n. (Fig. 14.)

Sp. char. Shell subglobose, somewhat compressed, narrowly umbilicated; greatest thickness at the margin of the umbilicus, about four sevenths of the diameter of the shell; height of outer whorl about three sevenths of the diameter of the shell. Whorls (? number); inclusion about two thirds; umbilicus deep, with subangular margin and nearly perpendicular sides, about three elevenths of the diameter of the

Fig. 14.



Glyphioceras ellipsoidale.—Lateral view of the type specimen in the collection of the Museum of Science and Art, Dublin. Carboniferous Limestone: Kildare, Ireland. About three fifths natural size.

shell in width, exposing the edges of the inner whorls. Whorl semielliptical in cross-section, the height about three fourths of the width; indented to nearly one third of its height by the preceding whorl; periphery broadly convex, imperfectly defined, continuous with the sides; sides convex, a little flattened near the umbilicus; umbilical zone narrow, convex, nearly perpendicular to the plane of symmetry of the shell. Body-chamber apparently occupying the whole of the last whorl; peristome with a broad, feeble, lateral crest and a wide and deep hyponomic sinus. Chambers (? depth); suture-line not seen. Test almost perfectly smooth, with obscure growth-lines near the aperture.

Dimensions.

| | (i.) | | (ii.) |
|--|---------------|-----------------|----------------|
| Diameter of shell . . | 83 mm. (100) | 70.5 mm. (100) | 70.5 mm. (100) |
| Width of umbilicus (at suture of shell) | 20 „ (24.0) | ? | 14 „ (19.8) |
| Width of umbilicus (at its margin) . . | 23.5 „ (28.3) | 17.5 mm. (24.8) | 17 „ (24.1) |
| Height of outer whorl | 36 „ (43.3) | 31.0 „ (43.9) | 31.5 „ (44.6) |
| Ditto above pre- ceding whorl . . | 25 „ (30.1) | ? | 21 „ (29.7) |
| Thickness of outer whorl | 47 „ (56.6) | 43 mm. (60.9) | 39.5 „ (56) |

Remarks. The type specimen of this species—the example upon which the diagnosis given above has been chiefly based—is in the collection of the Museum of Science and Art, Dublin. The specimen is labelled “Kildare,” and does not appear to be at all crushed or distorted. The whole of the outer whorl appears to be occupied by the body-chamber, so that I have not been able to make out the form of the suture-line. With some doubt I also refer to this species an example in the British Museum collection (no. C. 294) from the Carboniferous Limestone of Rathkeale, Co. Limerick; but, as will be seen from its dimensions given above (ii.), it is somewhat more compressed than the type specimen, but some of this compression may have been produced during fossilization. De Koninck recognized three divisions of the Carboniferous Limestone in Ireland—upper, middle, and lower; he referred the limestone at Rathkeale to the middle division, whilst that at Kildare he placed in the upper division.

Affinities and Differences. This species differs from *Gly. sphaericum*, Martin, sp.*, in being less inflated and more umbilicated. Compared with *Gly. crenistria*, Phillips, sp.†, it is more compressed, its ornaments are not crenulated, and they form a much deeper hyponomic sinus. Its transverse ornaments (or growth-lines), larger umbilicus, and more inflated shell at once distinguish this species from *Gly. striatum*‡, J. Sowerby, sp.

* *Conchylolithus Nautilites sphaericus*, W. Martin, *Petrif. Derb.* 1809, p. 15, pl. vii. figs. 3, 4, & 5.

† *Goniatites crenistria*, J. Phillips, *Geol. Yorks.* pt. ii. 1836, p. 234, pl. xix. figs. 7, 8, 9.

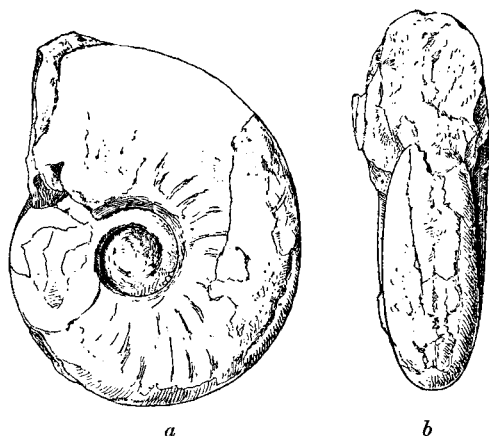
‡ *Ammonites striatus*, J. Sowerby, *Min. Conch.* vol. i. p. 115 (1814), pl. liii. fig. 1.

Horizon and Locality. Carboniferous Limestone: Kildare, Ireland (? Rathkeale, Co. Limerick, Ireland).

Prolecanites Leesoni, sp. n. (Fig. 15.)

Sp. char. Shell discoidal, compressed, rather narrowly umbilicated; greatest thickness at the margin of the umbilicus, about one third of the diameter of the shell; height of outer whorl about four ninths of the diameter of the shell. Whorls (? number); inclusion three fourths; umbilicus shallow, with subangular margin and sloping sides, about two sevenths of the diameter of the shell in width. Whorl

Fig. 15.



Prolecanites Leesoni.—*a*, lateral view of the type specimen; *b*, front view of the same. Carboniferous Limestone: Glenbane East, Limerick, Ireland. Drawn from an example in the collection of the Geological Survey of Ireland, Dublin. About three fifths natural size.

subtrapezoidal in cross-section, its width about three fourths of its height; indented to about two sevenths of its height by the preceding whorl; periphery somewhat imperfectly defined, very feebly convex, somewhat flattened; umbilical zone narrow, well defined, sloping towards the centre of the umbilicus. Body-chamber apparently occupying nearly the whole of the last whorl; aperture not seen, but (judging by the growth-lines) the peristome probably nearly straight on the lateral area, and with a fairly wide and moderately deep hyponomic sinus. Chambers (? depth); suture-line not seen. Test nearly smooth, with subregular growth-lines, which

have a nearly radial direction on the lateral area and form a fairly wide and moderately deep hyponomic sinus on the periphery; the body-chamber with obscure backwardly curved riblets extending from the edge of the umbilicus over about one third of the lateral area; the internal cast has on the first fourth of the outer whorl two constrictions, which arise at a short distance from the edge of the umbilicus and cross the whorl parallel to the growth-lines.

Dimensions.

| | |
|--|---------------|
| Diameter of shell | 90 mm. (100) |
| Width of umbilicus (at suture of shell)..... | 24 " (26·6) |
| Width of umbilicus (at its margin) | 27 " (30·0) |
| Height of outer whorl | 40·5 " (45·0) |
| Ditto above preceding whorl | 28 " (31·1) |
| Thickness of outer whorl..... | 29·5 " (32·8) |

Remarks. I have seen only one example of this species; it is in the collection of the Geological Survey of Ireland, and I am greatly indebted to the authorities of the Survey for the loan of the specimen. It is there labelled "*Goniatites Leasoni*," but, so far as I know, no description of the species has been published under this name. Unfortunately the suture-line cannot be made out; but there is every reason to believe that the species belongs to the genus *Prolecanites*.

Affinities and Differences. The present species can be readily distinguished from both *Prolecanites compressus*, J. Sowerby, sp.*, and *Prolec. similis*, Crick †, by the smallness of its umbilicus.

Horizon and Locality. Carboniferous Limestone: Glenbane East, Limerick, Ireland. This is the same locality as that which yielded the type specimen of L. G. de Koninck's *Goniatites ornatissimus* †.

* J. Sowerby, Min. Conch. vol. i. p. 84, pl. xxxviii., 1813 (*Ellipsolites compressus*). See also Foord & Crick, "On the Identity of *Ellipsolites compressus*, J. Sowerby, with *Ammonites Henslowi*, J. Sowerby," Geol. Mag. dec. iv. vol. i. (1894), p. 11, pl. i.

† G. C. Crick, Trans. Manchester Geol. Soc. vol. xxiii. pt. iii. 1895, pp. 80-84, woodcut.

‡ L. G. de Koninck, "Sur quelques Céphalopodes nouveaux du Calcaire carbonifère de l'Irlande," Ann. Soc. géol. de Belg. vol. ix., Mémoires, p. 55, pl. vi. figs. 3 & 4 (erroneously stated to be pl. v. figs. 3 & 4). See also *infra*, p. 453.

Brancoceras ornatissimum, L. G. de Koninck, sp.

Goniatites ornatissimus, L. G. de Koninck, "Sur quelques Céphalopodes nouveaux du Calcaire carbonifère de l'Irlande," Ann. Soc. géol. de Belg. vol. ix., Mémoires, p. 53, pl. vi. figs. 4 & 5 (erroneously stated to be pl. v. figs. 4 & 5) (1881).

Sp. char. Shell somewhat ovoidal, compressed, with closed umbilicus; greatest thickness at about one fourth of the height of the whorl from the umbilicus, about seven tenths of the diameter of the shell; height of outer whorl about three fifths of the diameter of the shell. Whorls (? number); inclusion complete; umbilicus closed with shelly callus, in centre of infundibuliform depression. Whorl oval or subcordate in cross-section, rather wider than high; indented to about one half of its height by the preceding whorl; periphery narrowly convex, imperfectly defined; sides feebly convex, convergent, their inner portion sloping towards the umbilicus and forming an obtuse angle with the rest of the side; no distinct umbilical zone. Body-chamber probably occupying fully half a whorl; aperture not seen, but (judging by the ornaments) the peristome probably with a broad lateral crest and a deep and fairly wide hyponomic sinus. Chambers (? depth); suture-line only imperfectly seen; external lobe narrow, with a single point, external saddle rounded, fairly wide; lateral lobe with a single point, somewhat wider than the external lobe; lateral saddle very broad, rounded, twice as wide as the external saddle. Test with fine regular raised lines, which cross the lateral area of the whorl in a bold orad-convex curve, and form on the periphery a deep and fairly wide hyponomic sinus.

Dimensions.

| | |
|-----------------------------------|-----------------|
| Diameter of shell | 68 mm. (100) |
| Width of umbilicus | (closed) |
| Height of outer whorl | 41·5 mm. (61·0) |
| Ditto above preceding whorl | 23 " (33·8) |
| Thickness of outer whorl | 47 " (69·1) |

The dimensions given by De Koninck are:—longitudinal diameter 70 millim.; transverse diameter 42 millim.; height of aperture 40 millim.

Remarks. I have seen only one example of this species, that is the type specimen which forms part of the collection of the Geological Survey of Ireland; it bears the locality "Limerick, Glenbane E.;" but De Koninck says it came

from Tomdeelys, Co. Limerick, Ireland. The specimen lacks the body-chamber, the anterior end of the specimen being the surface of the last septum. Although this septal surface is incomplete, there is sufficient to show clearly that the species belongs to the genus *Brancoceras*. This was the only example known to De Koninck.

Affinities and Differences. The closed umbilicus, the wide umbilical depression, the ornaments of the test, and the form of the suture-line at once distinguish the present species both from *Glyphioceras striatum*, J. Sowerby, sp., and *Glyphioceras crenistria*, J. Phillips, sp.

LX.—*Note on the Occurrence of Cytheridea castanea, G. S. Brady, in a Surface-deposit in the Vicinity of Buenos Ayres, South America.* By THOMAS SCOTT, F.L.S.

[Plate XVI]

DARWIN, when describing the surface-geology of the Pampas in his 'Geological Observations on South America,' alludes to the occurrence of shell-bearing sand-dunes on the shores of the Rio de la Plata and elsewhere in the province of La Plata. Numbers of these dunes are to be found in the vicinity of Buenos Ayres, especially towards the shores of the estuary of the Plate. The dunes referred to are generally more or less covered with vegetation, but in some instances, where the vegetation is displaced, a shell-bed a few inches thick and of a darker colour and firmer consistency than the sand is seen to stretch across each of the dunes in a nearly horizontal position. It is in this shell-bed that the *Cytheridea* was obtained that forms the subject of this note.

Buenos Ayres, being an important seaport, is frequently visited by ships trading to South America. My younger son, Mr. John Scott, is a marine engineer, and his ship happened to be at Buenos Ayres for several days during January last year (1898). My son is interested in natural history, and, being ashore, he took the opportunity to examine a few of the sand-dunes in the vicinity of the harbour of Buenos Ayres and also to collect a quantity of the material in which the shells are embedded. In collecting this material he first scraped away the surface-matter, then, digging well into the shell-bed, removed what he considered to be a fair sample of the material; this he brought home on his return to England. I made a careful examination of the material my son had brought to me, and obtained from it a number of different kinds of fossils; the most common species obtained was *Azara labiata*, d'Orb., a bivalve mollusk mentioned by Darwin as