

FIG.

- 11. Foraminifera: *M. valvulata.* × 45.
- 12. " *M. tricarinata.* × 35.
- 13. " *M. reticulata.* × 25.
- 14. " *Spiroloculina grata.* × 25.
- 15. " *S. limbata.* × 25.
- 16. " *Vertebralina* sp. × 30.

PLATE XIX: FORAMINIFERA FROM CRETE.

- 1. Foraminifera: *Peneroplis pertusus.* × 25.
- 2. " " " × 35.
- 3. " " " × 25.
- 4. " " " × 35.
- 5. " *Dentalina* sp. × 25.
- 6. " *Orbitolites complanata.* × 25.
- 7. " " " × 50.
- 8. " *Polymorphina lactea.* × 25.
- 9. " *Globigerina bulloides.* × 30.
- 10. " *Planorbulina mediterraneensis.* × 30.
- 11. " *Discorbina globularis.* × 45.
- 12. " *D. opercularis.* × 45.
- 13. " *D. orbicularis.* × 45.
- 14. " *D. turbo.* × 45.
- 15. " *Truncatulina lobatula.* × 45.
- 16. " *T. ungeriana.* × 45.
- 17. " *Rotalia becarii.* × 45.
- 18. " *Polystomella macella.* × 45.

III.—SEDGWICK MUSEUM NOTES.

NEW FOSSILS FROM THE HAVERFORDWEST DISTRICT.

By F. R. COWPER REED, M.A., F.G.S.

(PLATE XX.)

GASTEROPODA.

A FEW Gasteropoda were recorded by Messrs. Marr and Roberts from the *Trinucleus seticornis* Beds, principally from the Redhill stage, but Mr. Turnbull has been fortunate in obtaining a comparatively large number of species. The specimens are not usually well preserved, and the specific or even generic determination of all is not possible with the present material. Some interesting new forms, however, can be detected, and the following list can now be given:—

- R. *Eotomaria Robertsii*, sp. nov.
- R. *E. cf. elliptica*, His.
- R. *E.* sp.
- R. S. *Liospira* sp.
- S. *Lophospira cf. turrata*, Portl.
- R. *L.* sp.
- R. *Hormotoma* (?) sp.
- S. *Clathrospira* (?) sp.
- S. *Trochonema* sp.

<sup>1</sup> Marr & Roberts, Quart. Journ. Geol. Soc., vol. xli (1885), pp. 476-490.

- R, Sh. *Holopea concinna*, McCoy.  
 S. *Holopella* sp.  
 R. *Loxonema* sp.  
 R. *Ophiletina* (?) sp.  
 R. *Eccyliomphalus minor*, Portl.  
 R. *Bellerophon* (*Sinuities*) *crypticus*, sp. nov.  
 R. *B.* (*Bucanopsis*) *secundus*, sp. nov.  
 R. *B.* (*Oxydiscus*?) sp.  
 R. *B.* (s.g.?) *multirugatus*, sp. nov.  
 Sh. *B.* (s.g.?) sp.  
 S. *Conradella* (?) sp.  
 R. *Archinacella Prendergasti*, sp. nov.  
 R, S. *A.* aff. *rotunda*, Ulrich.

Of the foregoing those marked R. occur in the Redhill Beds those marked S. in the Slade Beds, and those Sh. in the Shoeshook Limestone.

*EOTOMARIA ROBERTSI*, sp. nov. (Pl. XX, Figs. 1-4.)

Shell low, conical, of 5-6 flat whorls; apical angle  $90^{\circ}$ - $110^{\circ}$ ; base convex; periphery angular; mouth obliquely subrhomboidal, wider than high; umbilicus very small, deep, partly covered by reflexed inner lip of mouth. Band concave, narrow, with sharp raised borders, the lower edge forming the periphery of the whorls; lunulæ of band very faint. Surface of whorls nearly flat; ornamented with fine, simple, oblique, curved lines of growth, meeting suture-line above at about  $75^{\circ}$ , but curved strongly back near band so as to meet it at  $20^{\circ}$ - $25^{\circ}$ . Base of shell more or less swollen, especially towards mouth, and marked by strong growth-lines.

Dimensions average about 18 mm. in basal diameter.

*Horizon*.—Redhill Beds.

*Localities*.—Prendergast Place and Lane, Haverfordwest.

*Remarks*.—The genus *Eotomaria* was established by Ulrich<sup>1</sup> for a certain type of shell differing from *Pleurotomaria* in merely having a notch in the outer lip and no slit; in the lower edge of the band forming the periphery of the whorls; in the lines of growth curving more or less forward beneath the band; and in the surface being marked by simple lines of growth only. The complete definition of the genus was given as follows: "Shell depressed-conical, sometimes sublenticular; base more or less convex, its bulk usually nearly equal to the apical part; umbilicus very small or wanting; volutions not very numerous, sometimes slightly turriculate or strongly angular near the mid-height; aperture oblique, subquadrate, the inner lip slightly reflected or merely thickened, the outer deeply notched at the peripheral angle; no slit; band of moderate width, concave, sharply defined, oblique or horizontal, lying upon the apical side of the periphery. The surface markings consist of fine lines of growth only. These curve

<sup>1</sup> Ulrich & Seofield: Final Rep. Geol. and Nat. Hist. Surv. Minnesota, vol. iii (1897), pt. 2, pp. 954, 1000.

backward more or less strongly toward the band on both the upper and lower sides of the whorls. Type, *E. sublaevis*, Ulrich.”

The specimens from the Redhill Beds occur only as internal casts or external impressions of the shell, and are generally more or less crushed and distorted. They are the commonest gasteropods on this horizon, and from the examination of a large series of specimens the above description has been drawn up. The characters of the base, umbilicus, and inner lip are always distinct, and the position and peculiarities of the band and surface-markings are clearly preserved on two or three shells.

A comparison with Ulrich's figures and descriptions of American species suggests that our Redhill form is closely allied to *E. canalifera*, Ulrich,<sup>1</sup> and *E. labiosa*, Ulrich,<sup>2</sup> from the Stones River Group of Tennessee. The well-known species generally known as *Trochus ellipticus*, Hisinger, from the Ordovician of Northern Europe is a much more elevated and conical shell with a smaller apical angle. The subgenus of *Pleurotomaria* which has been named by Miss Donald *Palaeoschisma*<sup>3</sup> is said to differ from *Eotomaria* in having “a distinct though short slit, instead of a sinus in the outer lip.” In the case of our Haverfordwest specimens of *E. Robertsi*, the state of preservation has not permitted me to determine whether a sinus or slit is present, but they differ much more from the type and only species of *Palaeoschisma* (*P. girvanense*) in all other observable characters than they do from the above-mentioned species of *Eotomaria*, so that their reference to the latter genus appears fairly certain.

#### EOTOMARIA cf. ELLIPTICA (Hisinger).

In addition to *E. Robertsi*, a taller, more conical species of *Eotomaria* occurs which, so far as it is preserved, appears to be comparable to the Ordovician form described by Hisinger as *Trochus ellipticus*.<sup>4</sup> One specimen from the Redhill Beds of Prendergast Place has an apical angle of 60°, a height of 18 mm., and a basal width of about 15 mm. The species was believed by Portlock<sup>5</sup> to occur in the Ordovician of Tyrone, but Miss Donald (op. cit., p. 337) declares that it is a distinct species, and she would apparently place Hisinger's shell in her subgenus *Palaeoschisma*.

*Horizon*.—Redhill Beds.

*Localities*.—Prendergast Place and Lane, Haverfordwest.

#### LOPHOSPIRA cf. TURRITA, Portlock. (Pl. XX, Figs. 6, 6a.)

Shell elevated, turreted, composed of about 5 (?) whorls with subangular periphery above middle and rather rapidly increasing in size to base; basal whorl ventricose, high. Apical angle 50°. Upper surface of whorls with one prominent carina about two-thirds the

<sup>1</sup> Ulrich: op. cit., p. 1002, pl. lxix, figs. 9-14.

<sup>2</sup> Ulrich: op. cit., p. 1003, pl. lxix, figs. 15-17.

<sup>3</sup> Donald: Quart. Journ. Geol. Soc., vol. lviii (1902), p. 335, pl. ix, figs. 11, 11a.

<sup>4</sup> Hisinger: Leth. Suec., 1837, p. 35, pl. xi, fig. 1. Lindström: Silur. Gastrop. Pterop. Gotland, p. 104, pl. viii, figs. 10-14. Koken: Bull. Acad. Imper. Sci. St. Petersb., ser. v, vol. vii (1897), No. 2, p. 152.

<sup>5</sup> Portlock: Geol. Rep. Londond., p. 414, pl. xxxi, fig. 1.

distance from band to suture, and one weaker one nearer the suture. Band peripheral (submedian on upper whorls), rather wide, trilineate with raised linear margins and stronger submedian raised line; lunulæ frequent, rather strong. Outer face of whorls with faint revolving carina below band at about twice its width, and another fainter one at same distance below. On outer and lower surface of basal whorl below the band there are in addition distinct spiral revolving lines regularly and closely placed. Upper surface of whorls crossed by regular, strong growth-lines meeting band at 60°, and continued below it on outer and lower surface of whorls.

*Dimensions :*

Height	...	...	...	about 18 mm.
Basal width	...	...	..	12·5 mm.

*Horizon.*—Slade Beds.

*Locality.*—Lane between Slade Hall and Pelcombe Bridge.

*Remarks.*—This species, though at present too imperfectly known to merit a distinctive name, undoubtedly belongs to the genus *Lophospira* as defined by Ulrich,<sup>1</sup> and it possesses many points of resemblance to *L. bicincta* (Hall),<sup>2</sup> but the band and carinæ are rather different. It is probably distinct from any British Bala species so far described, though *M. pulchra*, McCoy,<sup>3</sup> seems allied to it. But an examination of the supposed type of *Pleurotomaria turrita*, Portlock,<sup>4</sup> in the Jermyn Street Museum has convinced me that its nearest relation is found in this species, and it may best be compared with it, pending its specific separation.

*LIOSPIRA* sp. (Pl. XX, Figs. 7, 7a.)

Shell heliciform, low, depressed-conical, of 4-5 rounded whorls coiled into a low spire; base convex, rounded; whorls increasing in size rather rapidly to mouth; sutures more or less sunken; apical angle 130° or more; body-whorl higher than spire, with rounded periphery. Band of moderate width, not prominent, subperipheral, situated on body-whorl a little above middle, hidden on other whorls by their overlap. Ornamentation of shell consisting of fine, transverse lines of growth, curved back sharply to meet band, and continued on lower surface of body-whorl (base not well preserved).

*Dimensions :*

		I.		II.
Height	...	7·5	...	5 mm.
Diameter	...	11·5	...	8 mm.

*Horizons.*—Slade Beds (II); Redhill Beds (I).

*Localities.*—Roadside near St. Martin's Cemetery, Haverfordwest (II); Prendergast Place (I).

*Remarks.*—The specimens are not sufficiently well preserved to determine the species, but their reference to the genus *Liospira* as defined by Ulrich<sup>5</sup> is indisputable. So far as this form can be

<sup>1</sup> Ulrich : op. cit., pp. 951, 960.

<sup>2</sup> Hall : Palæont. N.Y., vol. i, p. 177, pl. xxxviii, figs. 5a-5f.

<sup>3</sup> McCoy : Synops. Brit. Pal. Foss. Woodw. Mus., p. 294, pl. ik, figs. 42, 42a.

<sup>4</sup> Portlock : op. cit., p. 413, pl. xxx, figs. 7a, 7b.

<sup>5</sup> Ulrich : op. cit., pp. 953, 992.

compared with others, we may mention *Pleurotomaria helicina*, Lindström,<sup>1</sup> and especially *Pl. æquilatera*, Wahlenb.,<sup>2</sup> as bearing much resemblance to it.

TROCHONEMA sp.

There is one fairly good but compressed specimen from Upper Slade in Mr. Turnbull's collection which must be referred to this genus. The shell is conical, of 4-5 whorls (only 3 are preserved); the whorls are rather low, with their upper surface more or less flattened and horizontal, their periphery angular and carinate, and their outer face nearly vertical to the suture; the base of the shell is more or less convex and rounded. On the upper surface of the whorls there is a shoulder-like, flat space round the suture; a weak carina separates it from the rest of the upper surface, which is slightly concave. The peripheral carina is strong and prominent, and the outer side of the whorl below it is nearly at right angles to the upper surface, and bears, low down, traces of one or two faint revolving carinæ. The whole surface of the whorls is crossed by coarse, oblique, continuous growth-lines, meeting the peripheral carina at about 45°, and passing over it and over the upper surface of the whorls without deflection. Apical angle of shell 100°-120°. Height about 21 mm.; basal width about 17 mm.

*Horizon.*—Slade Beds.

*Locality.*—Quarry at Upper Slade.

*Remarks.*—This imperfectly-known shell resembles in many respects *T. umbilicatum*, Hall,<sup>3</sup> but the obliquity of the growth-striæ is a distinguishing feature.

ARCHINACELLA PRENDERGASTI, sp. nov. (Pl. XX, Figs. 8, 8a, 9.)

Shell subcircular or subelliptical, equally rounded at both ends, convex, rounded, subconical, rather high, with highest point situated subcentrally behind apex; apex submarginal, incurved, sharp, not overhanging margin, but surface of shell below it steep and more or less excavated. Rostral scars large, oval, with traces of a small circular pair behind them and more closely placed together. Muscular band forming small, continuous loop, extending back a little over two-thirds the distance from apex to posterior end. Surface of shell marked by concentric, slightly wavy growth-lines, strongest near margin.

*Dimensions* (both specimens are somewhat crushed):

		I.	II.
Length	... ..	13·50	22·0 mm.
Width	... ..	17·30	13·5 mm.
Height	... ..	7·75	8·5 mm.

*Horizon.*—Redhill Beds.

*Locality.*—Prendergast Place, Haverfordwest.

<sup>1</sup> Lindström: op. cit., p. 124, pl. xi, figs. 34-37.

<sup>2</sup> Lindström: op. cit., p. 111, pl. ix, figs. 20-29.

<sup>3</sup> Hall: Palæont. N. Y., vol. i (1847), pp. 43, 175. Ulrich: op. cit., p. 1047, pl. lxxvii, figs. 1-8.

*Remarks.*—There are only two specimens of this shell in Mr. Turnbull's collection, and one (No. II) is somewhat laterally compressed and the other rather crushed. But sufficient characters are preserved to show we have to deal with a new species. The character by which the genus *Archinacella*<sup>1</sup> is principally distinguished from *Tryblidium*<sup>2</sup> is the possession of a continuous muscular loop instead of separate pairs of muscles arranged round the shell. The definition of the genus *Archinacella* is given by Ulrich, its founder, as follows (op. cit., p. 821):—"Shell patelliform, ovate to subcircular, usually widest anteriorly, forming a low cone with the apex in front of the centre and often submarginal. Muscular scars forming a continuous band. Surface markings concentric only. Type, *A. powersi*, Ulrich."

A species which seems deserving of comparison with our Redhill form is *A. valida* (Sardeson)<sup>3</sup> from the Trenton Group of Minnesota; and Billings' *Metoptoma simplex*<sup>4</sup> from the Calciferous formation appears to have precisely the same contour and shape.

ARCHINACELLA aff. ROTUNDA, Ulrich. (Pl. XX, Figs. 10, 10a.)

There is a smaller and apparently distinct species of *Archinacella* occurring in the Redhill and Slade Beds, which is, however, scarcely sufficiently known at present to warrant a new specific name. It is nearly circular in shape, strongly convex, with the sharp pointed apex vertically above and slightly overhanging the anterior margin; the shell is highest in the middle, and the apex is rather depressed and incurved, being only about half the maximum height of the shell above the margin. No surface-markings are distinguishable. This species appears to resemble Ulrich's *A. rotunda*<sup>5</sup> from the Utica Group of Iowa.

*Dimensions :*

Length	...	...	5.5 mm.
Width	...	...	5.5 mm.
Height	...	...	3.0 mm.

*Horizons.*—(I) Redhill Beds; (II) Slade Beds.

*Localities.*—(I) Redhill Quarry; (II) Quarry at Upper Slade.

BELLEROPHON (SINUITES) CRYPTICUS, sp. nov. (Pl. XX, Figs. 12–14.)

Shell involute, closely coiled, subglobose, sides somewhat flattened, greatest thickness at umbilicus, back narrowly rounded; outer whorl completely embracing and hiding inner whorls, and increasing rather rapidly in size to mouth; umbilicus minute (exposed in casts); section of whorls semi-elliptical to parabolic; aperture higher than wide, not expanded laterally; outer lip thin; inner lip more or less reflexed and thickened; dorsal sinus moderately deep, broadly V-shaped; apertural lobes rounded gently to sinus, where margin is rather suddenly and sharply curved inwards. Surface of

<sup>1</sup> Ulrich: op. cit., p. 828.

<sup>2</sup> Lindström & Angelin: Fragmenta Silurica (1880), p. 15.

<sup>3</sup> Ulrich: op. cit., p. 832, pl. lxi, figs. 14, 15.

<sup>4</sup> Billings: Palaeoz. Foss. Canada, vol. i (1865), p. 346, fig. 334.

<sup>5</sup> Ulrich: op. cit., p. 835, pl. lxi, figs. 24, 25.

shell ornamented with rather strong concentric growth-lines and ridges on apertural lobes, and generally with one rather strong, broad constriction a little inside margin of mouth; general surface of shell ornamented with a minute, regular cancellation composed of equal-sized, fine, revolving striæ closely placed and crossed by similar transverse, slightly flexuous striæ.

*Dimensions :*

Height (average)	... ..	about 20 mm.
Diameter "	... ..	" 8-10 mm.

*Horizons.*—(I) Redhill Beds; (II) Slade Beds (?).

*Localities.*—(I) Prendergast Place and Lane; (II) lane near Crundale, and Robeston Wathen.

*Remarks.*—The specimens of this shell are usually only preserved as internal casts, which are generally somewhat crushed and distorted. In a few instances the aperture and external ornamentation are fairly well seen. It is a rather abundant fossil in the Redhill Beds, but examples in anything approaching a perfect condition are rare.

The close resemblance of this form to the well-known but frequently misunderstood *Bellerophon bilobatus*, Sow.,<sup>1</sup> is obvious, and it undoubtedly belongs to the same group of species, which was named *Sinuities* by Koken (1896),<sup>2</sup> and subsequently *Protowarthia* by Ulrich (1897)<sup>3</sup> in apparent ignorance of Koken's name, the former choosing *B. bilobatus* as the type and the latter *B. cancellatus*, Hall, which has frequently been regarded as identical. Our shells, however, differ from typical examples of Sowerby's species in having a more narrowly rounded back, a less subquadrate section of the whorls, a less broad and less globose shell, a more rapidly increasing outer whorl, and a constriction near the mouth. The fine cancellation of the surface, though not mentioned or figured by Sowerby in his original description of *B. bilobatus*, was observed by McCoy<sup>4</sup> and Salter<sup>5</sup> in specimens which they attributed to that species. Koken's<sup>6</sup> *Sinuities bilobatus*, mut. *macer*, may be identical with our form, but his description is too brief, and no figure has been published. Portlock's *B. bilobatus*,<sup>7</sup> var. *compressus*, is founded on too crushed a specimen to determine its original shape and characters. But his *B. elongatus*<sup>8</sup> closely resembles our Redhill form in shape, though certainly devoid of the peculiar fine cancellation on the surface. Through the kindness of Dr. Kitchin I have had access to Portlock's types, and it is much to be regretted that they are in such a wretched state of preservation that his specific names are practically worthless. Accordingly, I feel

<sup>1</sup> Sowerby: in Murchison's Silur. Syst., p. 643, pl. xix, fig. 13.

<sup>2</sup> Koken: Die Leitfossilien (Leipzig, 1896), p. 392; id., Bull. Acad. Imper. Sci. St. Petersburg, ser. v, vol. vii (1897), No. 2, p. 117.

<sup>3</sup> Ulrich: op. cit., pp. 848, 867.

<sup>4</sup> McCoy: Synops. Brit. Pal. Foss. Woodw. Mus. (1854), p. 309.

<sup>5</sup> Salter: Cat. Camb. Silur. Foss. Woodw. Mus. (1864), p. 67.

<sup>6</sup> Koken: Die Leitfoss., p. 393; id., Bull. Acad. Imper. Sci. St. Petersburg, ser. v, vol. viii (1897), No. 2, p. 118.

<sup>7</sup> Portlock: op. cit., p. 397, pl. xxix, figs. 2a, 2b.

<sup>8</sup> Ibid., p. 397, pl. xxix, figs. 4a, 4b.

justified in giving a new specific name to this Haverfordwest fossil, as its characters are well marked, though individual specimens showing all of them are rare.

There can be no doubt that Koken's and Ulrich's groups *Sinuities* and *Protowarthia* are completely synonymous. The earlier classification and group typified by *B. bilobatus*, which Koken proposed in 1889,<sup>1</sup> were abandoned by him in 1896 and rejected by Ulrich in 1897. Koken's subsequent definition of *Sinuities* is much shorter than that given by Ulrich for *Protowarthia*, and he is doubtful about the distinction of the species which he mentions. The diagnosis is as follows:—"Mündung mit breiter Bucht, die kein Schlitzband hinterlässt. Nabelgegend mit nach vorn abgegrenzter Runzelschicht. Aussenseite der Windungen innerhalb der Mündung mit derben Runzeln. Nabel verdeckt. *Bellerophon bilobatus*, Sow." Ulrich defines *Protowarthia* as follows:—"Aperture large, but not abruptly expanded, the outer lip bilobate, with a broad and more or less deep sinus, but neither a slit nor band; dorsum convex, never carinate; umbilicus closed; surface markings very fine, generally consisting of more or less obscure crowded lines of growth and delicate revolving striæ. The inner lip forms a thin granulose deposit over the dorsum of the inner end of the last whorl, and extends on each side around the umbilical region. This portion is covered with interrupted or inosculating lines. Type, *Bellerophon cancellatus*, Hall." The ornamentation of *B. cancellatus*<sup>2</sup> is indistinguishable from that of our form, but Ulrich denies that this species is identical with *B. bilobatus*, Sow., and considers that his *Protowarthia obesa*<sup>3</sup> should rather be compared with it.

*BELLEROPHON* (?) *MULTIRUGATUS*, sp. nov. (Pl. XX, Figs. 11, 11a.)

Fragments of a large *Bellerophon*-like shell occur in the Redhill Beds of Prendergast Place and Mill Lane with peculiar characters which mark it off from all the other species. The shell seems to be involute, with the outer whorl embracing the inner ones and the umbilicus absent or minute; the back is broad with a low but distinct carina, but apparently no slit-band; the outer whorl enlarges rapidly towards the mouth, which is transversely expanded and has a reflexed inner lip. The margin of the mouth is not preserved, so that the sinus, if present, cannot be seen. The shell is specially remarkable for its ornamentation, which consists of regularly-arranged, strong, subequal, rounded to subangular, broad, transverse ribs, separated by shallow grooves of the same width. These ribs curve backwards towards the keel, over which they pass without interruption, the opposite ones uniting in a broad V enclosing an angle of about 150°. The ribs die out on the expanded margins of the mouth, and are weaker on the lower sides of the whorls. Fine, spiral, revolving, equidistant striæ cross the

<sup>1</sup> Koken: Neues Jahrb. f. Mineral., Beil., Bd. vi (1889), p. 377.

<sup>2</sup> Hall: Palæont. N.Y., vol. i (1847), p. 307. Ulrich: op. cit., p. 872, pl. lxiii, figs. 1-14.

<sup>3</sup> Ulrich: op. cit., p. 874, pl. lxiii, figs. 45-47.



ribs parallel to the keel, but become sinuous, broken, and irregular near the mouth. The shells are mostly crushed, but must have reached a rather large size, some measuring 50–70 mm. across the mouth. The true position and affinities of this form are doubtful.

*BELLEROPHON* (*BUCANOPSIS*) *SECUNDUS*, sp. nov. (Pl. XX,  
Figs. 15, 15a.)

Shell subglobose, with broad, rounded back; of few volutions; whorls transversely subquadrate in section, broader than high; umbilicus moderately large, deep, with subangular margins, exposing inner whorls; aperture transverse, more or less expanded; inner lip reflexed on inner end of last whorl; band rather broad, with narrow, raised margins, not depressed, with fine, gently curved lunulæ; surface of shell on each side of band marked with rather strong, regular, straight, parallel, subequal, revolving raised lines, about 24 in number, closely crowded near band, but becoming more widely separated laterally, crossed at right angles by very fine, transverse, slightly wavy striae.

*Dimensions.*—Height about 15 mm.

*Horizon.*—Redhill Beds.

*Localities.*—Prendergast Place and Lane.

*Remarks.*—The true generic position of this species in Ulrich's classification seems to be in *Bucanopsis*.<sup>1</sup> But our specimens are so crushed and distorted that it is upon the characters of the ornamentation and slit-band that we must chiefly depend; and these are sufficiently definite and important to mark the species.

The term *Bucania* is employed by Ulrich in a much more restricted generic sense than Hall originally intended, and than later authors (Waagen, Koken, etc.) have used it, and some of the species now placed in *Bucanopsis* have been included in it by them. Ulrich points out that in *Bucanopsis* the spiral surface-markings are straight and parallel with the direction of the whorls, while in *Bucania* sens. str. they are wrinkled, interrupted, and more or less oblique in direction. He would provisionally include in *Bucanopsis* all the Palæozoic spirally striated shells which agree in other respects with *Bellerophon*. The type is *B. carinifera*, Ulrich, from the Trenton Group.<sup>2</sup> The full definition of the genus is as follows: "Shells agreeing in all respects with *Bellerophon*, excepting that their surfaces are cancellated by regular, revolving, and transverse striae. The volutions enlarge rapidly, giving a broadly expanded aperture; the umbilicus is of moderate size, and may be closed entirely, while the inner lip is always somewhat thickened. The revolving lines are never oblique nor wrinkled."

Our Redhill species may be compared with the type species, which is the only Ordovician form previously known; but the band appears to be less prominent and the back broader, and the spiral lineation slightly different.

<sup>1</sup> Ulrich: op. cit., pp. 853, 922.

<sup>2</sup> Ulrich: op. cit., p. 925, pl. lxii, figs. 56–61.

CONRADELLA (?) sp. (Pl. XX, Figs. 5, 5a, 5b.)

There is a small shell occurring in some abundance in the Slade Beds of Upper Slade which may possibly belong to the genus *Conradella* established by Ulrich,<sup>1</sup> but its state of preservation is not quite satisfactory. It seems to consist of a few rapidly enlarging whorls coiled in the same plane, like *Cyrtolites*; the whorls are higher than wide and more or less sharply carinated on the back, below which they are somewhat compressed, swelling out to their maximum diameter near their middle. The keel appears to carry a slit-band crossed by rather distant, strong lunulæ. The ornamentation consists of rather coarse, raised, fimbriated lines, equidistant and equal in size, and connected by less prominent, short, straight lines at right angles to them and alternately arranged, so as not to form true revolving spirals. No other details can be made out. The ornamentation recalls that found in *C. Dyeri*, var. *cellulosa*, Ulrich,<sup>2</sup> and the shape is apparently similar. The height of our little shells averages about 6 mm.

*Horizon*.—Slade Beds.

*Locality*.—Upper Slade, Haverfordwest.

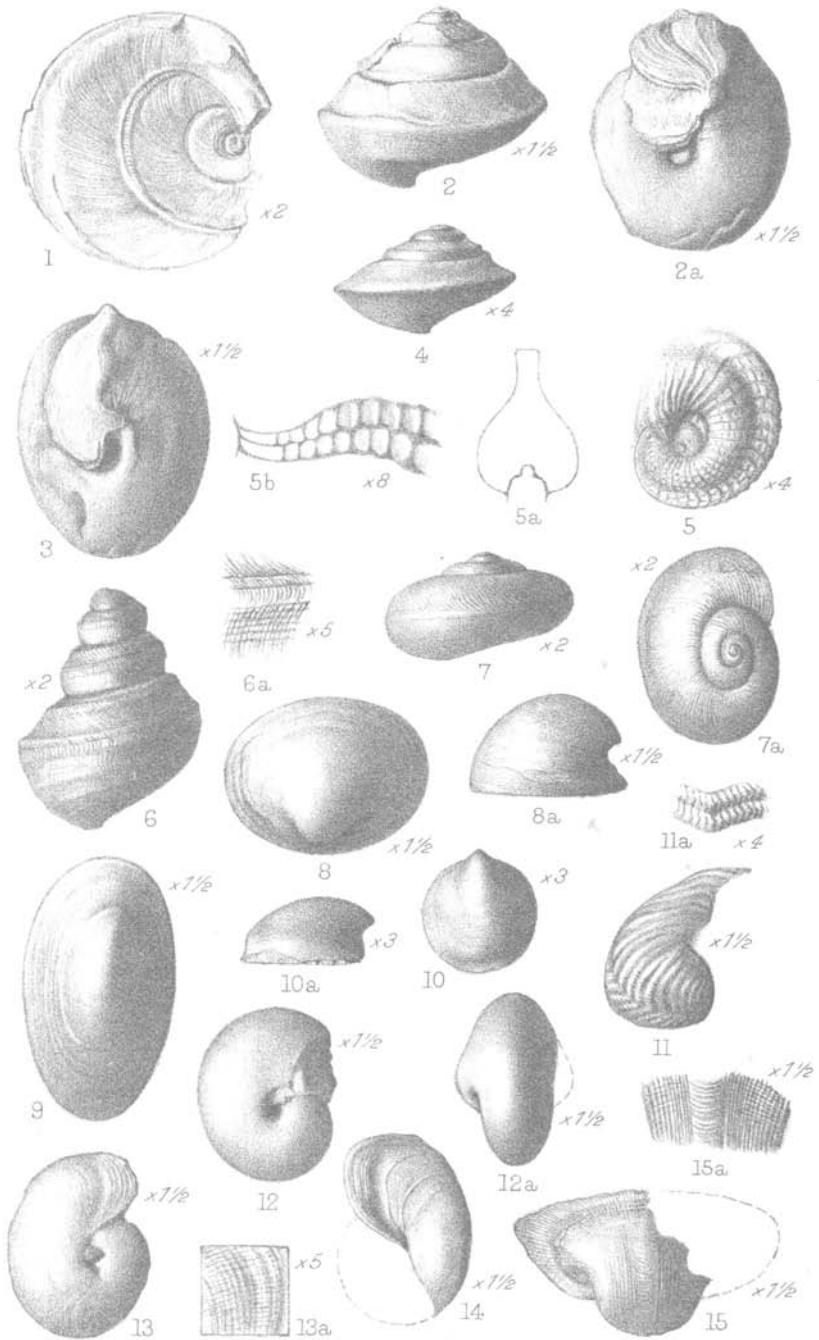
EXPLANATION OF PLATE XX.

FIG.

1. *Eotomaria Robertsi*, sp. nov. Impression of exterior of shell. × 2. Redhill Beds, Prendergast Place, Haverfordwest.
2. Ditto. Side view of internal cast of another specimen. × 1½. Same horizon and locality.
- 2a. Ditto. Base of same specimen. × 1½.
3. Ditto. Base of another specimen, showing reflexed lip. × 1½. Same horizon and locality.
4. Ditto. Internal cast of a young individual. × 4. Redhill Beds, Prendergast Mill Lane.
5. *Conradella* (?) sp. × 4. Slade Beds, Quarry at Upper Slade.
- 5a. Ditto. Transverse section through shell.
- 5b. Ditto. Portion of surface of same specimen enlarged to show ornamentation. × 8.
6. *Lophospira* cf. *turrita*, Portlock. × 2. Slade Beds, lane between Slade Hall and Pelcombe Bridge.
- 6a. Ditto. Band of same specimen enlarged. × 5.
7. *Liospira* sp. × 2. Redhill Beds, Prendergast Place, Haverfordwest.
- 7a. Ditto. Same specimen, viewed from above. × 2.
8. *Archinacella Prendergasti*, sp. nov. Top view. × 1½. Redhill Beds, Prendergast Place.
- 8a. Ditto. Side view of same specimen. × 1½.
9. Ditto. Another specimen, laterally compressed. × 1½. Same horizon and locality.
10. *Archinacella* aff. *rotunda*, Ulrich. Top view. × 3. Redhill Beds, Redhill Quarry.
- 10a. Ditto. Side view of same specimen. × 3.
11. *Bellerophon* (?) *multirugatus*, sp. nov. Crushed and distorted specimen. × 1½. Redhill Beds, Prendergast Mill Lane.
- 11a. Ditto. Portion of back of same specimen enlarged to show ornamentation. × 4.

<sup>1</sup> Ulrich : op. cit., p. 904.

<sup>2</sup> Ulrich : op. cit., p. 910, pl. lxvii, figs. 27-29.



G M Woodward del. et lith.

West, Newman imp.

Ordovician Gastropoda from Haverfordwest.

- 12. *Bellerophon (Sinuities) crypticus*, sp. nov. Side view of internal cast.  $\times 1\frac{1}{2}$ . Redhill Beds, Prendergast Place.
- 12a. Ditto. Dorsal view of same specimen.  $\times 1\frac{1}{2}$ .
- 13. Ditto. Another specimen, showing apertural margin and reflexed lip.  $\times 1\frac{1}{2}$ . Same horizon and locality.
- 13a. Ditto. Portion of surface of same specimen enlarged to show ornamentation.  $\times 5$ .
- 14. Ditto. Portion of another shell, showing apertural margin and dorsal sinus.  $\times 1\frac{1}{2}$ . Same horizon and locality.
- 15. *Bellerophon (Bucanopsis) secundus*, sp. nov. Dorsal view of imperfect specimen.  $\times 1\frac{1}{2}$ . Redhill Beds, Prendergast Place.
- 15a. Ditto. Portion of back of another specimen enlarged, showing band and ornamentation.  $\times 1\frac{1}{2}$ . Same horizon. Prendergast Mill Lane, Haverfordwest.

IV.—ON A SECTION OF MIDDLE AND UPPER LIAS ROCKS NEAR EVERCREECH, SOMERSET.

By L. RICHARDSON, F.G.S.

DURING a brief survey of the Inferior Oolite in the neighbourhood of Doulling, Somerset, in 1905, I visited a disused quarry on the hill a mile and a half north of Evercreech, and situated where the boundary-line between the Inferior Oolite and Midford Sands is shown on the Geological Survey Map, Sheet xix. I was surprised to find that instead of the somewhat massive rock exposed in the quarry being Inferior Oolite, it was Marlstone, capped with Upper Lias clays and limestones. Since the section is becoming rapidly overgrown, it appears desirable to record the details obtained for the benefit of those who will survey the district in the future for the New Series Maps.

QUARRY NEAR EVERCREECH.  
ft. ins.

MIDDLE LIAS (PLEINBACHIAN).	spinati.	8. Clay, brown ... ..	0	3			
		9. Limestone, hard, dark, ironshot, top layer crowded with belemnites ... .. (seen)	10	0	<i>Belemnites paxillosus</i> , Schlotheim, <i>Terebratula punctata</i> , Sow., <i>Rhynchonella tetrahedra</i> (Sow.), <i>Cypricardia pellucida</i> , Moore (= <i>C. intermedia</i> , Moore).		
		UPPER LIAS (TOARCIAN).	fauliferi.	7. Limestone, pale-brown, ironshot	0	3	<i>Paltopleuroceras spinatum</i> (Brug.).
				6. Clay, grey and brown ... ..	0	4	
				5. Limestone, brownish-grey, somewhat earthy, but hard in places, devoid of ferruginous granules	0	2½	<i>Polyplectus capellinus</i> (Quenstedt), <i>Cryptaulax scobina?</i> (Deslongchamps).
		bifrons.	bifrons.	4. Clay, dark-purplish ... about	1	6	
				3. Limestone, brownish-grey, with a few ferruginous granules 2 in. to 6 in. ... ..	0	4	
				2. Limestone, dark-green, earthy, with dark-yellow specks resulting from the decomposition of the ferruginous granules ...	1	4	<i>Hildoceras bifrons</i> (Brug.), <i>Dactyloceras</i> cf. <i>Hollandrei</i> , Wright, non D'Orb., <i>Rhynchonella</i> cf. <i>jurensis</i> (Quenstedt), and <i>Pecten substriatus</i> , Roemer.
1. Clay, brown and bluish.							

I am indebted to Mr. S. S. Buckman for approximately identifying the ammonites. The precise date of beds 3 and 4 could not be