APPENDIX B.

NOTES ON A NEW SPECIES OF *Turritella*, AND A NATICOID-SHELL
REFERRED TO THE GENUS *Gyrodes*, FROM BRITISH
CRETACEOUS ROCKS.

BY R. BULLEN NEWTON.

(By permission of the Trustees of the British Museum.)

PLATE 10.

NOTE.—The writer wishes to state that the manuscript of this paper was prepared in 1914, and that no subsequently published literature in connection therewith has been since considered.—April 5th, 1918.

The Gastropods forming the subject of this communication were collected by Mr. Geo. E. Dibley, F.G.S., from beds of Upper Cretaceous age at Cuxton and Burham, in Kent. The *Turritella* is from the Chalk Marl of Burham, and consequently belongs to the Cenomanian stage, whereas the example of *Gyrodes* was obtained from the *Terebratulina gracilis* var. *lata*-zone of Cuxton, and therefore may be referred to the Turonian stage. It should be mentioned that *Gyrodes* is here identified for the first time as a genus to be included in the British fauna, although perfectly well known in the Cretaceous seas of Europe, the two Americas, India and Africa.

TURRITELLA DIBLEYI, SP. NOV.

[PLATE 10, FIGS. 1, 2.]

Description.—Shell elongate; whorls subquadrangular, compressed, the later ones slightly convex, divided by a moderately oblique suture; sculpture microscopical, exhibiting numerous fine, mostly equi-distant, rounded, equal-sized and smooth spiral costæ, intermediate grooves furnished with minute, closely-set, nearly vertical, or oblique striations; surface, also covered with elevated, flexuous growth lines the more prominent representing thickened, longitudinal, incurved varices. Spiral angle= 11° ; sutural angle= 110° .

Dimensions.—Length=60 m.m.; Diameter (base)=20 m.m.

Remarks.—It is to be regretted that the species herewith described is represented by only one specimen, which is so imperfect at both extremities that it is not only doubtful as to the number of whorls which would have completed its original longitudinal axis, but the important elements of the mouth and base are also entirely absent. Six of the latest whorls are preserved in sequence, including the last; so that probably some 7 or 8 additional, as composing the earlier part of the spire, would suffice, thus making about 14 in all, and so yielding a total length

of about 90 millimetres. The spiral costæ are of one uniform thickness, rather wider apart near the suture, but afterwards equidistant; numbering about 35 on the penultimate whorl, the sulcations between being crowded with nearly vertical striations, whereas the longitudinally oblique and inwardly curved growth lines when crossing the spiral costæ give rise sometimes to a reticulate surface. The more distant of the growth lines are very prominent and assume the character of varices, these being best seen on the four last whorls of the fossil. The test bears evidence of having been cracked in places, as if crushing had taken place during fossilization, an agency which would account for more compression in the whorls than was originally present.

I am inclined to regard this specimen as a new species of *Turritella*, on account of the equal-sized spiral costæ and their association with the striated character of the intermediate grooves. In most similarly sculptured forms of this genus the spiral costæ are of unequal thickness and frequently granulated, whereas they are smooth in the specimen described. Similar grooval striations may be seen in the living *Turritella terebra* of Linnæus, as also in *T. terebellata* of Lamarck from the Eocene rocks, and in probably other species also, but the character appears to be absent in Cretaceous forms of the genus hitherto studied.

The specimen may, perhaps, be best compared with Zekeli's* *T. columna* from the Gosau Cretaceous, which is furnished with spiral costæ of equal strength although much less numerous, but no mention is made of any vertico-oblique striations within the grooves; and further, that species, having a greater spiral angle ($=15^\circ$), would be a relatively less elongate and pointed shell than the British form under description.

I have much pleasure in naming this interesting fossil *Turritella dibleyi*, after our friend, Mr. George E. Dibley, F.G.S., who by his extensive collecting has done so much towards elucidating the history of the British Chalk fauna.

Horizon—Cenonian (Chalk Marl), Zone C.N. 1 of Dibley.

Locality—Margetts' Pit, Burham, Kent.

GYRODES GENTI, J. Sowerby. (Plate 10, Fig. 3.)

Helix gentii. J. Sowerby, "Mineral Conchology," 1816. Vol. ii, pl. 145, p. 101.

<i>Ampullaria canaliculata</i> and <i>Ampullaria</i> (?). (Types in British Museum.)	{	Mantell, "Foss. South Downs," <i>Geol. Sussex</i> , 1822, pl. 18, fig. 11, p. 111; pl. 19, fig. 13, p. 87. (Hamsey, near Lewes), <i>non</i> Lamarck, 1804.

* *Abhandl. K.K. Geol. Reichs.* [Wien] 1852, vol. i, part 2, pl. 1, figure 6, p. 24.

- Natica canaliculata*, J. de C. Sowerby, *Trans. Geol. Soc., London*, 1836, ser. 2, vol. iv, pl. xi, fig. 12, and pl. 18, fig. 6, pp. 336, 343, non Deshayes, 1832.
- Natica gaultina*, Orbigny, "Pal. Française Terr. Crétacés, Gastropoda," 1842, vol. ii, pl. 173, figs. 3—4, p. 156.
- Natica canaliculata*, Geinitz, "Verstein. Kieslingswalda Nachtrag Sächsisch-Böhmischen Kreid." 1843, pl. 1, fig. 20, p. 10; Reuss, "Verstein. Böhmischen Kreideformation, 1845, part 1, pl. xi, fig. 1, p. 49.
- Natica gaultina*, Forbes, *Quart. Journ. Geol. Soc.*, 1845. Vol. i, p. 347; Pictet and Roux, "Desc. Moll. Foss. Grès Verts env. Genève," 1849. Pl. 18, fig. 1, p. 184.
- Natica geinitzii*, Orbigny, "Prod. Pal. Strat.," 1850, vol. ii, p. 150.
- Helix woodwardi*, A. Bell, *Geological Magazine*, 1875, p. 240. (Type in British Museum).
- Natica gaultina*, R. B. Newton, *Proc. Dorset. Nat. Hist. Field Club*, 1897, vol. xviii, pl. 3, fig. 6, p. 82. (Type in British Museum).
- Natica genti*, E. T. Newton and A. J. Jukes-Browne, "Cretaceous Rocks Britain," vol. i. "The Gault, etc., of England," *Mem. Geol. Surv. United Kingdom*, 1900, p. 447.
- Natica (Gyrodes) gaultina*, Pervinquière, "Études Paléontologie Tunisienne-Gastropodes et Lamellibranches des Terrains Crétacés," *Cart. Geol. Tunisie*, 1912, p. 47.

Diagnoses (original):—*Helix gentii*, J. Sowerby, "Discoid, gibbose, smooth, with a spiral band along the upper part of the whorl; aperture large, expanded, elliptical." *Loc.*, near Devizes.

Ampullaria canaliculata, Mantell. "Ventricose, whorls three or four; transversely and obliquely striated; the striae decussating each other; spire short, turns of the spire separated by a deep channel." *Loc.*, near Lewes.

Natica canaliculata, J. de C. Sowerby. "Globose, depressed, smooth. Umbilicus large, circular, gradually expanded into the base. Around the upper edges of the whorls is a concave, transversely striated groove, best defined in the young shell." *Locs.*, Blackdown, and near Folkestone.

Remarks.—The specimen referred to this species is of considerable size and probably the largest yet recorded. Although only a natural cast in chalk without shell structure, it is an unusually fine example and shows extremely well the leading external characters of the species, which include a subglobose discoid contour, a prominent, subangulate, depressed spire, composed of 3 or 4 whorls with flattened summits and com-

pressed sides separated by a canaliculated suture. The body whorl is large and expansive, being 3 times the maximum depth of the penultimate and about $1\frac{1}{2}$ times the width of the spiral region. The original testiferous covering must have been particularly delicate and thin, as the surface of the cast retains some of the sculpture markings consisting of obliquely curved growth striations which are closely arranged and flexuous at the suture; no spiral ornamentation however can be observed. There are no exposed internal characters, as the fossil is attached to a small block of chalk by nearly the whole of its base. A part of the postero-lateral surface of the body whorl is, however, seen beneath the obtusely angulate periphery, where it follows a sloping direction to the umbilical region, which is buried in matrix, so that any attempt to remove the latter would seriously endanger the safety of the specimen.

Dimensions.—Diameters, 75 by 65 mm.; depth of last whorl (about $\frac{3}{4}$ from margin of aperture), 35 mm.

It is unfortunately not known where the type specimen of *Helix genti* may be located at the present day, and all that can be stated is that (according to James Sowerby's account) it was borrowed for figuring purposes from a Mrs. Gent who obtained it from the "micaceous sand formation near Devizes"; no doubt it was subsequently returned to the owners, as the specimen apparently never formed part of the Sowerby collection when acquired by the British Museum. There are, however, a few excellent examples of the species from the same sandstone in the British Museum, one being of rather smaller dimensions, but otherwise in perfect agreement with the original description and figure of the type. Like the type they are all sandstone-casts of fairly young forms showing the channelled suture which is the equivalent of the "spiral band" referred to in the original description, as well as possessing the more or less compressed or discoidal contour. The sculpture markings are identical, although in addition there appears to be only the obscurest evidence of spiral striations, a character more emphasised in a small example from the Cenomanian rocks of Burham (Margett's Pit), Kent, in the collection of Mr. Geo. E. Dibley, and still more so in British Gault forms of more globose outline and which usually show more perfect umbilical characters.

The fossil is strikingly like a large example of the species from the siliceous deposits of Blackdown, in Devonshire, figured by J. de C. Sowerby (pl. 18, fig. 6), in 1836, and now in the Bristol Museum, and which, through the kindness of Mr. Herbert Bolton, the Director of that Institution, I have had forwarded to me for examination. The Blackdown fossil is smaller, measuring 60 by 52 m.m., in the greater and lesser diameters, the depth of body whorl ($\frac{3}{4}$ from margin of aperture) being 21 m.m., and presenting a sharper angulation at the

shoulder on account of being better preserved, besides possessing a distinctly discoidal and spreading contour, with broad flattened summits and sides to the volutions. The oblique lines of growth are similarly constructed and arranged, and there exists also some feeble evidence of spiral striations. The base is largely filled with matrix, thus preventing an examination as to the real structure of the umbilical region, although seemingly of considerable width. Well preserved and moderately young forms of the species bear spiral striations, a character only alluded to by Mantell, and never, curious to state, mentioned by subsequent investigators of the shell. He described the whorls as being "transversely and obliquely striated, the striæ decussating each other;" although the character is absent in the type specimen from Sussex (now in British Museum), which is a natural cast in hard clay, without sculpture markings of any kind. The author probably had for comparison some examples from the Gault of Folkestone, in which sculpture details were better preserved, and so applied that character to the Sussex form.

The synonymy of the species is that adopted by Messrs. E. T. Newton and the late Jukes-Browne in the "Memoirs of the Geological Survey of the United Kingdom" for 1900, where James Sowerby's *genti* (under *Helix*) is recognised as the earliest specific name for that which was subsequently and more commonly known as *canaliculata* or *gaultina*, although it is perhaps worthy of mention that Reuss had previously indicated, with some hesitation, a practically similar result. (Verstein. Böhmischen Kreidef., 1845, p. 49.)

As pointed out some years since, the history of this species includes, also, Mr. A. Bell's *Helix woodwardi* from the Folkestone Gault, which was then erroneously considered a terrestrial shell, but which, from an examination of the type in the British Museum, has proved conclusively to be of marine character, and a crushed form of a Naticoid shell belonging to the present species (R. B. Newton, *Proc. Dorset Nat. Hist. Field Club*, 1897, vol. xviii, p. 82).

Both Geinitz and Reuss have published excellent figures of this species from the Cenomanian-Turonian rocks of Bohemia.

Distribution of the Species.—

Neocomian (Hauterivian) ...	Tunisia, Northern Africa.
Barremian	Atherfield, Isle of Wight.
Aptian	Parham, Sussex; Hythe, Kent.
	{ Folkestone; Black Ven; Black-
Albian	down; Haldon; Hunstanton;
	{ Cambridge; Dunton Green;
	{ Compton Bay (I. of Wight);

Albian	...	...	...	{	Okeford Fitzpaine (Dorset); Ringmer; Northern France (Wissant, etc.); Africa (Tunisia).
				{	Burham (Margett's Pit), Kent; Devizes; near Lewes; Hamsey;
Cenomanian	...	...	...	{	Isle of Wight; White Nothe; Ringstead; Austria (Bohe- mia); Switzerland.
			-		
Turonian	...	...	...	{	(Near Sidmouth; Potterne; Cuxton (Kent); Austria (Bohemia).

Horizon.—Turonian (*Terebratulina gracilis*, var. *lata*, zone).

Locality.—Cuxton, Kent. (British Museum, G. 19000.)

History of Gyrodes.—There can be no doubt as to the accuracy of referring the chalk fossil just described to the genus *Gyrodes*, which in a subgeneric sense has been adopted by M. Pervinquière for *Natica gaultina* of Orbigny, discovered in the Albian rocks of Tunisia (see synonymy for reference). It was founded by Conrad (*Journ. Ac. Nat. Sci. Philadelphia*, 1860, Ser. 2, vol. iv., p. 289) on Morton's *Natica petrosa* from the Upper Cretaceous deposits of the United States ("Synop. Organ. Remains Cretaceous United States," 1834, pl. 19, fig. 6, p. 48), as a subgenus of *Natica* and described as "Globose, thin in substance; whorls channelled above; umbilicus profound, without a callus on the columella or base." The base may be said to possess a more or less wide as well as a deep umbilical cavity, and frequently it is furnished with an angulate periphery. Since its establishment by Conrad, *Gyrodes* has been regarded by all palæoconchologists as a perfectly acceptable genus, and particularly by Meek, who referred to it as exhibiting "a combination of characters unknown in any other type of the Naticidæ" ("Rept. Invert. Cretaceous & Tert. Fossils Upper Missouri": *Rept. United States Geol. Surv. Territories*, 1876, vol. ix, p. 309). The genus is distributed throughout nearly all the stages of the Cretaceous period, especially in Britain and the continent of Europe, but in other countries it is found almost entirely in rocks of Upper Cretaceous age. It is known in the Barremian stage as instanced by the occurrence of *G. genti* (*canaliculata*) in the Atherfield deposits of the Isle of Wight, referred to by Edward Forbes; M. Pervinquière has recorded a species (*excavata* Michelin) from the Neocomian beds of Tunisia; it also existed through the later stages of the Cretaceous epoch right up to the Aturian or Upper Senonian, when it apparently died out; there appear to be no authentic accounts of its existence in Tertiary or later times. The following table will serve to show the distribution of the principal species of the genus:—

DISTRIBUTION TABLE
OF THE CHIEF SPECIES OF GYRODES.

GYRODES.		Britain.	Europe.	India.	Africa.	S. America.	N. America.
<i>abbotti</i> , Gabb.....	New Jersey (Mullica Hill)....						
	(Upper Senonian)						
<i>abyssina</i> (Morton).....	New Jersey.....						x
	Aturian (Upper Senonian).						
<i>altispira</i> (Gabb).....	New Jersey....						x
	Aturian (Upper Senonian).						x
<i>alveata</i> (Conrad).....	Tippah Co., Mississippi.....						x
	(Upper Senonian).						
<i>bouveti</i> , Pervinquiére.....	Tunisia.....						
	Aturian (Upper Senonian).						
<i>conradi</i> , Meek... ..	Dakota and Colorado.....				x		
	(Kossmat).						x
(?) <i>conradiana</i> , Gabb.....	California.....						x
	Aturian (Upper Senonian).						
<i>crenata</i> , Conrad.....	Tippah Co., Mississippi.....						x
	(Upper Senonian).						x
<i>depressa</i> , Meek.....	Colorado.....						x
	Turonian						
<i>euryomphala</i> (Philippi)...	Chili... ..						x
	Aturian (Upper Senonian).						
<i>excavata</i> (Michelin)...	France... ..						
	Albian.						
	Africa (Tunisia).....						
	Neocomian.		x		x		
<i>expansa</i> , Gabb... ..	Chico Group... ..						x
	Aturian (Upper Senonian).						
<i>genti</i> (J. Sowerby).....	Barremian to Turonian.....	x	x				
<i>infracarinata</i> (Gabb).....	New Jersey.....						x
	Aturian (Upper Senonian).						
<i>manuanensis</i> (R. B. Newton)...	Zululand.. ..						
	Emscherian						
	(Lower Senonian).						
<i>munita</i> (Forbes).....	Utatur Group.....				x		
	Cenomanian						
(?) <i>obtusivolva</i> , Gabb.....	Mississippi.....						x
	Aturian (Upper Senonian).						
<i>phansus</i> , Stoliczka... ..	Utatur to Ariyalur Groups...						
	Cenomanian to Senonian.						
<i>petrosus</i> (Morton)...	New Jersey and Alabama...						
	Ripley Group, Aturian (Upper Senonian).						
<i>spillmani</i> , Gabb... ..	Mississippi... ..						x
	Aturian (Upper Senonian).						
<i>subexcavata</i> (Thomas and Peron)...	Algeria and Tunisia...						x
	Cenomanian.						
<i>tenellus</i> , Stoliczka... ..	Trichinopoly and Ariyalur Groups...						
	Turonian to Aturian (Upper Senonian).						
<i>truncatus</i> (Pictet and Roux)...	Perte-du-Rhône... ..						
	Albian		x				
<i>sp.</i> , H. Woods.....	Pondoland.....						
	Upper Cretaceous.						
(?) <i>sp. ind.</i> , R. Etheridge...	Umkwelane Hill, Zululand...						
	Upper Cretaceous.						

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EXPLANATION OF PLATE 10.

TURRITELLA DIBLEYI, *sp. nov.* Cenomanian (Chalk Marl). Margett's Pit, Burham, Kent. *Collection*.—G. E. Dibley.

Fig. 1. Front view of the type specimen embedded in matrix. Natural size.

Fig. 2. Enlarged portion of the same showing the innumerable obliquely vertical striations between the equi-distant spiral costæ, and the flexuous varices of growth. $\times 2$. (p. 97.)

GYRODES GENTI (J. Sowerby). Turonian (*Terebratulina gracilis*, var. *lata* zone). Cuxton, Kent. *Collection*.—British Museum. G. 19000. Collected by G. E. Dibley.

Fig. 3. Dorsal aspect of specimen attached to a small mass of chalk, exhibiting the widely depressed spiral region, and the characteristic canaliculation of the suture. Natural size. (p. 98.)