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# MISCELLANEOUS NAUTILID TYPE SPECIES OF ALPHEUS HYATT

BY BERNHARD KUMMEL

WITH THIRTY PLATES

CAMBRIDGE, MASS., U.S.A.

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# MISCELLANEOUS NAUTILID TYPE SPECIES OF ALPHEUS HYATT

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# No. 6 — *Miscellaneous Nautilid Type Species of Alpheus Hyatt*

By Bernhard Kummel

The impact of Alpheus Hyatt on the study of fossil nautilids is keenly felt by all students of this group of animals. Preparation of the section covering the order Nautilida for the forthcoming volume on the nautilid cephalopods as Part K of the Treatise on Invertebrate Paleontology has necessitated re-examination of many genera and species introduced by Hyatt. Many of these genera and species have been little recognized or used since their introduction because in many cases the original descriptions left much to be desired, and there were no illustrations. Fortunately, many of Hyatt's nautilids are preserved in the Museum of Comparative Zoology. In this paper are presented descriptions and illustrations of 32 species, of which 17 are holotype specimens, including 9 which are types of genera introduced by Hyatt. There are in addition 14 plesiotypes of specimens Hyatt discussed in his "Phylogeny of an Aquired Characteristic." All of these specimens are illustrated by photographs for the first time.

The objective of this paper is the illustration and brief description of these little-known Hyatt types. Discussion of the broader relationship of the various taxa is being presented in another contribution and in the forthcoming Treatise volume.

The species described and illustrated are as follows:

*Anomaloceras anomalum* (Barrande) Hyatt, 1894, pp. 494-495, pl. 8, figs. 16-20.

*Millkoninckioceras konincki* (Miller and Kemp) = *Koninckioceras* (*Nautilus*) *ingens*, Hyatt, 1884, p. 295; 1893, pp. 439-440.

*Planetoceras retardatum* Hyatt, 1893, pp. 421-422.

*Tainoceras duttoni* Hyatt, 1893, pp. 401-402, text-figs. 3, 4.

*Metacoceras wolcotti* Hyatt, 1891, pp. 337-339, figs. 36, 37; 1893, pp. 394-396, fig. 2.

*Diodoceras avonensis* (Dawson), Hyatt, 1894, p. 536, pl. 8, figs. 36-39.

*Lispoceras trivolve* Hyatt, 1893, p. 428.

*Lispoceras rotundum* Hyatt, 1893, pp. 428-429.

*Leuroceras aplanatum* Hyatt, 1893, pp. 437-438.

*Stroboceras anglicum* Hyatt, 1893, pp. 410-411.
*Subclymenia occulta* Hyatt, 1893, pp. 414-416.
*Subclymenia gibbosa* Hyatt, 1893, pp. 414-416.
*Thrincoceras depressum* Hyatt, 1893, pp. 430-432, figs. 9-10.
*Thrincoceras kentuckiense* Hyatt, 1893, pp. 432-434, figs. 11-15.
*Vestinautilus cariniformis* Hyatt, 1893, p. 420.
*Vestinautilus koninckii* (d'Orbigny) Hyatt, 1872, p. 91, pl. 4, figs. 7-9; 1894, pp. 540-541, 602, pl. 9, figs. 5-13.
*Oncodoceras fusiforme* Hyatt, 1893, pp. 455-456.
*Liroceras globatum* (deKoninck), Hyatt, 1894, pp. 541-543, pl. 10, figs. 1-14.
*Coelogasteroceras coxi,* Hyatt, 1894, pp. 498-499, pl. 10, fig. 33.
*Peripetoceras freieslebeni* (Geinitz), Hyatt, 1894, pp. 545-546, pl. 11, figs. 1-3.
*Potoceras dubium* Hyatt, 1894, pp. 537-539, pl. 10, figs. 15-22.
*Ephippioceras ferratum* (Cox), Hyatt, 1894, p. 539, pl. 10, figs. 23-26.
*Eutrephoceras faxoense* Hyatt, 1894, p. 558, pl. 13, figs. 9-12.
*Eutrephoceras imperialis* (Sowerby), Hyatt, 1894, pp. 559, 605, pl. 13, figs. 13-16.
*Cenoceras intermedium* (Sowerby), Hyatt, 1894, pp. 550, 604, pl. 11, figs. 15-16.
*Cenoceras granulosum* (d'Orbigny), Hyatt, 1894, p. 553, pl. 11, figs. 36-39, pl. 31.
*Cenoceras clausum* (d'Orbigny), Hyatt, 1894, p. 552, pl. 12, figs. 12-15.
*Cenoceras aratum* (Quenstedt), Hyatt, 1894, pp. 551-552, pl. 11, figs. 32-35.
*Cenoceras lineatum* (Sowerby), Hyatt, 1894, p. 551, pl. 11, figs. 22-27.
*Cenoceras* sp. Hyatt, 1894, p. 549, pl. 11, figs. 19-21.
*Cymatoceras deslongchampsianum* (d'Orbigny), Hyatt, 1894, p. 554, pl. 12, figs. 22-27.
*Cymatoceras radiatum* (Sowerby), Hyatt, 1894, pp. 554-555, pl. 12, figs. 29, 30; pl. 13, figs. 1, 2.
*Cymatoceras* sp. indet. Hyatt, 1894, pp. 553-554, pl. 12, figs. 16-21.
*Remeleceras impressum* Hyatt, 1894, pp. 525-526, pl. 8, figs. 1-8.

## SYSTEMATIC DESCRIPTIONS

## Order NAUTILIDA Agassiz, 1847

### Superfamily TAINOCERATACEAE Hyatt, 1883

### Family RUTOCERATIDAE Hyatt, 1884

### Genus ANOMALOCERAS Hyatt, 1884

(=*Hyatticeras* Cossman, 1900; *Alpheiceras* Cossman, 1900 [obj.])

*Type species. Nautilus anomalus* Barrande, 1865a

#### ANOMALOCERAS ANOMALUM (Barrande)

Plate 13, figures 5-7

*Anomaloceras anomalum* (Barrande) Hyatt, 1894, pp. 494-495, pl. 8, figs. 16-20.

Hyatt's several illustrations of this species are of a specimen he had sawed in two and polished; the figures represent various stages during his grinding operation. The specimen is quite typical for the species but not well preserved insofar as the external features of the conch are concerned. Hyatt's figure 20 on plate 8 represents accurately the state of the inner whorls as shown on the polished section.

*Locality.* Bohemia.

*Repository.* MCZ 8810.

### Family KONINCKIOCERATIDAE Hyatt, 1900

Although it is argued below that the type species of *Koninckioceras, K. ingens,* is unrecognizable and that the generic name should not be used, I consider that the family-group name based on it should continue to be used in the interests of stability.

### MILLKONINCKIOCERAS n. gen.

*Type species. Koninckioceras koninckı* Miller and Kemp, 1947 (=*Nautilus ingens* deKoninck, *non Conchyliolithes* (*Nautilites*) *ingens* Martin, 1809, type of *Koninckioceras* Hyatt, 1884, *nom. dubium*; = *Koninckoceras* Hyatt, 1900, *nom. null.*).

When Hyatt established the genus *Koninckioceras* in 1883 he stated: "Type, *Kon.* (*Naut.*) *ingens* sp. DeKon. Calc. Carbon. pl. 23, Mus. Comp. Zool. Camb." This specimen deKoninck described and illustrated as *Nautilus ingens* Martin (1809). It

is in the collections of the Museum of Comparative Zoology. Most authors have accepted the specimen in the Museum of Comparative Zoology as the type. After thorough correspondence on this question with Dr. Curt Teichert, it seems inescapable that Hyatt's genus *Koninckioceras* must have for its type species *Conchyliolithus* (*Nautilites*) *ingens* Martin (1809, pl. 41, fig. 5).

Martin's description of his species reads as follows: "CONCHYLIOLITHUS N. Ammonites (*ingens*) anfractibus subextrinsecis teretibus laevibus, ambitu integro, dissepimentis integris. S. p.

"A fossil shell. The original a *Nautilus;* spiral, depressed. (Syst. G. 6. Fam. Ammonitae.) Volutions three, nearly external, even, round, and gradually tapering to the centre, which is hollow or sunk beneath the level of the outward whirl. Ambit entire. Dissepiment entire, oblique, slightly waved. The structure of the siphuncle unknown. Found near Ashford. Limestone. This is the largest of the Ammonitae yet discovered in Derbyshire. The specimen represented is about twice the size of the figure."

The above description, needless to say, leaves much to be desired. The illustration is that of a large evolute nautiloid, probably with a more or less oval whorl section. As drawn, the specimen is an internal cast with prominent striations, which was probably not the intent of the author.

M'Coy (*in* Sedgwick and M'Coy, 1855, p. 559) assigned a number of specimens to *Nautilus ingens* (Martin) which he described as follows:

"Discoid, gibbous, of about four whorls (rarely more than one half preserved), about one half of each whorl of the spire concealed by the involutions; umbilicus wide, usually with sloping sides, and then defined by an obtuse angulation from the sides of the shell, or (in other specimens, or other parts of same specimen) moderately convex and undefined; volutions thick, sides either very convex or slightly flattened, periphery either broadly rounded or obtusely carinate along the middle; edge of the mouth with a rounded, angular sinus in the middle; septa simple, moderately convex; siphon nearly central, a little nearer the inner than the outer margin. Dimensions of small specimen, diameter five inches, proportional diameter of last whorl $\frac{48}{100}$, diameter of umbilicus $\frac{55}{100}$, width of last whorl $\frac{50}{100}$. Shell having the surface marked with fine, obsolete, transverse lines of growth. Last few septa, with a diameter of one inch and a half,

four lines apart; with a diameter of four inches, one inch apart. Adult diameter about nine inches."

There is no indication that M'Coy had available for study Martin's type specimen. In his discussion of *Nautilus ingens,* M'Coy made the following comments: "The examination of a great number of large specimens induces me to propose the union of *Nautilus pentagonus* (Sow.) with this species, because out of a great number of specimens with rounded periphery, some have the inner whorls convex on the sides, and the outer ones flattened, and there are all gradations between the broadly rounded periphery of the true *N. ingens,* and the keeled exterior of the *N. pentagonus;* but it curiously happens that the two widest extremes which I have seen are at the two ends of one large fragment from Closeburn, which in itself would set the question completely at rest; further this latter specimen so strongly keeled in its unseptate portion, shows the impression of simply rounded whorls of the spire on its inner margin."

Sowerby's illustration of *Nautilus pentagonus* (his plate 249) is a composite figure, embodying BMNH 43865b (Pl. 25, figs. 1, 2, of this report) for the general shape and the two patches of matrix, and BMNH 43865a (Pl. 24, figs. 1-3, of this report) for the septal surface and siphuncle at the aperture (M. K. Howarth, personal communication). Foord (1891) discussed *Nautilus pentagonus* and Sowerby's types but placed them in the genus *Solenochilus.* In the synonymy of his *Solenochilus pentagonus* he placed with question *Conchyliolithus (Nautilites) ingens* Martin and specifically excluded *Nautilus ingens* deKoninck (1851, p. 710, and 1878, p. 105) and Hyatt (1884, p. 295). Foord (1891, p. 177) was in agreement with M'Coy's opinion that *N. pentagonus* Sowerby should be united with *N. ingens* Martin. At the same time, however, even though he recognized that Martin's name *ingens* should have precedence over *pentagonus,* he concluded that "there is so much uncertainty about the former species that I have thought it best, after carefully examining the specimens at the Jermyn-Street Museum, as well as those of the British Museum, to allow Sowerby's name to supersede Martin's." In 1893 Hyatt selected *N. pentagonus* Sowerby as the type of his new genus *Lophoceras.*

It appears inescapable that the generic name *Koninckioceras* has for its type the species *ingens* of Martin and that this is an unrecognizable species. Hence the generic name *Koninckioceras* should not be used for specimens other than the type. I reject M'Coy's conclusion that *ingens* and *pentagonus* are synonyms.

Miller and Kemp (1947) accepted Foord's (1891, pp. 176-178) conclusion that *N. ingens* deKoninck was not conspecific with *Conchyliolithus* (*Nautilites*) *ingens* Martin and introduced the specific name *koninckі* for Hyatt's specimen of *Koninckioceras*. Since the generic name *Koninckioceras* cannot be utilized, the new name *Millkoninckioceras* is proposed for the species *koninckі* which is described on the following pages.

As now interpreted, the family Koninckioceratidae includes the following genera: *Edaphoceras* Hyatt, 1884, *Endolobus* Meek and Worthen, 1865, *Foordiceras* Hyatt, 1893, *Millkoninckioceras* n. gen., *Knightoceras* Miller and Owen, 1934, *Koninckioceras* Hyatt, 1883 (unrecognizable), *Lophoceras* Hyatt, 1893, *Planetoceras* Hyatt, 1893, *Subvestinautilus* Turner 1954b, *Temnocheilus* M'Coy, 1844, *Tylodiscoceras* Miller and Collinson, 1950, and *Valhallites* Shimanskii, 1959. The family ranges through the Mississippian and Permian.

MILLKONINCKIOCERAS KONINCKI (Miller and Kemp)

Plate 5, figure 1; Plate 6, figure 2

*Nautilus ingens* deKoninck, 1851, p. 710, pl. 60, fig. 1; 1878, p. 105, pl. 23, fig. 4.

*Koninckioceras* (*Nautilus*) *ingens*, Hyatt, 1884, p. 295.

*Nautilus ingens*, Foord, 1891, pp. 176-178.

*Koninckioceras ingens* Hyatt, 1893, pp. 439-440; Miller and Owen, 1934, p. 245.

*Koninckioceras koninckі* Miller and Kemp, 1947, p. 353, pl. 51, figs. 1, 2; Miller and Youngquist, 1949, pp. 34-36, pl. 9, fig. 1, text-fig. 3.

Interpretation of this genus until now has been based on Hyatt's brief original diagnosis, the original figures by deKoninck (1878), and supplementary remarks made by Hyatt in 1893 in which he clearly states that deKoninck's figures represent a restoration and are in error in many details. The holotype is illustrated here for the first time.

The specimen is an incomplete phragmocone of 135 mm. in diameter, consisting of two volutions; the innermost volutions are not preserved.

The whorl section is depressed and elliptical in outline, measuring 42 mm. in height and 59 mm. in width on the most adoral camarae. The venter is broadly arched merging onto broadly convex umbilical shoulders and lateral areas. The umbilical shoulder is more distinctly rounded, the umbilical wall very broad and flattened, sloping to the umbilical seam at approximately 45 degree angle. The whorl section of the preserved inner

volutions maintain the same shape and proportional dimensions as the outer volutions. The impressed zone is broad and shallow, enclosing only the venter of the preceding whorls. The umbilicus measures approximately 60 mm. in diameter.

The sutures are essentially straight over the venter, lateral areas, and umbilical wall but have a shallow dorsal lobe. The siphuncle is small, presumably tubular, and subcentral in position, that is, closer to the venter than to the dorsum. No shell is preserved on any part of the specimen.

*Locality and horizon.* Lower Carboniferous, Halloy, Belgium.

*Repository.* Holotype — MCZ 5205.

*Remarks.* The genus *Koninckioceras* has been thoroughly reviewed by Miller and Youngquist (1949) who also reproduced deKoninck's original figures.

## Genus PLANETOCERAS Hyatt, 1893

*Type species. Planetoceras retardatum* Hyatt, 1893, pp. 421-422.

### PLANETOCERAS RETARDATUM Hyatt

Plate 7, figures 1-3

The type specimen of this genus and species is a small individual, only moderately well preserved. The specimen measures 29.7 mm. in diameter, 16.6 mm. for the width of the last whorl, 9.5 mm. for the height of the last whorl; the umbilicus measures 13 mm. in diameter. The conch is evolute, tarphyceraconic, and the most adoral quarter whorl is not in contact with the preceding whorl. The whorl section of the outer volution is depressed with a broad, slightly convex venter, broadly rounded ventral shoulders which grade imperceptibly onto a slightly convex lateral area. The umbilical shoulder is marked by a conspicuous angular ridge; the umbilical shoulder is broad, slightly convex and slopes inward at a steep angle. The nature of the inner volutions is not known. As well as one can tell, the suture is essentially straight or at most has extremely shallow broad ventral and lateral lobes. The siphuncle is small, tubular, and slightly ventral of the center.

No surface markings, except faint growth lines, are visible on the test. The aperture has a large tongue-shaped hyponomic sinus marked by a raised border.

*Locality and horizon.* Belgium, Visé.

*Repository.* Holotype — MCZ 2392.

*Remarks.* Hyatt included in his new genus, *Planetoceras,*

*Coelonautilus globatus* (Sowerby) described by Foord (1891, pp. 127-130) from the Carboniferous Limestone of Cork, Kildare. Hyatt had two poorly preserved topotypes of this species for study which are in the collections of the Museum of Comparative Zoology. In addition, Hyatt (1893, p. 422) considered the possibility that *Nautilus atlantoideus* deKoninck and *Nautilus neglectus* deKoninck of the Tournaisian of Belgium and *Nautilus distensus* deKoninck of the Viséan of Belgium belonged also to his genus *Planetoceras.*

After its introduction into the literature, the genus *Planetoceras* was all but forgotten until Miller, Dunbar, and Condra (1933) discussed it and presented a diagnosis. The fact that Hyatt did not supply an illustration of his species and that his description left much to be desired has made interpretation of the genus difficult. The diagnosis of the genus presented by Miller, et al. (1933, p. 138) is remarkably accurate in view of the data available to them. These authors assigned two new species to *Planetoceras, P. bellilineatum* and *P. tiltoni,* both of which I believe are valid species of this genus. The former species differs from *P. retardatum* in that the whorls are in contact throughout the specimen. However, as these authors pointed out, the specimen is small and most probably an immature form. In nearly every other aspect there is good agreement between these species. *Planetoceras tiltoni* is based on a large specimen (225 mm.) that has the general morphological architecture of *Planetoceras.* It is unique, however, in that the adoral half volution has a median concave zone on the venter.

Hyatt (1893) originally placed his new genus in the family Triboloceratidae, and he maintained this viewpoint in the 1900 edition of Zittel-Eastman, Text-Book of Palaeontology. This procedure was followed by Miller, et al. (1933) and Schmidt (1951). *Planetoceras* was placed in the family Koninckioceratidae by Kummel (in Flower and Kummel, 1950), and this procedure was followed with question by Shimanskii (1957). The general character of the conch allies it with members of the Koninckioceratidae much more closely than with the Triboloceratidae. However, too few specimens of this genus have been studied to date, and more data are needed.

## Family TAINOCERATIDAE Hyatt, 1883

### Genus TAINOCERAS Hyatt, 1883

*Type species. Nautilus quadrangulus* McChesney, 1860, pl. 3, fig. 5

#### TAINOCERAS DUTTONI Hyatt

Plate 3, figure 1; Plate 4, figure 1; Plate 6, figure 1

*Tainoceras duttoni* Hyatt, 1893, pp. 401-402, text-figs. 3, 4; Miller, Dunbar, and Condra, 1933, p. 146; Miller and Unklesbay, 1942, pp. 720, 728-729 (not pl. 115, figs. 1, 2); Miller and Youngquist, 1949, pp. 85-88, text-figs. 27, 28.

*Tainoceras unklesbayi* Miller and Youngquist, 1949, p. 91, pl. 33, figs. 1, 2.

The original description and illustrations of this species by Hyatt (reproduced in full by Miller and Youngquist, 1949) are more satisfactory than most for this author. Hyatt summarized the distinctness of his species by the following opening statement of his description: "This interesting form is easily distinguished from all others of its genus, so far described, by reason of the great transverse breadth of the whorls through the umbilical shoulders, the consequent breadth of the smooth umbilical zones of the whorls and the unusual prominence and size of projecting ridges which form the shoulders." On the other hand, Miller and Youngquist (1949, p. 88) felt that "the most distinctive character of *T. duttoni* seems to be the fact that its conch bears longitudinally elongate dorsolateral and ventrolateral nodes but rounded ventral nodes." These authors had only Hyatt's description and illustrations to go by, which are wanting in several details. The ventral nodes are illustrated on a portion of the inner whorls (Hyatt's fig. 3; here Pl. 4, fig. 1) where they appear rounded in Hyatt's stippled drawing but are in fact obliquely elongate, becoming more markedly so on the living chamber where the nodes are so much larger (Pl. 6, fig. 1).

Miller and Unklesbay (1942) recognized a specimen of this species from the Toroweap formation, near Coconino Point in Grand Canyon, Coconino County, Arizona. Later, Miller and Youngquist (1949, p. 91) introduced a new name for this specimen (*T. unklesbayi*) on the basis that the ventral nodes in *T. duttoni* "are moderately small and are rounded whereas in *T. unklesbayi* they are large and are obliquely elongate." This statement as to the differences is due to Hyatt's faulty drawing, as the specimen has nodes quite comparable to those of the

specimen from Arizona. *Tainoceras unklesbayi* is clearly a synonym of *T. duttoni*. Another species which appears to be very similar to *T. duttoni* is *T. shellbachi* Miller and Unklesbay (1942) which the authors differentiated on the basis of the whorls being more slender and the nodes rounded rather than elongate. It is quite conceivable that *T. shellbachi* falls within the limits of variation of *T. duttoni*. Unfortunately, all of these species are known from only one or two specimens.

Hyatt's holotype of *T. duttoni* has a diameter of 162 mm., measures 62.5 mm. for the height of the last whorl and approximately 108 mm. for the width of the last whorl. The umbilicus is 45 mm. in diameter.

*Locality and horizon.* Upper Valley of Zuni Plateau, 12 to 15 miles S.W. of Grants, a station on N.M.A. and P.R.R., collected by Capt. Dutton, U.S.A. Miller and Youngquist (1949, p. 88) suggest that the horizon is the Chupadera formation.

*Repository.* Holotype — MCZ 8804.

## Genus METACOCERAS Hyatt, 1883

*Type species. Nautilus* (*Discus*) *sangemonesis* Meek and Worthen, 1861, p. 470; 1866, pp. 386-388, pl. 29, figs. 3-3b; also Kummel 1953b, pl. 1, figs. 3-5.

### METACOCERAS WALCOTTI Hyatt

Plate 11, figure 5

*Metacoceras walcotti* Hyatt, 1891, pp. 337-339, figs. 36, 37; Hyatt, 1893, pp. 394-396, fig. 2.

It is uncertain whether the single specimen of this species in the Museum of Comparative Zoology is any of those illustrated by Hyatt. No data accompanies this specimen except a note by Hyatt which reads "side view of 3 internal whorls showing striae." This specimen could possibly be the holotype figured by Hyatt (1891, fig. 37), but this cannot be established with any certainty.

The specimen at hand is approximately 192 mm. in diameter, and crushed with only one side of the conch preserved. Hyatt's illustrations of this species are reconstructions, and whether they are based on single specimens or are composite drawings cannot be determined. The present illustration is at least of a specimen studied by Hyatt.

*Horizon and locality.* No horizon or locality data accompanies this specimen but in 1891 and in 1893 Hyatt indicated that his

material came from Bend, San Saba County, Texas.
*Repository.* MCZ 8823.

## Superfamily TRIGONOCERATACEAE Hyatt, 1884

## Family TRIGONOCERATIDAE Hyatt, 1884

### Genus DIODOCERAS Hyatt, 1900

*Type species. Nautilus avonense* Dawson, 1868, p. 311, fig. 124

#### DIODOCERAS AVONENSIS (Dawson)

Plate 1, figures 3, 4

*Nautilus avonensis* Dawson, 1868, p. 311, fig. 124.
*Endolobus avonensis,* Hyatt, 1894, p. 536, pl. 8, figs. 36-39.
*Diodoceras avonensis,* Hyatt, 1900, p. 526; Miller, Dunbar, and Condra, 1933, p. 195.

This is one of the many genera that Hyatt established in the 1900 edition of the Zittel-Eastman, Text-Book of Palaeontology. At that time no diagnosis was given, except listing *Nautilus avonensis* (Dawson) as the type, and placement of the genus in the family Estonioceratidae. The genus has been pretty well neglected, except for a brief mention by Miller, et al. (1933). Dawson's type specimen is in the Museum of Comparative Zoology.

The type specimen is an internal cast consisting of the first half volution, the latter half of the second volution, and slightly less than a half volution of the living chamber, and one camera. The fragmentary specimen is embedded in matrix, and only a portion of the venter and one side of the volutions are preserved.

The conch is evolute with a wide, deep umbilicus. Each volution is impressed by the preceding volution only to a very slight degree. The whorls are broad, elliptical, and depressed. The venter is convex, sloping directly to a more acutely rounded umbilical shoulder. The venter, ventral shoulders, and lateral areas are not distinguishable. The umbilical shoulder is broad, convex, and slopes steeply toward the umbilicus. The first half volution consists of a rapidly expanding, slightly curved cone, the whorl section at the most adoral part being oval. The adoral half of the second volution has a whorl section much like that of the living chamber.

The suture is straight except for a shallow, broad V-shaped dorsal lobe. The siphuncle is subcentral in position, that is,

slightly ventral of the center of the whorl. On the earlier volutions the siphuncle is closer to the venter than on the outer volution.

Only small remnants of shell are preserved, and these show no surface markings of any kind.

*Locality and horizon.* Windsor formation, approximately six miles (?) north of Minudie, Nova Scotia.

*Repository.* Holotype — MCZ 2830.

*Remarks.* Hyatt (1894, pp. 536-537) commented extensively on this specimen in his classic paper on the Phylogeny of an Acquired Characteristic. He interpreted the presence of a cicatrix at the tip of the tiny first half whorl, an observation in which I am not in agreement. The preservation, being that of an internal cast, is not nearly good enough; and the so-called cicatrix is merely an imperfection in preservation, as the extreme tip of this volution is absent.

*Diodoceras* has been placed in the family Trigonoceratidae (= Triboloceratidae) by Flower and Kummel, 1950, and Shimanskii, 1957. Aside from the type species no other species of this genus have been reported.

## Genus LISPOCERAS Hyatt, 1893

*Type species. Lispoceras trivolve* Hyatt, 1893, pp. 426-427

### LISPOCERAS TRIVOLVE Hyatt

Plate 9, figures 1-4; Plate 10, figure 4; Plate 12, figures 1-3

*Lispoceras trivolve* Hyatt, 1893, p. 428; Schmidt, 1951, p. 24; Miller and Garner, 1953, p. 116.

*Lispoceras trivolve* var. *simplum* Hyatt, 1893, p. 428.

The three specimens on which Hyatt established this species and his variety *simplum* are preserved in the Museum of Comparative Zoology. The holotype (Pl. 12, figs. 1-3) measures 46 mm. in diameter and is moderately well preserved. The conch is widely umbilicate with a narrow, shallow impressed zone. The outer whorls have a depressed, lenticular outline with no distinct lateral areas. The venter is broadly arched, merging with a narrowly rounded umbilical shoulder which lies about mid-way between the venter and the dorsum. The umbilical wall is only slightly convex, but very broad. Only the outer volution and one quarter are preserved, the remainder of the inner whorls not being present. The earliest quarter of the preserved volutions are more rounded in cross-section than the more adoral portions.

The depressed lenticular aspect of the whorl section becomes more pronounced adorally.

The conch bears fine longitudinal lines, equally developed over the whole whorl section and on the preserved volutions. Fine growth lines describe a fairly deep, rounded hyponomic sinus. Only fragments of the suture are visible, and it is not possible to develop its pattern. The siphuncle lies roughly mid-way between the center of the whorl and the venter.

The "imperfect living chamber" described by Hyatt (1893, p. 428) is illustrated on Plate 9, figures 1, 2. This specimen is nearly a quarter of a volution in length. The whorl section is lenticular in cross-section, the posterior part measuring 16.3 mm. in height and 28 mm. in width. The anterior part of this living chamber measures 17.3 mm. in height and 24.5 mm. in width; there is a pronounced lenticularity of the living chamber adorally. The portions of the shell which are preserved are smooth except for sinuous growth lines. The dorsal area of the conch has no impresesd zone.

The specimen Hyatt designated var. *simplum* is illustrated on Plate 9, figures 3, 4 and Plate 10, figure 4. This is a fragmentary, distorted specimen consisting of slightly more than one volution, mainly phragmocone, with a small amount of living chamber preserved; the inner volutions are missing. As the specimen is distorted, any measurements would not be significant; this factor may also account for the fact that the whorl section tends to be more oval in cross-section than the holotype. In spite of the faulty preservation, I am inclined to agree with Hyatt that this specimen is conspecific with the holotype. As pointed out by Hyatt, the longitudinal ornament is greatly reduced on this specimen and disappears completely on the most adoral part of the phragmocone. The suture is essentially straight with the shallowest sort of ventral and lateral lobes and an obtuse but prominent dorsal lobe which perhaps is actually an annular lobe. There is no dorsal impressed zone.

*Locality and horizon.* Lower Carboniferous, Visé, Belgium.

*Repository.* Holotype — MCZ 5206; paratypes — MCZ 5147, 5148.

### Lispoceras rotundum Hyatt

Plate 12, figures 4, 5

*Lispoceras rotundum* Hyatt, 1893, pp. 428-429.

"The form of the whorl is quite distinct in this fossil, the abdomino-dorsal diameter being but little shorter than the transverse

on the last whorl. The whorl is rounder or more nearly approaching a quadrate form, the abdomen less depressed than in trivolve. In other words, the whorl begins when much younger than in *L. trivolve* to show a tendency to form lateral zones, and differentiate the abdomen and dorsum. The sutures are not distinctly different from those of trivolve. The longitudinal ridges are well marked on this cast, occupying the entire surface, but are finer in the older stages than in the young. The transverse lines of growth are also present but much fainter, and these differed only slightly from that of trivolve. The aperture has a blunt V-shaped hyponomic sinus and very broad, low crests on either side, rising to the highest point at the abdominal angles (or where these would be if present), very faint sinuses near the umbilici rising into a saddle on the dorsal face.

"This fossil shows plainly that the saddles of the sutures across the dorsum were continuous in the metanepionic sub-stage, and that the subsequent introduction of annular lobes when the whorls came into contact split this saddle in the center of the dorsum, as in other species of the same family.

"Siphuncle is above the center in all stages observed, but is somewhat more above this point in the adult, about one-third of the distance towards the venter.

"A fragment of the young in paranepionic sub-stage shows the whorl to have been at this time elliptical, the ventro-dorsal diameter longer than the transverse, with very slight ventral and dorsal saddles and lateral lobes in the sutures; the siphuncle is just above the center. In the ananeanic sub-stage the transverse diameters become the longest. There is a distinct depression of the rounded abdomen and a tendency to form lateral zones with abdominal angles and umbilical shoulders, the venter being somewhat narrower than the dorsum. The sutures in correlation with these changes have hardly perceptible ventral and lateral lobes and an equally faint dorsal or annular lobe. This last is in the center of a broad dorsal saddle which occupies the umbilical zones as in *L. trivolve*.

"There is also a faint trace or nascent zone of involution on this part which may indicate contact with the next younger whorl. This ananeanic whorl is decidedly broader and more depressed than the next to be described. The siphuncle is somewhat farther removed from the center than in the nepionic stage.

"The latest stage preserved consisted of the cast of a complete living chamber with the septal floor exposed. In this whorl, which

probably represents some part of the paraneanic sub-stage, the transverse diameters continue to be a little longer than the ventro-dorsal. It has more rounded umbilical shoulders and more depressed abdominal angles; the lateral zones are narrower and more convergent outwardly than in younger whorls. The umbilical zones and zone of impression are not distinctly differentiated, the presence of this last zone being indicated on the cast more by the faint lobe in the dorsal than by the form of that side of the whorl. The shell would perhaps have shown traces of contact, but this was not present. In other words, the whorl approximates more to the diagonal type at this time than it has previous to this in the early part of the ananeanic sub-stage.

"The sutures differ from those of the ananeanic sub-stage only in the larger size and better definition of annular lobe, which was barely indicated and only seen after very careful inspection in the early ananeanic sub-stage, about one-half of a whorl younger. The siphuncle is small and its position the same as in the preceding sub-stage.

"The dorso-ventral diameter of the aperture was 13 mm., and the transverse about the same length; the same diameters at the base of the living chamber were respectively 10 mm. and 8.5 mm. The diameter of the whole shell when restored was reckoned at 35 mm."

*Locality and horizon.* Carboniferous, Kildare, Ireland.

*Repository.* Holotype — MCZ 5146.

## Genus LEUROCERAS Hyatt, 1893

*Type species. L. aplanatum* Hyatt, 1893, pp. 437-438

### LEUROCERAS APLANATUM Hyatt

Plate 1, figures 1, 2

*Leuroceras aplanatum* Hyatt, 1893, pp. 437-438; Miller and Garner, 1953, p. 116.

The specimen upon which Hyatt based his genus and species is in the Museum of Comparative Zoology, and is another of the genotypes established by Hyatt but never illustrated. The specimen is involute, compressed, broadly lenticular in cross-section. The diameter of the conch is 78 mm., the width of the most adoral whorl is estimated to be 29 mm., and the height 35 mm. The umbilicus measures 18 mm. in diameter. The whorl

section is compressed with broad, convex, lateral areas and narrowly rounded venter. The greatest width of the whorl is approximately at the center of the whorl. The umbilical shoulders are broadly convex, and the umbilical shoulder slopes to the umbilical seam at a steep angle.

The suture forms a narrow rounded ventral saddle, a broad shallow lateral lobe extending across the whole whorl-side, with the beginning of a saddle on the umbilical whorl. Presumably, there is a shallow dorsal lobe; but on this I cannot be certain; nor does there appear to be a small annular lobe as suggested by Hyatt (1894, p. 437). The lateral areas of the penultimate whorl bear three fine longitudinal lines located on and adjoining the umbilical shoulder. The outer volution is completely smooth. Whether or not these lines are present on the innermost whorls cannot be told because of poor preservation of this portion of the conch.

The siphuncle lies slightly ventral of the center of the whorl, The living chamber on the holotype occupies the outer quarter volution.

*Remarks:* Hyatt placed his new genus in his family Rineceratidae and believed *Nautilus perplomatum* Portlock (1843, p. 403, pl. 29A, fig. 11) from the Lower Carboniferous of Ireland, *Coelonautilus derbiensis* Foord (1891, pp. 131-132; = *N. chesterensis* deKoninck, 1878, p. 97, pl. 31, figs. 4a-c; Tzwetaev, 1888, p. 54, pl. 5, figs. 19-22) and *Coelonautilus globularis* Foord (1891, pp. 132-133) as being congeneric. With this conclusion I have serious misgivings. Portlock's species is so poorly described and illustrated that direct comparisons are at best tenuous. The remaining species are much more inflated forms of quite different aspect.

Assignment of *Leuroceras* to the Trigonoceratidae is based largely on the presence of longitudinal lines on the inner whorls; the general features of the conch suggest that it may be a compressed member of the Liroceratidae. However, since the genus is known only from a single specimen, whose preservation leaves much to be desired, it is probably best to leave it in the Trigonoceratidae for the time being with question.

*Locality and horizon.* Lower Carboniferous, Visé, Belgium.

*Repository.* Holotype — MCZ 3387.

## Genus STROBOCERAS Hyatt, 1884

*Type species. Gyroceras hartii* Dawson, 1868, p. 311, fig. 124.

### STROBOCERAS ANGLICUM Hyatt

Plate 14, figures 1-4

*Stroboceras anglicum* Hyatt, 1893, pp. 410-411.

Hyatt did not illustrate the two specimens he assigned to this species, but his description is as follows: "*Stroboceras anglicum,* n.s., is a more compressed phylogerontic form, also in the collection of the Museum of Comparative Zoology, from Settle, in Yorkshire. The shell has the elevated, sulcated central ventral zone and fluted lateral zones and fluted faces inside of these on the lateral aspects, and internally gibbous lateral faces with longitudinal ridges dividing them into facets at a much earlier stage. In fact all the characteristic elements of the mature whorl of *Stroboceras* as they appear in the early stage of *edwardsianum* are so rapidly developed that the whorl in the paranepionic substage is equivalent to that of the early ephebic stage in *edwardsianum* and very similar to that figured by De Koninck in his figure 10, referred to above, but the lateral faces are narrower and have broad lateral flutes without ridges and lateral gibbous zones with three ridges. In these characteristics the shell approximates to the *Nautilus sulcatus,* equal here to *S. belgicum,* as figured by De Koninck in "Calcaire Carbonifere," pl. 27, fig. 2, but it is much smaller, 14.5 mm. in diameter instead of nearly 25 mm. in diameter, as in that figure.

"It is, in other words, a fine example of the action of Tachogenesis (accelerated or abbreviated development), and this extends to the earlier appearance of the first quarter of the second whorl of the gerontic form and characteristics of an aged whorl. The abdomen becomes smooth, very narrow and concave, the sides smooth, the lateral fluted facets disappear, and the sole distinction between the lateral ventral zones and the gibbous lateral faces lies in the difference of the curves. The whorl becomes as purely senile as is the old whorl of *S. sulcifer* as shown in De Koninck's figure. This species is consequently more specialized and accelerated in development than *edwardsianum,* and *edwardsianum* is more specialized and has therefore more accelerated development than *S. sulcifer* and some other species in which the whorls are stouter, not so much compressed and the young still more like the adults of *Coelonautilus stygialis.* The progressive stages are also more prolonged in these last named

and less specialized forms, and the gerontic stage begins later in the life of the individual."

The holotype is the specimen illustrated on Plate 14, figures 1 and 2. This specimen measures 29 mm. in diameter, 12.3 mm. for the height of the last whorl, and 9.5 mm. for the width of the last whorl; the umbilicus is 11 mm. in diameter. The paratype consists of slightly more than one half of an early volution (Pl. 14, figs. 3, 4). This specimen is 15 mm. in diameter.

*Locality and horizon.* Carboniferous, Settle, Yorkshire, England.

*Repository.* Holotype — MCZ 3392a, Paratype — MCZ 3392b.

## Genus SUBCLYMENIA d'Orbigny, 1850

*Type species. Goniatites evolutus* Phillips, 1836, p. 237, pl. 20, figs. 65-68.

### SUBCLYMENIA OCCULTA Hyatt

Plate 2, figures 1, 2

*Subclymenia occulta* Hyatt, 1893, pp. 414-416.

There are two specimens in the Museum of Comparative Zoology, illustrated here on Plate 2, that are in a tray with a label in deKoninck's handwriting reading, "*Nautilus* n. sp. Carb., Visé" and another label written by Hyatt reading, "*Subclymenia gibbosa,* Hyatt Geol. Surv. Tex." In his discussion of the genus *Subclymenia* in 1894, Hyatt clearly states that he had specimens from Yorkshire and Visé; but he also stated that he had only one specimen of *Subclymenia gibbosa* and one of *S. occulta.* To the best of my knowledge no specimens of this genus from Yorkshire are in the Museum at the present time.

Careful study of the two specimens in the collection and Hyatt's descriptions of them clearly indicates that one of the specimens (Pl. 2, figs. 1, 2) is his type of *Subclymenia occulta.* The other specimen (Pl. 2, figs. 3, 4) is probably the one Hyatt assigned to *S. gibbosa.* However, as will be more fully developed in the discussion of that species, there are some discrepancies between Hyatt's description and the specimen. This I believe can be explained as a result of Hyatt's not clearly distinguishing which specimen he was referring to in his discussion of the ornamentation and internal whorls. He stated that he had laid bare the conical apex of the conch in his two species, *S. occulta*

and *S. gibbosa,* then proceeded into a long detailed description which agrees well with the features of *S. occulta* but are not shown, for the most part (due to preservation) in the other specimen. It is possible that the initial volutions of the latter specimen may have been destroyed since Hyatt's study; there are, however, no indications on the specimen to show this. It is more readily apparent that the specimen illustrated here on Plate 2, figures 1, 2 is the type of *S. occulta.* On this specimen Hyatt mentions filing away the venter to expose the suture; these marks are present on the specimen.

The type specimen of *S. occulta* is a moderately well preserved evolute, slightly distorted conch measuring 61.6 mm. in diameter. Approximately the last half volution is living chamber; the rest of the shell is phragmocone. The whorl section of the outer volution is subrectangular. The whorl section of the adoral part of the living chamber measures 22 mm. in width and 20.3 mm. in height. The venter of the outer volution is only slightly concave, the ventral shoulders angular. The lateral areas are broadly convex merging onto broadly rounded umbilical shoulders which in turn grade onto a steeply sloping, convex umbilical wall.

The initial portion of the conch is a slender, slightly curved, slowly expanding cone which bears fine radial growth lines and on the lateral area longitudinal lines. The intersection of the growth lines and longitudinal lines gives a beaded appearace. Beginning approximately at the end of the first half volution, the growth lines project adapically across the umbilical wall; on the ventral half of the lateral areas they curve adorally, a pattern which continues through the remainder of the conch. Beginning at the adoral end of the first volution, the longitudinal lines become confined to the central half of the lateral areas and continue in this fashion to the aperture. The better preserved areas of the venter on the outer whorl show four fine longitudinal lines closely spaced next to the angular ventral shoulder. The venter inside these longitudinal lines is smooth except for the deep tongue-shaped pattern of the very fine growth lines inscribing a hyponomic sinus.

The only portion of the suture that is exposed is the deep V-shaped ventral lobe which Hyatt mentioned.

*Locality and horizon.* Lower Carboniferous, Visé, Belgium.

*Repository.* Holotype — MCZ 8824.

## SUBCLYMENIA GIBBOSA Hyatt

Plate 2, figures 3, 4

*Subclymenia gibbosa* Hyatt, 1893, pp. 414-416.

Hyatt introduced this species name for the specimen which deKoninck (1880, pp. 83-84, pl. 45, figs. 5, 6) assigned to Phillips' (1836, p. 237, pl. 20, figs. 65-68) species, *S. evoluta,* the genotype of *Subclymenia.* He concluded that the Belgian specimens differed from the British species in that they were "broader on the abdomen at all stages of growth, the English form being narrower on the abdomen, with lateral zones decidedly convergent, smaller whorls, and the ventro-dorsal diameter also longer proportionately than in the Belgian form."

As mentioned in the discussion of *S. occulta,* there are only two specimens in the collections of the Museum of Comparative Zoology, both from the Lower Carboniferous of Visé, Belgium. The label in the tray with these two specimens, written by Hyatt, reads *Subclymenia gibbosa.* However, one of the specimens is clearly the type of *S. occulta.* The other specimen, illustrated here on Plate 2, figures 3, 4, I believe is the one Hyatt had assigned to *S. gibbosa* in spite of the fact that there are discrepancies between his discussion and the specimen — discrepancies that are a result of Hyatt's long discussion which not always clearly indicated which of the two species he had in mind.

The present specimen is a distorted conch of fair preservation, except for the innermost volutions. The adoral quarter volution is living chamber. The shape of the whorl section is very similar to that of *S. occulta* except that the venter on the living chamber is much more concave.

The ornamentational pattern of sinuous growth lines and longitudinal lines, with a beaded appearance, is present only on the penultimate adoral half volution. The adoral half volution has no ornamentations at all on the lateral areas, which could possibly be due to poor preservation; and there are the faint longitudinal lines on the venter next to the ventral shoulder.

The long, sinuous, V-shaped ventral lobe is well exposed. This is followed by a long, narrow, angular saddle on the acute ventral shoulders, and a broadly, deeply concave lobe that extends from the ventral shoulder to the umbilical seam. The siphuncle was not observed.

*Locality and horizon.* Lower Carboniferous, Visé, Belgium.

*Repository.* Holotype — MCZ 8825.

## Genus THRINCOCERAS Hyatt, 1893

*Type species. Thrincoceras depressum* Hyatt, 1893, pp. 430-432, figs. 9-10.

### THRINCOCERAS DEPRESSUM Hyatt

Plate 23, figure 1

*Thrincoceras depressum* Hyatt, 1893, pp. 430-432, figs. 9-10; Schmidt, 1951, p. 24; Miller and Garner, 1953, p. 116.

Hyatt's illustration of the type specimen of this species leaves much to be desired as it is largely a reconstruction and not an accurate drawing of the specimen. The conch is broadly evolute with a wide deep umbilicus. The whorls are depressed, subquadrate with a broad flattened venter, rounded ventral shoulders, narrow convex lateral areas and broadly rounded umbilical shoulders. The umbilical walls are broad and slope into the umbilical seam at a high angle. The conch measures approximately 115 mm. in diameter, 61 mm. for the width of the last whorl, 45 mm. for the height of the last whorl, and 52 mm. for the diameter of the umbilicus.

The conch bears fine longitudinal lines throughout its length which are most conspicuous on the umbilical shoulders and lateral areas and less so on the venter. This, however, is most probably a reflection of preservation.

The specimen bears numerous cracks which cross the whorls at many different angles. Hyatt selected one of the cracks as most probably coinciding with the course of the suture. There does not appear to be any real justification for this observation. The position of the siphuncle is not visible.

*Locality and horizon.* Bullitt County, Kentucky, presumably from Mississippian strata.

*Repository.* Holotype — MCZ 8813.

### THRINCOCERAS KENTUCKIENSE Hyatt

Plate 20, figure 1; Plate 21, figure 1; Plate 22, figures 1, 2

*Thrincoceras kentuckiense* Hyatt, 1893, pp. 432-434, figs. 11-15; Foord, 1900, pp. 99-100.

The two specimens on which Hyatt established this species are in the collections of the Museum of Comparative Zoology. The original drawings used to illustrate these specimens do not accurately portray the poor preservation and are inaccurate in many details. The holotype (Pl. 20, fig. 1; Pl. 22, fig. 1) measures

165 mm. in diameter, and is a broadly evolute conch with a very shallow impressed zone. The outer whorl measures approximately 65.5 mm. in width, 62 mm. in height, and the umbilicus is 64 mm. in diameter. The outer whorl is subquadrate in cross section with a broad, slightly arched venter, sharply rounded ventral shoulders, flattened lateral areas, a conspicuous subangular to rounded umbilical shoulder, and a broad umbilical wall that is slightly convex and sloping to the umbilical seam at approximately a 45 degree angle. The inner whorls are more depressed and rounded in cross section. Though a portion of the inner volutions are absent, it seems probable that there is an umbilical perforation of roughly 10 mm. in diameter.

The suture bears a very shallow ventral, lateral, and dorsal lobe with saddles on the ventral and umbilical shoulders. The siphuncle is small, tubular, and located about midway between the center of the whorl and the venter.

Fine longitudinal lines are preserved on the umbilical wall of the penultimate half volution; the remainder of the conch is so eroded and poorly preserved as to show no surface features.

The paratype, illustrated on Plate 21, figure 1 and Plate 22, figure 2, is slightly better preserved than the holotype though more of the innermost volution is missing. Hyatt's original illustration of this specimen shows the longitudinal lines over the whole length of the specimen, but they are actually only vaguely visible on the first volution. This specimen measures 159 mm. in diameter, 60 mm. for the width of the last whorl, 54 mm. for the height of the last whorl; and the umbilicus is 68 mm. in diameter. In whorl shape, degree of evolution, ornamentation, suture, etc., this specimen is nearly identical to the holotype.

*Locality and horizon.* Franklin County, Kentucky, presumably from Mississippian strata.

*Repository.* Holotype — MCZ 8811, Paratype — MCZ 8812.

## Genus VESTINAUTILUS Ryckholt, 1852

*Type species. Nautilus koninckii* d'Orbigny, 1847, pl. 95, figs. 1-6.

### VESTINAUTILUS CARINIFORMIS Hyatt

Plate 7, figures 4, 5

*Vestinautilus cariniformis* Hyatt, 1893, p. 420.

When Hyatt established this species, he stated that it "is part of De Koninck's *cariniferous* [*sic*] figured in his 'Calcaire Carbonifère' on plate 30, figure 2, a-b (not figure 1)." The specimen referred to on plate 30 is a juvenile of *Nautilus koninckii,*

the type species of *Vestinautilus*. The *cariniferus* of De Koninck (1878) are illustrated on his plate 28, figures 1-5. It is presumed that plate 30 in Hyatt's statement is an error and that he actually meant plate 28. The *cariniferus* of De Koninck's plate 28, figures 1-5 were all placed by Foord in his species *Coelonautilus paucicarinatus* (Foord, 1891, p. 116). The specimen illustrated by Foord (his figure 17) is nearly identical in its features to the specimen of *cariniferus* illustrated by De Koninck (1878, pl. 28, figs. 1a, b). Hyatt established *cariniformis* for forms which acquired a smooth venter early, as illustrated by De Koninck's *cariniferus* (1878, pl. 28, figs. 2a, b).

Hyatt's type of *V. cariniformis* is a slightly deformed specimen of 54 mm. in diameter, and measuring 34 mm. for the width of the most adoral whorl of the conch and 22.7 mm. for the height. Only the adoral one-half volution and the inner whorls on one side of the conch are well preserved. The venter is broad, slightly convex with broadly rounded ventral shoulders that end at a sharp ridge that disappears on the living chamber. Approximately 3 mm. below this ridge there is another ridge which also disappears adorally on the living chamber but not as markedly as the ridge on the ventral shoulder. From the second ridge there extends a broad, slightly convex umbilical wall. The only other surface markings are very faint growth lines which inscribe a deep rounded hyponomic sinus on the venter.

Only a small portion of the suture is visible on the venter. The siphuncle appears to be about central in position.

*Locality and horizon.* Lower Carboniferous, Visé, Belgium.

*Repository.* Holotype — MCZ 8827.

### VESTINAUTILUS KONINCKII (d'Orbigny)

Plate 14, figures 5-10

*Vestinautilus koninckii*, Hyatt, 1872, p. 91, pl. 4, figs. 7-9; Hyatt, 1894, pp. 540-541, 602, pl. 9, figs. 5-13.

The specimen of Hyatt's plate 4, figures 9 and 10 (1894) is preserved in the Museum of Comparative Zoology and is illustrated here. This specimen was thought by Hyatt to represent the nepionic stage and ananeanic substage. There is a note with the specimen stating that the apex, which according to Hyatt represented the "ana- and metanepionic with rounded whorl and cyrtoceran form and ornament like *T. puzosianum*," was lost when the specimen was mounted.

*Locality and horizon.* Carboniferous, Tourney, Belgium.

*Repository.* MCZ 8828.

## Superfamily AIPOCERATACEAE Hyatt, 1883

## Family SOLENOCHILIDAE Hyatt, 1893

### Genus ONCODOCERAS Hyatt, 1893

*Type species. Oncodoceras fusiforme* Hyatt, 1893, pp. 455-456.

### ONCODOCERAS FUSIFORME Hyatt

Plate 26, figures 1, 2; Plate 27, figures 1, 2; Plate 28, figures 1, 2; Plate 29, figures 1, 2; Plate 30, figure 6

*Oncodoceras fusiforme* Hyatt, 1893, pp. 455-456.

Hyatt's description of his new genus and species is as follows: "The young of the species of this genus, until the end of the ananeanic sub-stage, and perhaps throughout the whole of the neanic stage, is similar to the young and full grown shells of *Aipoceras*. The trigonal form is represented, but it is much modified in all the shells of *Oncodoceras fusiforme*. In some of them it is indicated in the slight flattening of the dorsum and slight convergency of the sides, but in others the whorl is rounded.

"The sutures of the ephebic stage are straight or have slight ventral and lateral lobes, with dorsal saddles and annular lobes.

"The siphuncle is ventral and the shell is smooth.

"The living chambers of the full grown shell are depressed, elliptical in section, and the apertures are apt to be contracted, but this last characteristic may be dependent largely upon the age of the specimen.

"There is no impresesd zone in the type, but this may be present in some other species.

"The type is *Oncodoceras fusiforme*, from Kildare, a specimen consisting of a living chamber complete, with first septum and aperture. This species is closely similar to De Koninck's *conspicuus* in the general aspect of the living chamber and whorl. It, however, has no impressed zone, the dorsum being entire and rounded in four specimens, two from Kildare, one from near Cork, and one from Visé. All four have living chambers of about the same size and age as that figured in *Asymptoceras conspicuum*, sp. De Koninck, in his 'Calcaire Carbonifère.' The aperture is, however, much less contracted and has a depressed oval opening in place of the quadrate outline depicted by De Koninck. It has a broad hyponomic sinus, low crests on either side, reaching their extreme extension on the line of what may be called the nascent abdominal angles. There are shallow narrow sinuses on the imperfectly formed, narrow and rounded lateral zones, very low broad crests on the imperfectly formed

umbilical shoulders, and an equally dorsal sinus. The increase by growth is extremely rapid, more so than in *A. gibberosum,* and the full size is reached at the end of the first whorl; the living chamber takes up somewhat less than one-half of this volution.

"The form is like that of *A. gibberosum,* and can be easily confused with that species on the second quarter of the whorl, but later the venter becomes more depressed and the ventro-dorsal diameters are shorter than the transverse, especially near the aperture. The sutures of the adult have very shallow ventral lobes and are either straight or have faint lobes on the lateral faces and a very small annular lobe on the dorsum. The septa are not deeply concave and the siphuncle is ventral."

The holotype (Pl. 26, figs. 1, 2; Pl. 27, fig. 1) consists of body chamber and first septum and a fairly well preserved aperture. At its widest part the body chamber has a width of 60.7 mm. and a height of 49 mm. The body chamber inscribes a broad curvature, the venter is broadly rounded, grading gradually onto arched flanks. On a portion of the body where a small piece of shell is preserved, the umbilical shoulders are abruptly rounded; the dorsum is broadly convex with no impressed zone. From the last septum to the aperture the body chamber flattens appreciably. The last septum measures 44.5 mm. in width and 42 mm. in height. The aperture has a broad, fairly deep ventral sinus, a shallow lateral sinus; and there appears to be a very shallow dorsal sinus. The siphuncle is small and approximately one mm. from the venter.

The paratype of Plate 27, figure 2 and Plate 28, figures 1, 2 is a slightly distorted specimen of 95 mm. in diameter of one-half volution of which approximately one-third is phragmocone. A fair amount of the shell is preserved, and this is completely smooth. There is no impressed zone. The second paratype (Pl. 29, figs. 1, 2 and Pl. 30, fig. 6) consists of slightly more than a half volution of which approximately half is phragmocone. The whorl section is oval with no indication of the umbilical shoulders as in the holotype. The anterior part of the body chamber is slightly contracted, but the aperture is not preserved except for a small area on the venter which indicates a deep ventral sinus.

Hyatt's paratype from Cork, Ireland, is a highly distorted body chamber which appears to be conspecific with the other specimens.

*Locality and horizon.* Holotype and paratype from Lower Carboniferous, Kildare, Ireland. Another paratype from Lower

Carboniferous, Visé, Belgium. Unfigured paratype from Lower Carboniferous, Cork, Ireland.

*Repository.* Holotype — MCZ 5143; paratypes — MCZ 5144, 5201, 5202.

Superfamily CLYDONAUTILACEAE Hyatt, 1900

Family LIROCERATIDAE Miller and Youngquist, 1949

Genus LIROCERAS Teichert, 1940

*Type species. Coloceras liratum* Girty, 1911, p. 144.

LIROCERAS GLOBATUM (de Koninck)

Plate 18, figures 1-9; Plate 19, figures 1-3

*Coloceras globatum*, Hyatt, 1894, pp. 541-543, plate 10, figures 1-14.

Hyatt in his 1894 paper devoted two and one-half pages of text and fourteen illustrations of five specimens of this species to present the history of the dorsal furrow. It is of special interest to note his conclusions: "the action of tachygenesis upon degenerative characters is thus clearly apparent throughout the neanic and ephebic stages in this interesting species. This fact is entirely in accord with the principles of Bioplastology as explained above with regard to the action of this law upon retrogressive characters." (Hyatt, 1894, p. 543.)

Hyatt's specimen of his plate 10, figures 1, 2, which illustrated the nepionic and neanic volutions is illustrated here on Plate 18, figures 1-3. Hyatt's specimen of his plate 10, figures 10-12 is the specimen illustrated here on Plate 18, figures 4-6. From this same specimen Hyatt illustrated cross sections of the "meta and paranepionic substages" (his figures 3-6) and an enlarged oblique view of the apex showing the ana- and metanepionic substages. Unfortunately, the apex of this specimen has been broken off and is not in the collections.

The specimen of Hyatt's plate 10, figures 8, 9 which he indicates as showing the ananepionic, and a part of the metanepionic substages, and the cicatrix is illustrated here on Plate 18, figures 7-9. None of the features which Hyatt thought indicated a cicatrix and included on his ilustrations (his plate 10, fig. 9 and the apex of fig. 8) are visible on the specimen — the apex is perfectly smooth with no surface markings of any kind.

The fragmentary specimen of Hyatt's plate 10, figure 13, is in the MCZ collections but not illustrated here because of its poor preservation. However, the specimen of Hyatt's plate 10, figure 14, is illustrated here on Plate 19, figures 1-3.

*Locality and horizon.* Lower Carboniferous, Visé, Belgium.

*Repository.* MCZ 8818 (Pl. 18, figs. 1-3), MCZ 8819 (Pl. 18, figs. 4-6), MCZ 8820 (Pl. 18, figs. 7-9), MCZ 8830 (Pl. 19, figs. 1-3).

## Genus COELOGASTEROCERAS Hyatt, 1893

(= *Solenoceras* Hyatt, 1884 [obj.] *non* Conrad, 1860; *Conradiceras* Cossman, 1900 [obj.])

*Type species. Coelogasteroceras coxi* Gordon, 1960 (nom. subst. pro *Nautilus canaliculatus* Cox, 1857, pp. 575-576, pl. 10, figs. 3-3a, *non N. canaliculatus* Eichwald, 1857).

### COELOGASTEROCERAS COXI Gordon

Plate 11, figures 3, 4

*Coelogasteroceras canaliculatum* Hyatt, 1894, pp. 498-499, Plate 10, figure 33.

The specimen from which Hyatt developed his illustration of the "meta- and paranepionic volutions" of this species is in the collections of the Museum of Comparative Zoology. It is a phragmocone of fair preservation measuring 36.6 mm. in diameter. Hyatt's illustration (1894, pl. 10, fig. 33) was made from a polished section of the inner volutions. Due to the poor state of preservation of this portion of the specimen, the outlines of the whorls are just barely visible.

The specimen studied by Hyatt is very typical for the species in all respects.

*Locality and horizon.* Carboniferous, Edmondson County, Kentucky.

*Repository.* MCZ 8808.

## Genus PERIPETOCERAS Hyatt, 1894

(= *Cyclonautilus* Hind, 1911; *Periptoceras* Chao, 1954; *Nannoceras* Hyatt, 1894 [*nom. null.*])

*Type species. Nautilus freieslebeni* Geinitz, 1843, p. 95, figured in 1841, p. 637, pl. 11, figs. 1a-c.

### PERIPETOCERAS FREIESLEBENI (Geinitz)

Plate 10, figures 1-3; Plate 11, figures 1, 2

*Peripetoceras freieslebeni,* Hyatt, 1894, pp. 545-546, pl. 11, figs. 1-3.

When Hyatt established the genus *Peripetoceras,* he designated *N. freieslebeni* (Geinitz, 1841, p. 637, pl. 11, fig. 1) as type;

however, he was clearly describing and interpreting the genus on two specimens from the Permian of Tunstall Hill, England, which are in the Museum of Comparative Zoology. The original illustrations of *Nautilus freieslebeni* (Geinitz, 1841, plate 11, figures 1a, b, c) are drawings of what appear to be a deformed individual. The specimen is a smooth subglobular nautilicone with whorls that are slightly flattened laterally and ventrally with small umbilici, a deep rounded hyponomic sinus, slightly sinuous sutures, and a small subcentral siphuncle. At a later date Geinitz (1848, pl. 3, figs. 1a, b, c) again described and illustrated the same species. The illustrations of the 1848 paper are superior to those of the 1841 paper, and even though there are differences between the two sets of illustrations, they appear to be of the same specimen. A later illustration of this species by Geinitz (1861, plate 11, figures 7a, b, c) is of a different specimen, much smaller in size, of rounded whorl section, evolute conch — a specimen with the appearance of an evolute *Liroceras* or *Hemiliroceras*. The identity of this specimen with the type of *N. freieslebeni* is not clearly established.

Hyatt had two specimens, one of which (Pl. 10, figs. 1-3) consists of one-third volution of living chamber plus a fragmentary quarter volution of an inner whorl. The other specimen, a paratype (Pl. 11, figs. 1, 2), consists of one-half volution of phragmocone — this is the specimen which Hyatt (1894, Pl. 11, figs. 1-3) illustrated with cross-sectional drawings of the whorl section.

The former specimen consists mainly of living chamber, has a subquadrate, elliptical, depressed whorl section. The venter is broad and flattened, the ventral shoulders broadly rounded. The lateral areas are only slightly convex and converge toward the venter. The umbilical shoulder is more sharply rounded than the ventral shoulder, and the umbilical wall is convex and slopes steeply to the umbilical seam. The umbilicus must have been approximately one-fifth the diameter of the conch and rather deep. The siphuncle is small, circular in outline, and located midway between the center of the whorl section and the dorsum. Only a small remnant of the test is preserved on the umbilical shoulder, and this shows prominent growth lines.

The second specimen is identical to the first in the shape of the whorl section. Portions of the suture are visible, and these show a shallow ventral and lateral lobe. More of the test is preserved, and these inscribe a deep rounded sinus on the venter.

*Locality and horizon.* Permian, Tunstall Hill, England.
*Repository.* MCZ 8806, 8807.
*Remarks.* The inadequate description and illustrations of Hyatt's specimens and the same for the German specimens described by Geinitz readily explain the difficulties encountered in the interpretation of this genus and the fact that it has been recognized and discussed by few subsequent authors. Miller and Youngquist (1949, pp. 119-120) briefly commented on this genus and concluded that no species from the Permian of North America are referable to it. These authors did, however, believe that it should contain *Solenochilus henryvillense* Miller and Gurley of the Lower Mississippian of Indiana, *Cyclonautilus umbilicatus* Hind of the early Upper Carboniferous of England, and possibly *C. dubius* Bisat of the early Upper Carboniferous of Wales. As pointed out by Miller and Youngquist, *C. umbilicatus* is the genotype of *Cyclonautilus* Hind, which should be suppressed as a synonym of *Peripetoceras* which has priority. Recently, Gordon (1960, p. 137) described *P. whitei* from the Coal Measures, Fountain County, Indiana. *Peripetoceras hsuyuchiani* Chao (1954, pp. 44-45, pl. 6, figs. 5-6) from the Permian of Hunan, China, is wrongly placed in *Peripetoceras;* it appears to be a typical representative of *Liroceras. Nautilus wanneri* Haniel (1915, pp. 136-138, pl. 55, fig. 4; pl. 56, fig. 1) is similar to *Peripetoceras freieslebeni* in its flattened ventral and lateral areas; it differs only in its much greater degree of involution. I would consider it a valid species of *Peripetoceras.*

## Genus POTOCERAS Hyatt, 1894

*Type species. Potoceras dubium* Hyatt, 1894, pp. 537-539, pl. 10, figs. 15-22.

### POTOCERAS DUBIUM Hyatt

Plate 8, figures 1-4; Plate 19, figures 16-18

*Potoceras dubium* Hyatt, 1894, pp. 537-539, pl. 10, figs. 15-22.

The interpretation of this genus has been a difficult problem ever since its introduction because Hyatt's description was mainly in context of his thesis on the history of the impressed zone, and his illustrations were nothing more than outline drawings. In addition, the locality and horizon of Hyatt's type specimen is unknown.

The type and only specimen of this species is in the Museum of Comparative Zoology. It consists of a phragmocone 37.5 mm.

in diameter. Hyatt had broken the specimen into a number of distinct segments to facilitate his study of the impressed zone. The conch is moderately involute with depressed, smooth whorls. The most adoral camerae measure 17.7 mm. in height and 25.6 mm. in width. The venter is broadly arched grading imperceptibly onto slightly arched lateral areas. The umbilical shoulders are more clearly marked and the umbilical wall convex but sloping to the umbilical seam at a steep angle. The umbilicus measures 9.5 mm. in diameter. The siphuncle is subcentral in position; that is, it is closer to the venter than to the dorsum. The suture is essentially straight except for the barest indication of a slight lobe on the flanks, a very shallow dorsal lobe and an annular lobe. Hyatt's illustrations of these adoral camerae (1894, pl. 10, figs. 20, 21), which are outline drawings, are duplicated here in the form of photographs of the specimen (Plate 8, figures 1, 2). The front view of the ana-, meta-, and paranepionic substages and the neanic volution (in part Hyatt's, pl. 10, fig. 16, 1894) is shown on Plate 19, figure 18. The initial part of the conch is an asymmetrical cone of 6.5 mm. in length, at which time the first strong curvature of the shell takes place and also the beginning of the impressed zone. This first volution has very faint radial and longitudinal lines. As indicated by Hyatt himself, these lines are much more distinct in his drawings than they are on the specimen. The cicatrix, shown in Hyatt's plate 10, figure 17, is actually a very faint transverse narrow depression, but one can't be sure if it is an original shell feature or due to scratching or impact during the cleaning of the specimen. Hyatt's figures 17 and 18 of his plate 10 of the "ana-, meta-, and paranepionic stages" are correct insofar as the gross outline of the shell is, but the details of the shell surface are not faithfully reproduced.

On this earliest volution the siphuncle is very near the venter; as growth proceeds the position of the siphuncle becomes more central.

*Locality and horizon.* There is no locality or horizon data with this specimen. Hyatt ventured an opinion that it is Devonian and had verification of his opinion from a brachiopod attached to the conch which Schuchert thought compared closely with species of *Martinia* from the IbergerKalk of the Upper Devonian of Grund, Germany.

I sent the same brachiopod to G. A. Cooper, and he could not make a positive identification but thought that some Mississippian forms from the United States are more similar to it than any

Devonian forms. He also adds that the lithology is suggestive of the Visean.

*Repository.* Holotype — MCZ 8805.

Family EPHIPPIOCERATIDAE Miller and Youngquist, 1949

Genus EPHIPPIOCERAS Hyatt, 1884

*Type species. Nautilus ferratus* Cox, 1857, pp. 574-575, pl. 10, figs. 2-2a.

EPHIPPIOCERAS FERRATUM (Cox)

Plate 15, figures 4-7

*Ephippioceras ferratum,* Hyatt, 1894, p. 539, pl. 10, figs. 23-26.

The specimen studied by Hyatt for his 1894 paper is in the Museum of Comparative Zoology. Unfortunately, the portion of the innermost volutions that Hyatt illustrated and discussed is not in the collections. The mature conch is a fairly well preserved phragmocone of 45.5 mm. in diameter and is illustrated here. The general characters of this genus and species have been recently discussed by Miller and Youngquist (1949, p. 129), and Hyatt's specimen adds nothing new to this interpretation, except that few good illustrations exist in the literature.

*Locality and horizon.* Carboniferous, Edmondson County, Kentucky.

*Repository.* MCZ 8816.

Superfamily NAUTILACEAE de Blainville, 1825

Family NAUTILIDAE de Blainville, 1825

Genus EUTREPHOCERAS Hyatt, 1894

*Type species. Nautilus dekayi* Morton, 1834, p. 33, pl. 8, fig. 4

EUTREPHOCERAS FAXOENSE Hyatt

Plate 15, figures 8, 9

*Eutrephoceras faxoense* Hyatt, 1894, p. 558, pl. 13, figs. 9-12.

In proposing this species Hyatt commented that it "differs from *Eutrephoceras dekayi* in the extreme subdorsan position and smaller size of the siphuncle in the nepionic stage, has larger umbilical openings and is also apparently a smaller form. Otherwise it is very close in sutures and form to this species." Hyatt's holotype is a phragmocone of one-half volution measuring 35.5 mm. in diameter, preserving the inner volutions in an excellent

state of preservation. The conch is smooth, with no shell preserved, involute, with an umbilicus of only a few millimeters in diameter. The most adoral camerae are depressed with broadly arched venter and lateral areas which imperceptibly grade together. The umbilical shoulders are more distinctly rounded and the umbilical wall broadly convex. The adoral camera measures 20.8 mm. in height and 30.8 mm. in width. The suture is essentially straight; and the siphuncle is subcentral, being closer to the dorsum than to the venter.

The whorl section at the end of the first half volution is subtrigonal with a more distinct narrow obtusely rounded venter and more strongly converging whorl sides. The most interesting aspects of these earliest volutions is that the siphuncle rests right on the dorsum, and progressively from this stage the siphuncle migrates away from the dorsum.

*Locality and horizon.* Danian, Faxoe, Denmark.

*Repository.* Holotype — MCZ 8815.

EUTREPHOCERAS IMPERIALIS (Sowerby)

Plate 30, figures 1-3

*Eutrephoceras imperialis,* Hyatt, 1894, pp. 559, 605, pl. 13, figs. 13-16.

Hyatt apparently had several specimens of this species, but only the specimen illustrated by his front view (Hyatt, pl. 13, fig. 13) is in the collections. In addition, there are two fragments of phragmocone and a nearly perfectly preserved juvenile form (Pl. 30, figs. 1, 2 of this report). I agree with Hyatt on the near identity of this species with *E. dekayi.*

*Locality and horizon.* London clay, Isle of Wight.

*Repository.* MCZ 8834a, b.

Genus CENOCERAS Hyatt, 1884

*Type species. Nautilus intermedius* J. Sowerby, 1816, p. 53, pl. 125.

CENOCERAS INTERMEDIUM (J. Sowerby)

Plate 14, figures 11-13

*Cenoceras intermedium,* Hyatt, 1894, pp. 550, 604, pl. 11, figs. 15-16.

In the description of this species Hyatt figured the specimen illustrated here as illustrative of the paranepionic and ananeanic substage. The specimen consists of one-half volution of phragmocone which on the most adoral camera measures 14.5 mm. in width and 12.3 mm. in height; the adapical camera measures

9.5 mm. in width and 7.3 mm. in height. The whorl section is subtrapezoidal in cross-section with a flattened venter and converging, flattened lateral areas. The suture has shallow ventral and lateral lobes; the dorsal lobe is broad, V-shaped and with an annular lobe. The impressed zone is very slight on the most adapical camerae but increases in width and depth adorally. The siphuncle is slightly dorsal of the center of the whorl. No shell is preserved on any part of the specimen, and the internal cast is smooth.

*Locality and horizon.* Middle Lias, Balingen.

*Repository.* MCZ 8829.

### Cenoceras granulosum (d'Orbigny)

Plate 19, figures 4-12

*Cenoceras granulosum*, Hyatt, 1894, p. 553, pl. 11, figs. 36-39, pl. 12, fig. 31.

Hyatt had three specimens of this species of which he illustrated and discussed two. His comments were as follows: "In this species, which is well characterized by its compressed form and tubercular ornamentation, the compressed form is present even in the nepionic stage. Figs. 37 and 38 (Pl. 19, figs. 6, 7, 10-12 of this report) show that the umbilical perforation is of medium size. Contact takes place on or near the dorsal edge of the cicatrix on the apex, as shown in Fig. 31, pl. xii (Pl. 19, figs. 4, 5 of this report). The cicatrix is plainly visible in several specimens of this species and it is also obvious that in none of them does the dorsal furrow appear until after the gyroceran bend begins. The dorsum of the metanepionic substage remains rounded and gibbous until the bending begins and then it becomes flattened and immediately hollow, showing the commencement of the dorsal furrow as in Figs. 36 and 37 (Pl. 19, figs. 6, 7 of this report), and this continues to deepen and broaden throughout the paranepionic, as is shown in Figs. 38 and 39 (Pl. 19, figs. 10-12 of this report)."

*Locality and horizon.* Oxfordian, Chatillon, France.

*Repository.* MCZ 8831a (Pl. 19, figs. 10-12), 8831b (Pl. 19, figs. 6-7), 8831c (Pl. 19, figs. 4, 5), 8831d (Pl. 19, figs. 8, 9).

### Cenoceras clausum (d'Orbigny)

Plate 30, figures 4, 5

*Cenoceras clausum*, Hyatt, 1894, p. 552, pl. 12, figs. 12-15.

Hyatt's comments on this juvenile specimen are as follows: "This species has a small umbilical perforation. The form and

general aspect are very similar to those of other compressed shells of this genus, but the shell in the paranepionic substage has peculiarly well-marked and broad growth bands with interrupted longitudinal ridges. The ana- and metanepionic volutions are shown in Figs. 13-15 (Pl. 30, figs. 4, 5 of this report) and have a rounded dorsum, the dorsal furrow appears in the paranepionic at the gyroceran bend and deepens rapidly as the shell grows around the perforation. The amount of involution is probably about the same as in *Cenoceras granulosus,* which it also resembles in general aspect as well as in ornamentation."

*Locality and horizon.* Inferior Oolite, St. Vigor, near Bayeux, France.

*Repository.* MCZ 8832.

CENOCERAS ARATUM (Quenstedt)

Plate 19, figures 13-15

*Nautilus aratus,* Saemann, 1853, p. 158, pl. 19, fig. 13; Hyatt, 1872, p. 91, pl. 4, figs. 5, 6.

*Cenoceras aratum,* Hyatt, 1894, pp. 551-552, pl. 11, figs. 32-35.

Hyatt made the following comments on this specimen: "The specimen shown in Figs. 32-35 (Pl. 19, figs. 13-15 of this report) was figured first in my *Embryology of Fossil Cephalopods,* is one of Saemann's originals and although quite perfect in some respects has no shell.

"It is a cast in iron of the interior and shows the characteristics figured very distinctly. The early beginning of the annular lobe in the third suture and that of the dorsal furrow in the metanepionic between the third and fourth sutures is very interesting in view of the fact that this shell had a comparatively large umbilical perforation and the curvature of the first whorl is so uniform that its early origin cannot reasonably be attributed to that as a cause. The furrow deepens immediately and affects the outline of the fourth suture. A slight dorsal lobe appears in the suture of the third septum at the same time with the annular lobe, and is better given in Fig. 33 than in Fig. 34. The flattening of the dorsum is apparent in the second suture, and, so far as I could see after repeated observations, my former figure in *Embryology of Cephalopods* was erroneous in placing an annular lobe in this suture. This species shows highly accelerated development in all of its characteristics and this acceleration is obviously genetic and independent of the size of the umbilical perforation, which is very large considering the fact

that it is a Jurassic species."

*Locality and horizon.* Middle Lias, Swabia.

Repository. MCZ 8833.

### CENOCERAS LINEATUM (Sowerby)

Plate 17, figures 1-9

*Cenoceras lineatum,* Hyatt, 1894, p. 551, pl. 11, figs. 22-27.

Hyatt's two specimens of this well known and common species are very well preserved. Hyatt only illustrated the inner whorls of the larger specimen; and here the whole specimen and its various parts are illustrated for the first time. The small specimen of Hyatt's plate 11, figures 24-27 is here illustrated on Plate 17, figures 8 and 9. Hyatt's drawing of the apex is highly restored.

*Locality and horizon.* Inferior Oolite, Bayeux.

*Repository.* MCZ 8821a, b.

### CENOCERAS sp.

Plate 12, figures 6, 7

*Digonioceras* sp. (?) Hyatt, 1894, p. 549, pl. 11, figs. 19-21.

This fragmentary juvenile specimen, of four camerae, Hyatt originally assigned to his genus *Digonioceras.* This genus, however, is a synonym of *Cenoceras* (Kummel, 1953a); since most Lias nautiloids are best assigned to the highly variable genus *Cenoceras,* Hyatt's specimen seems to belong here also. Hyatt's drawings are slightly inaccurate, even his Figure 21 which is supposed to be a correction of a portion of his Figure 20.

*Locality and horizon.* Middle Lias, Balingen.

*Repository.* MCZ 8809.

## Family CYMATOCERATIDAE Spath, 1927

### Genus CYMATOCERAS Hyatt, 1884

*Type species. Nautilus pseudoelegans* d'Orbigny, 1840, p. 70, pl. 8.

### CYMATOCERAS DESLONGCHAMPSIANUM (d'Orbigny)

Plate 9, figures 5, 6; Plate 16, figures 1-8

*Cymatoceras deslongchampsianum,* Hyatt, 1894, p. 554, pl. 12, figs. 22-27.

This specimen of Hyatt's plate 12, figure 24 is illustrated here on Plate 9, figure 6; that of Hyatt's plate 12, figures 22 and 23 are here on Plate 16, figures 6 and 7; that of Hyatt's plate 12,

figure 27 is here on Plate 16, figure 8. A mature specimen, which probably yielded one or more of the juvenile volutions studied by Hyatt, is illustrated here on Plate 16, figures 1 and 2.

*Locality and horizon.* Cretaceous, Rouen, France.

*Repository.* MCZ 8817 a-f.

### CYMATOCERAS RADIATUM (Sowerby)

Plate 15, figures 1-3

*Cymatoceras radiatum,* Hyatt, 1894, pp. 554-555, pl. 12, figs. 29, 30; pl. 13, figs. 1, 2.

Hyatt's specimen is a well preserved representative of this species and his illustrations reasonably accurate. The specimen consists of slightly less than one-half whorl of phragmocone. The portion of the innermost volutions showing the beginning of the dorsal furrow (Hyatt, 1894, pl. 13, fig. 1) is illustrated here on Plate 15, figure 3.

*Locality and horizon.* Rouen, Cretaceous.

*Repository.* MCZ 8814.

### CYMATOCERAS sp. indet.

Plate 17, figures 10-11

*Cymatoceras* sp. indet. Hyatt, 1894, pp. 553, 554, pl. 12, figs. 16-21.

The specimen of Hyatt's plate 12, figure 16 is that illustrated here. There are two additional, polished specimens in the collections which served for Hyatt's figures 17 and 20 of his plate 12. These specimens are typical of the small inner volutions of cymatoceratids which are fairly common in the Cretaceous of Texas. Kummel (1953c) has described and illustrated a number of these specimens.

*Locality and horizon.* Cretaceous, Texas.

*Repository.* MCZ 8822.

## Genus of Uncertain Position

### Genus REMELECERAS Hyatt, 1894

*Type species. Remeleceras depressum* Hyatt, 1894, pp. 525-526, pl. 8, figs. 1-8.

### REMELECERAS DEPRESSUM Hyatt

Plate 13, figures 1-4

This interesting species was better illustrated by Hyatt than most of his specimens; even so, interpretation of the genus has been difficult since there is no locality or horizon data with the

specimen. Hyatt's description is as follows: "This extraordinary form is described and figured in this memoir on account of its interesting connection with the history of the impressed zone, notwithstanding the absence of any information with regard to the locality. The side view, Fig. 1, Pl. 8 (Pl. 13, fig. 1 of this report), shows the sutures, which are similar to those of *Estonioceras,* and the impression of what appears to be the annular muscle at the base of the living chamber is very distinct. This may be seen on the dorsal side, Fig. 3 (Pl. 13, fig. 2 of this report), where the lower line has a deeper and broader depression in the cast reaching across the contact furrow. These two lines of depression depart from each other widely on the ventral side, Fig. 2 (Pl. 13, fig. 3 of this report), the outer one forming a broad saddle. They of course correspond to raised ridges on the inner surface of the shell of the living chamber and may have been due to abnormal action in the secretions along the upper and lower borders of the annular muscle.

"The depth of the contact furrow in the full-grown shell near the end of the incomplete living chamber was somewhat greater than is given in Fig. 4 (Pl. 13, fig. 4 of this report), but only a shade deeper, and is also slightly deeper than this beyond the base of this living chamber on the septate part of the volution. In younger stages, shown successively in Figs. 5-7, with their accompanying sections, Figs. 6-8, this furrow diminishes in depth and breadth and almost disappears on the third fragment. This shows that it did not begin to exist in this shell until late in the neanic stage and the younger nepionic stage must have been similar to that of Estonioceras.

"It is also interesting and suggestive to note that the depth and development of the dorsal lobe correlates exactly with the depth and breadth of the contact furrow. The lateral asymmetry in the dorsal lobes of the sutures is another fact to be noted in this specimen.

"The central whorls existed in this specimen, but were completely concealed by the matrix. A section was made of these, but they exhibited no structures.

"The siphuncle was not visible.

"This cast reminds the observer more closely of *Estonioceras* (?) *lamellosum,* as figured by Angelin and Lindstrom, than any other form, but according to Schröder this last is a true estonioceran form with only a slight contact furrow."

*Locality and horizon.* Unknown.

*Repository.* Holotype — MCZ 5082.

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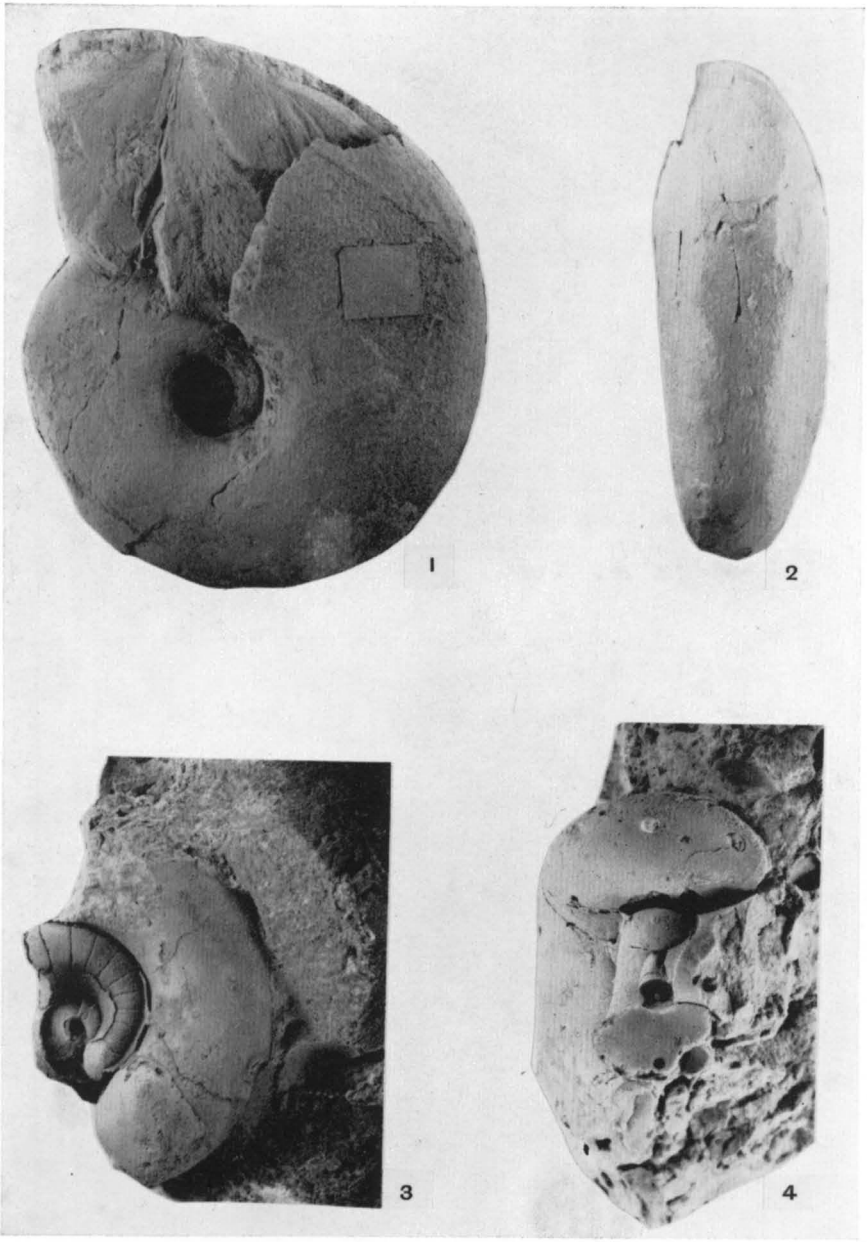

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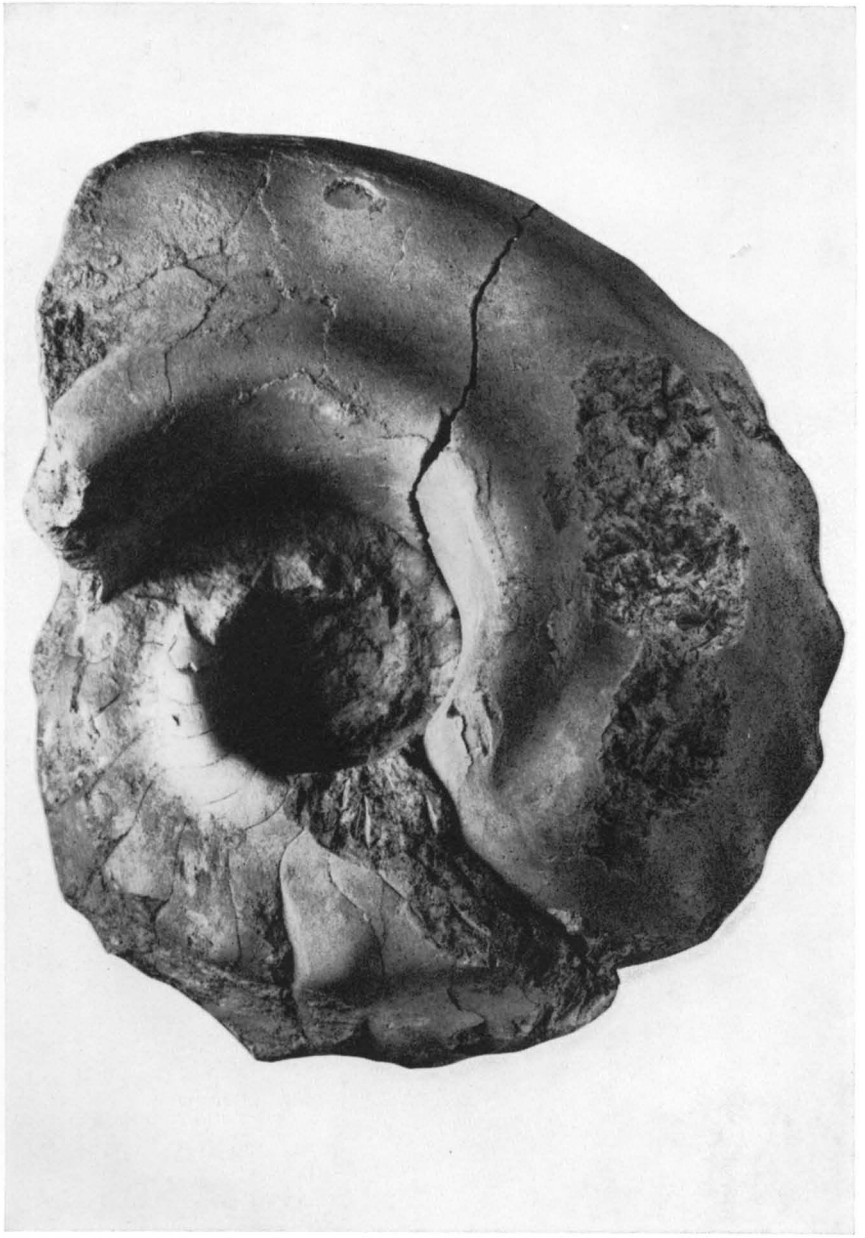

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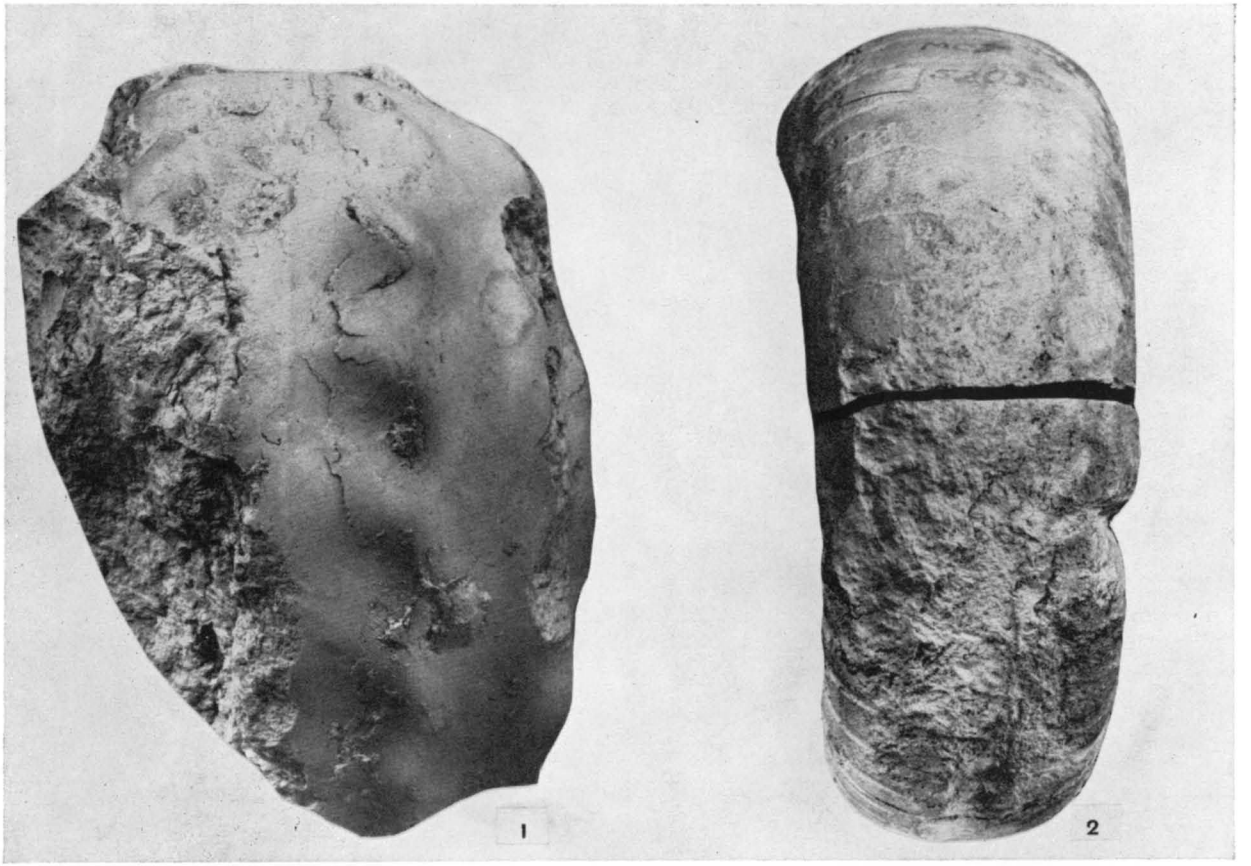

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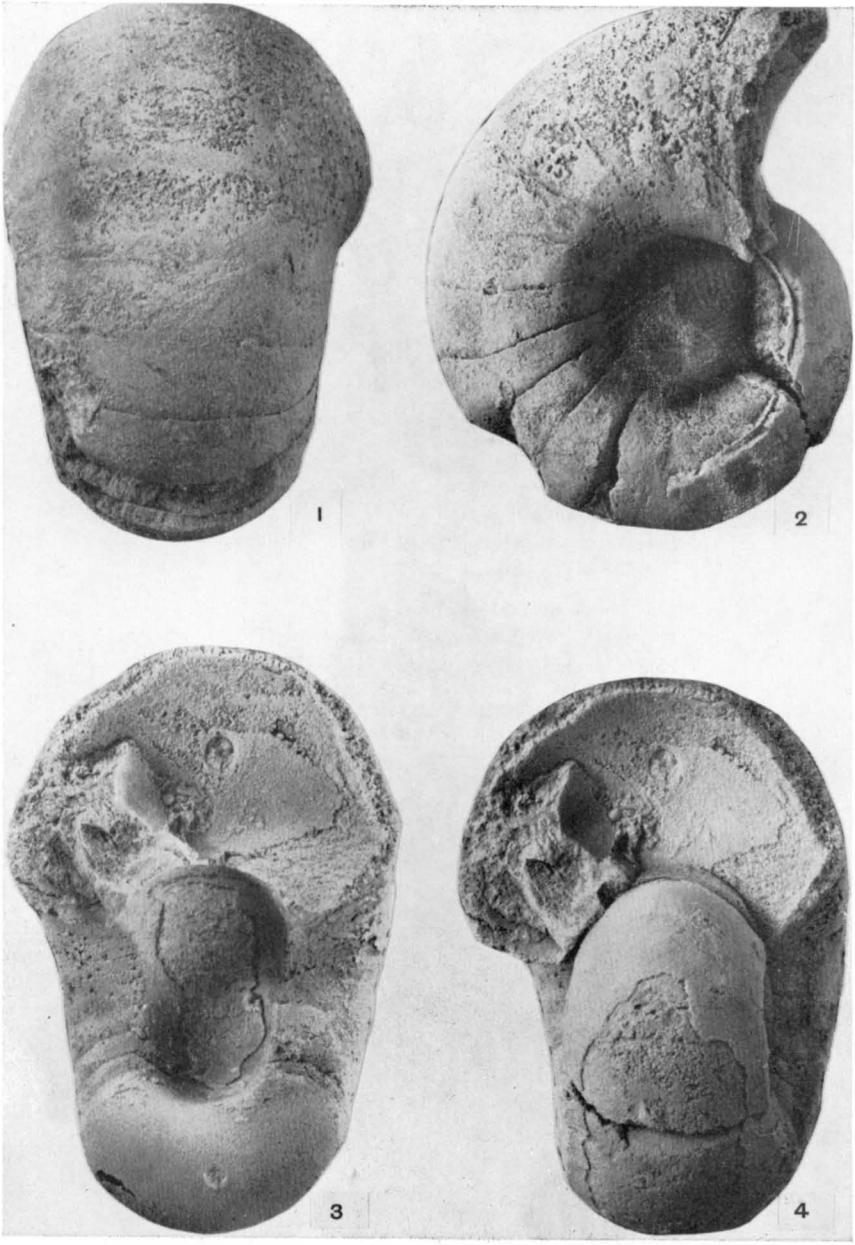

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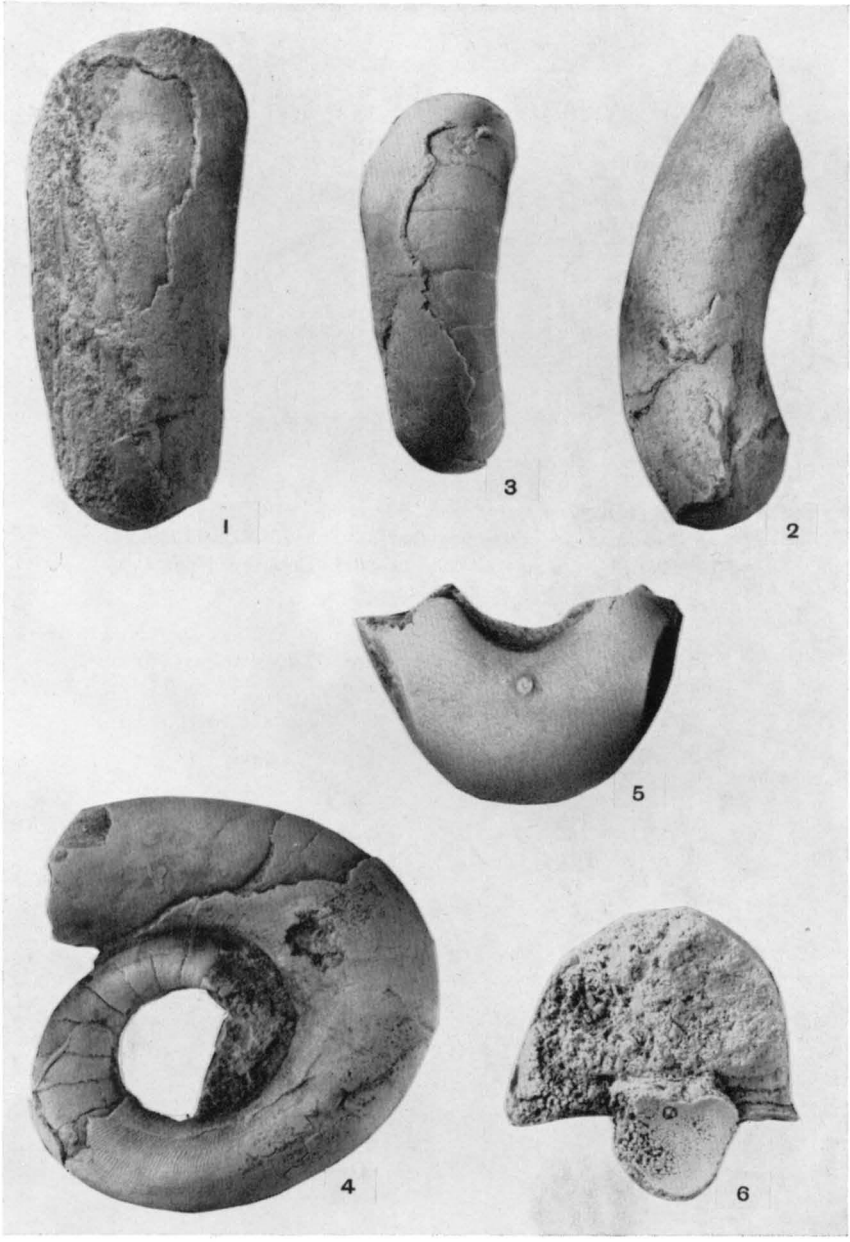

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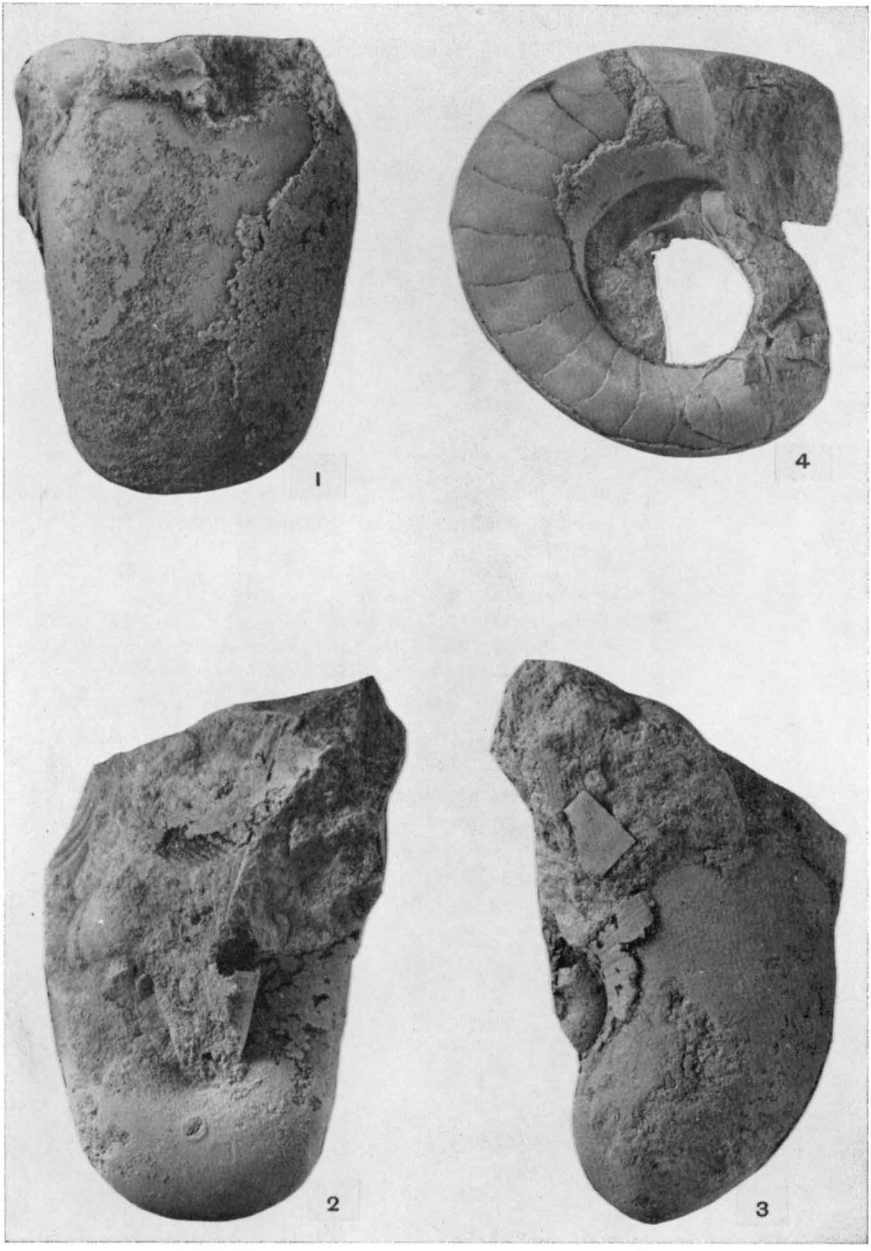

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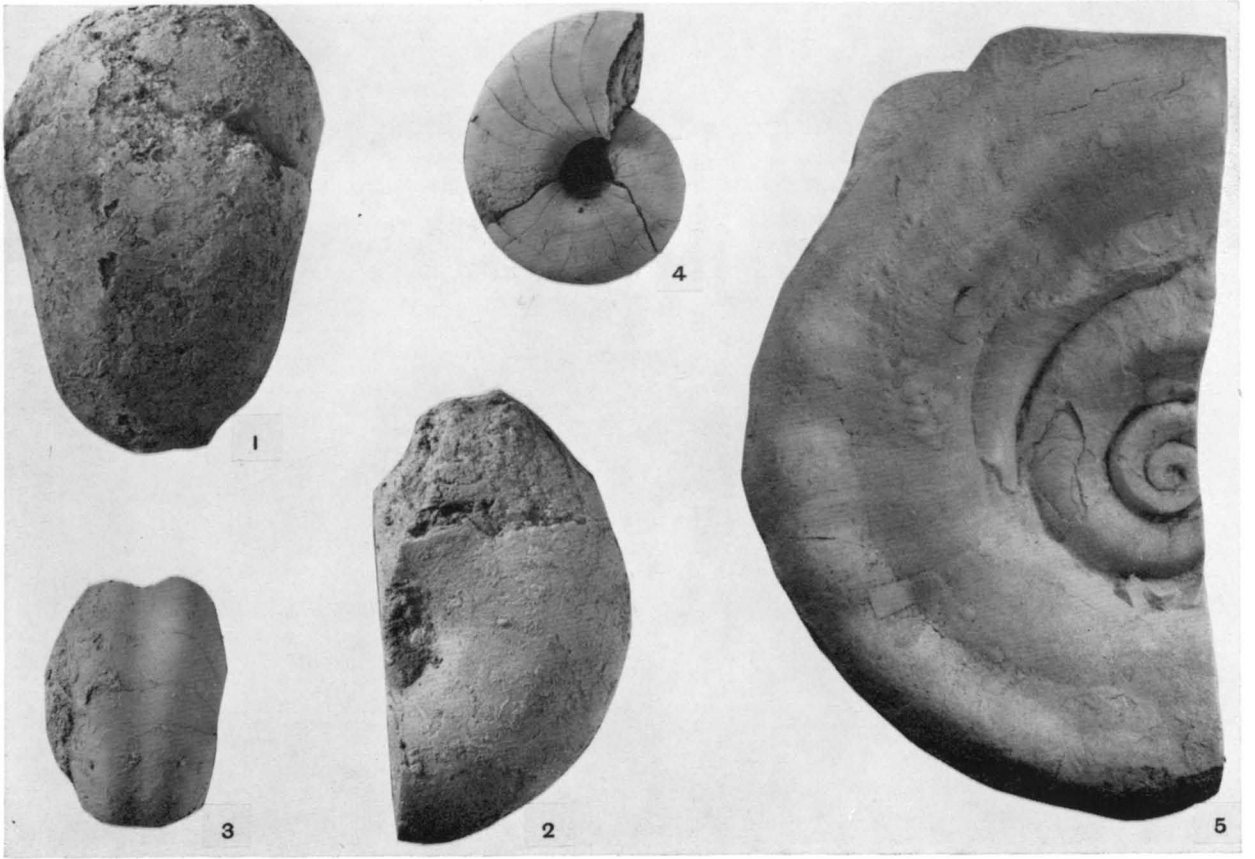

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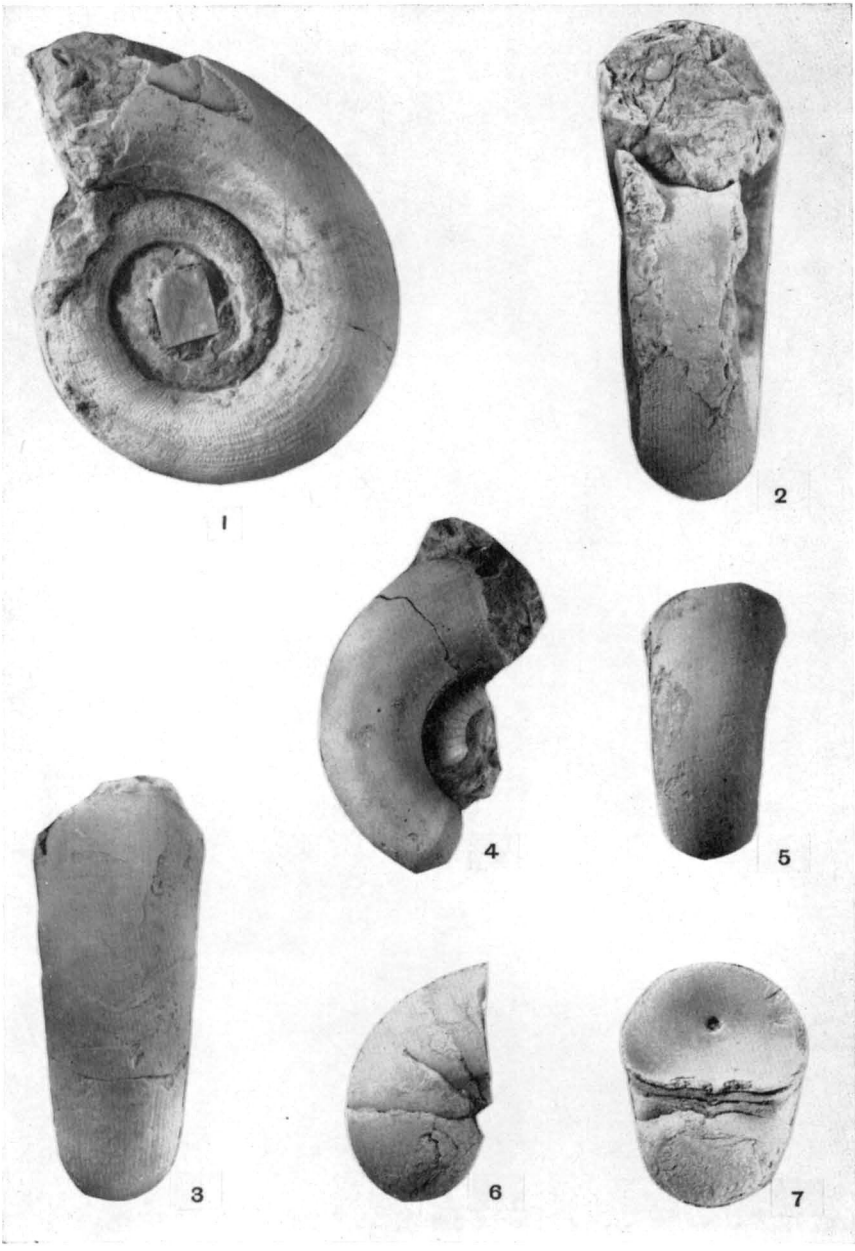

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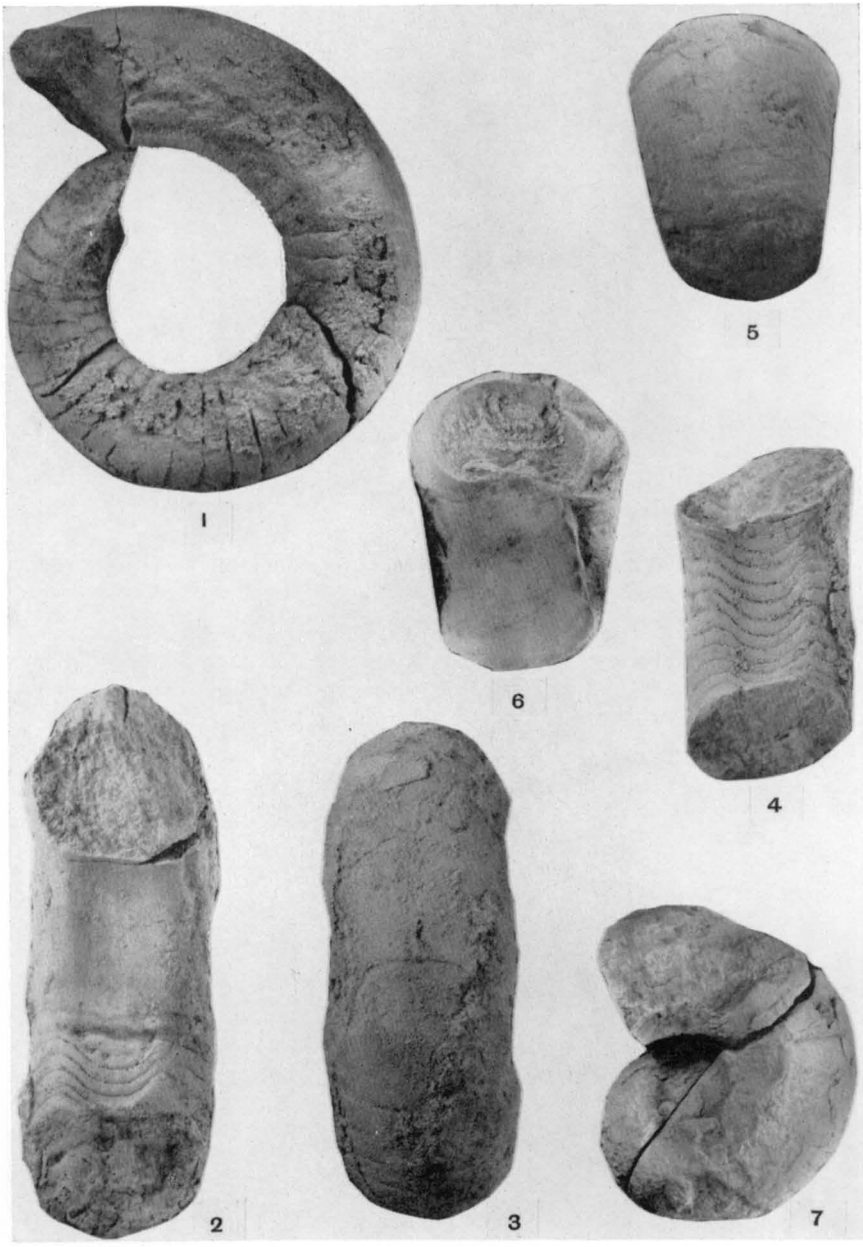

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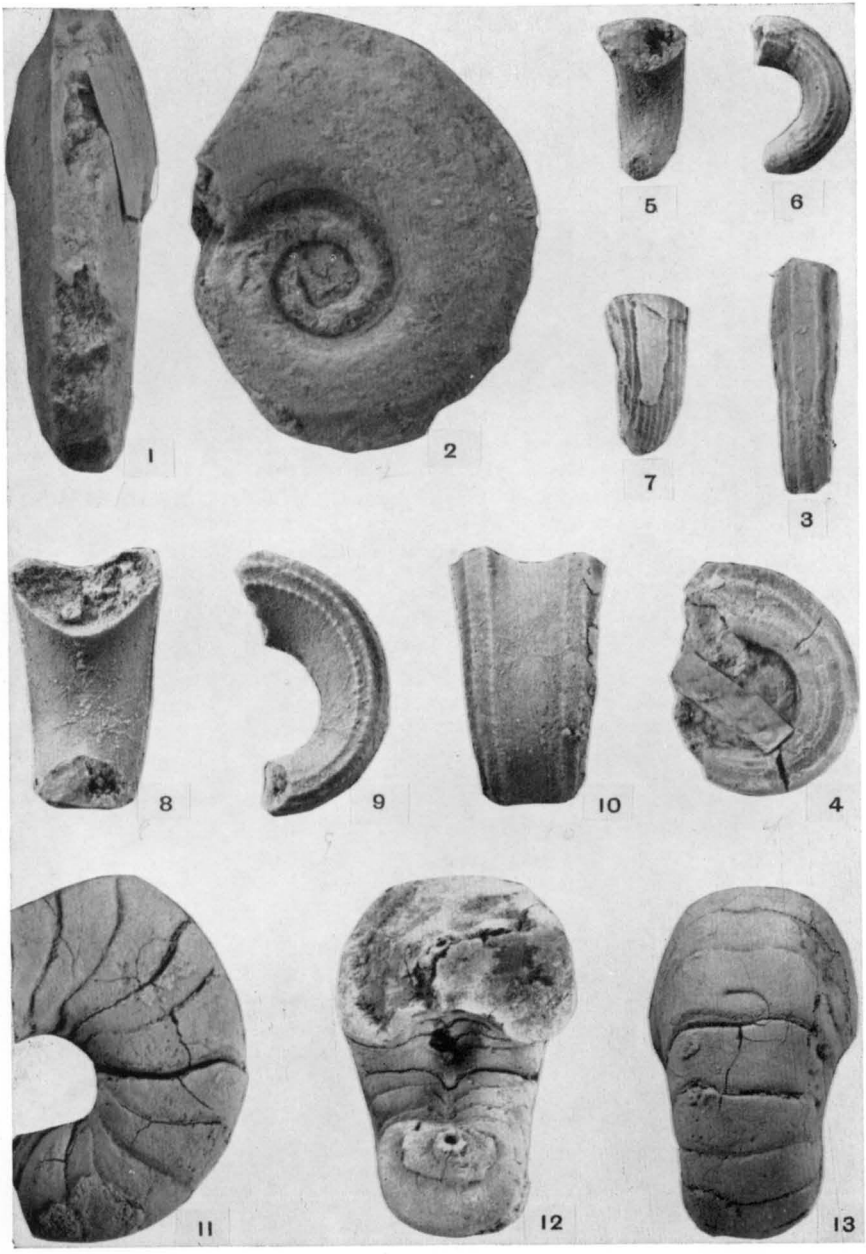

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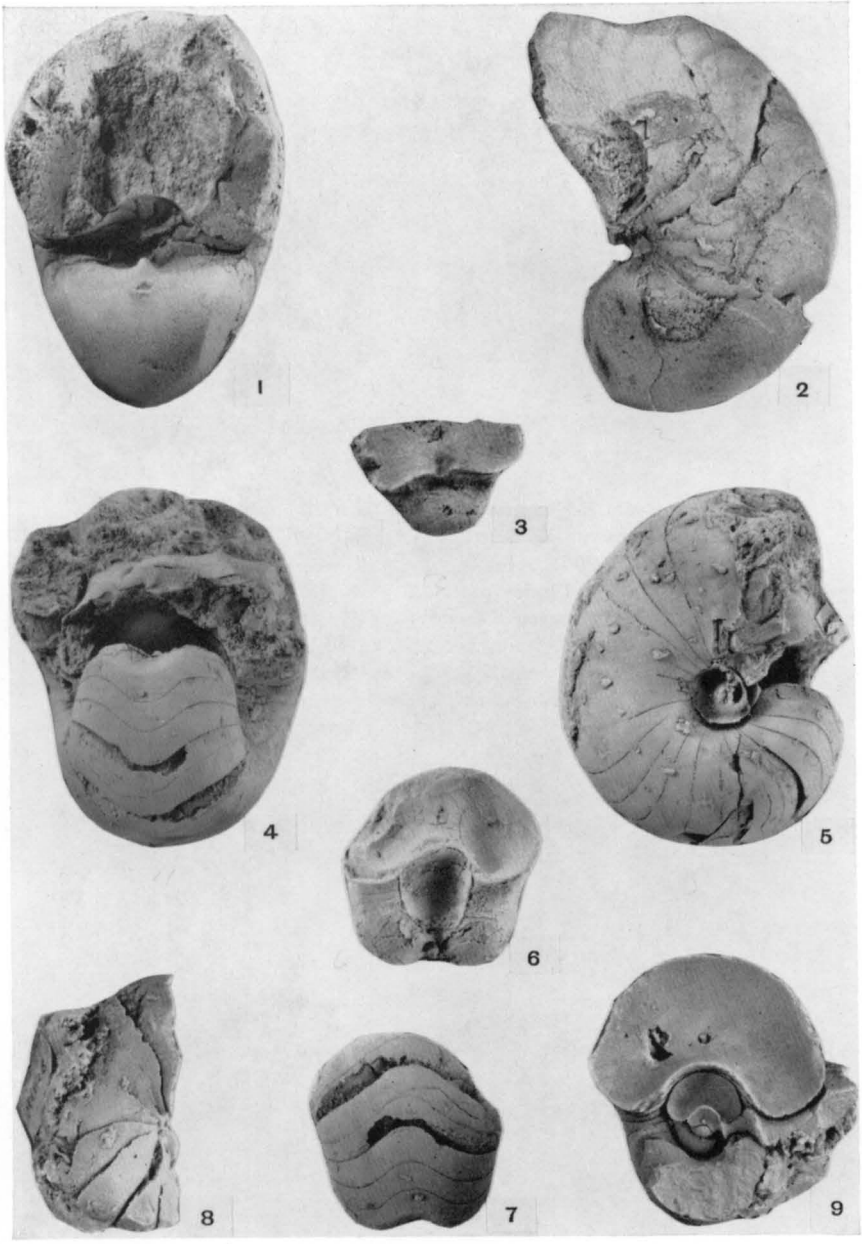

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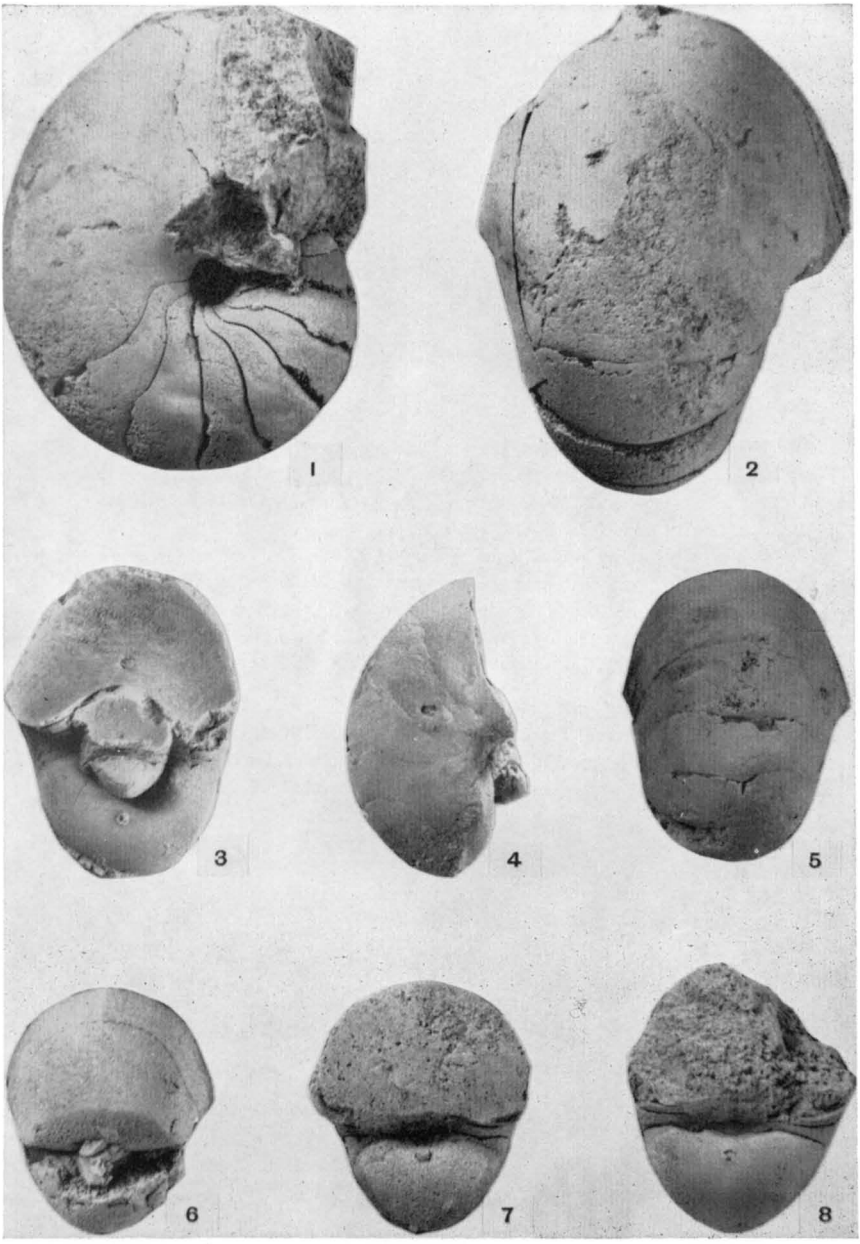

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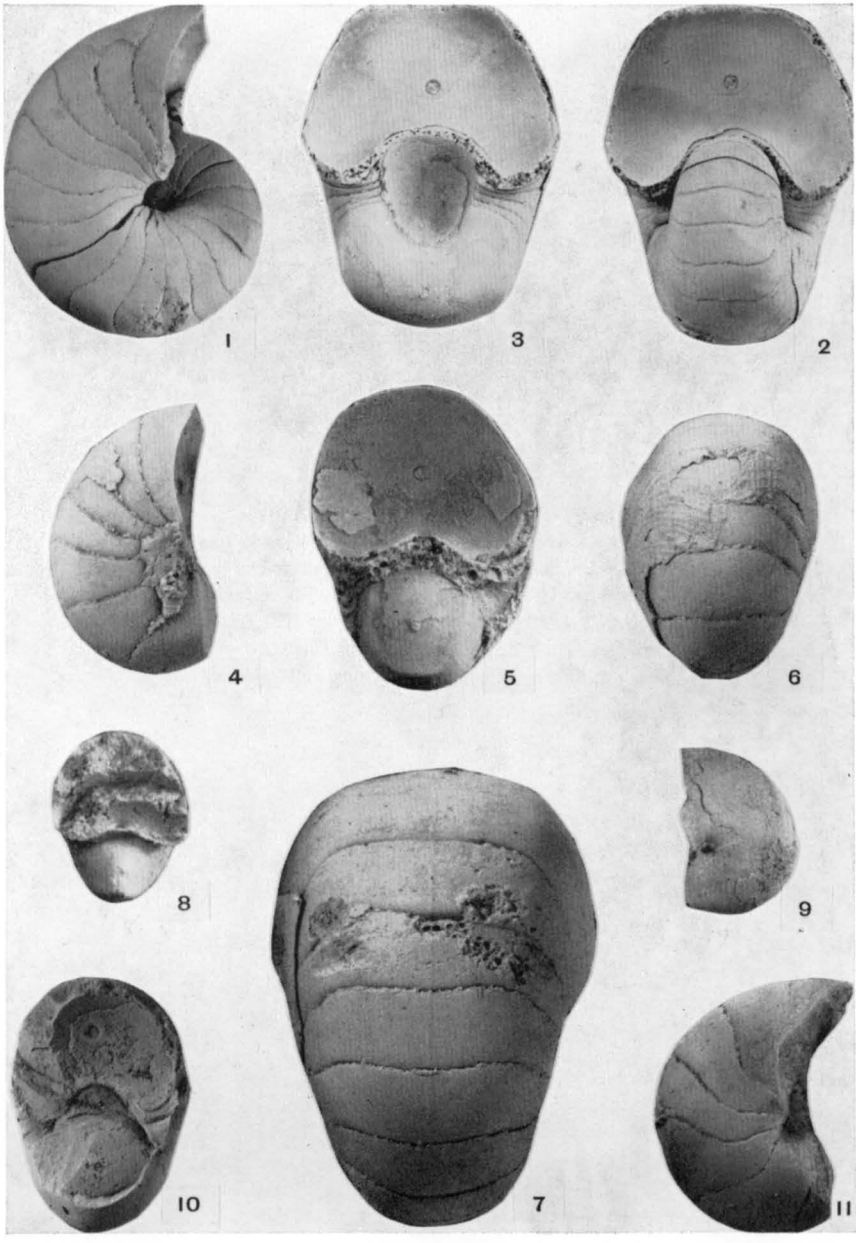

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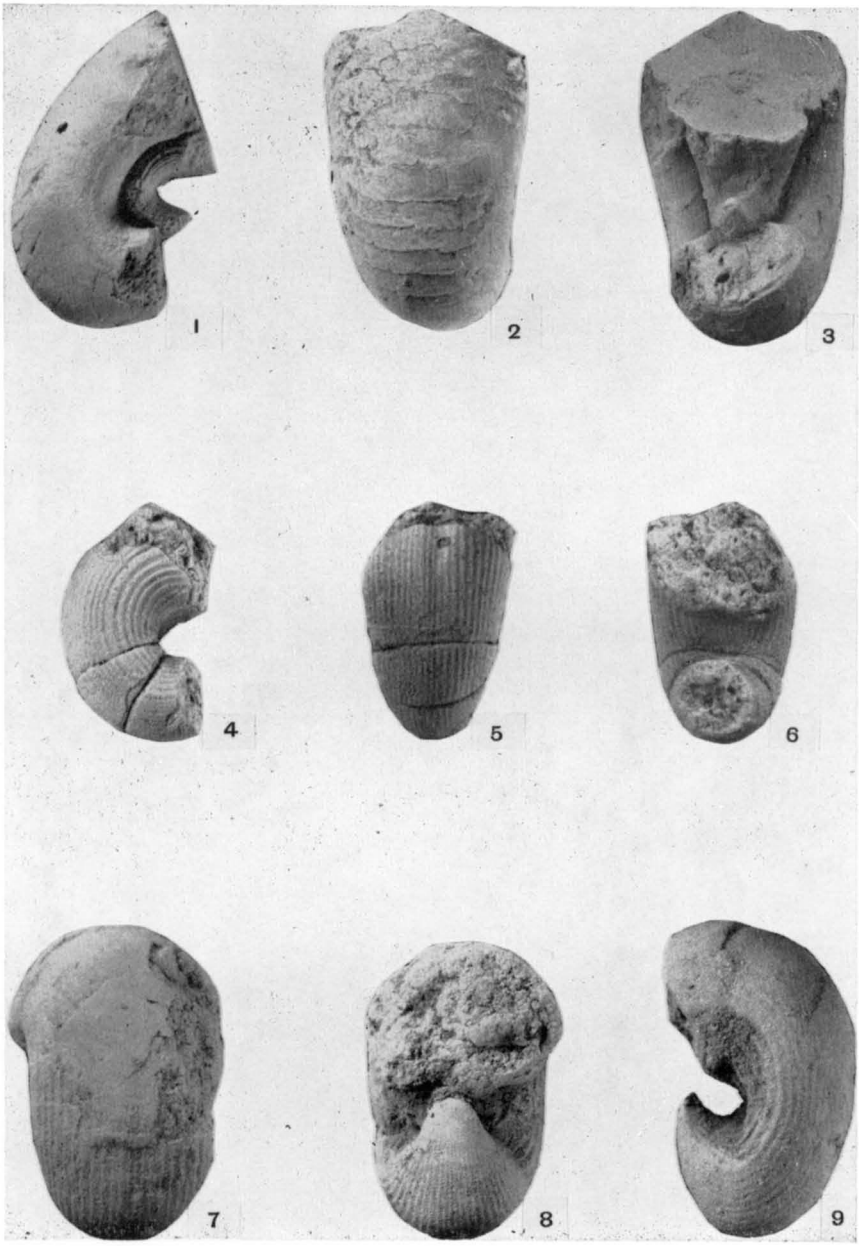

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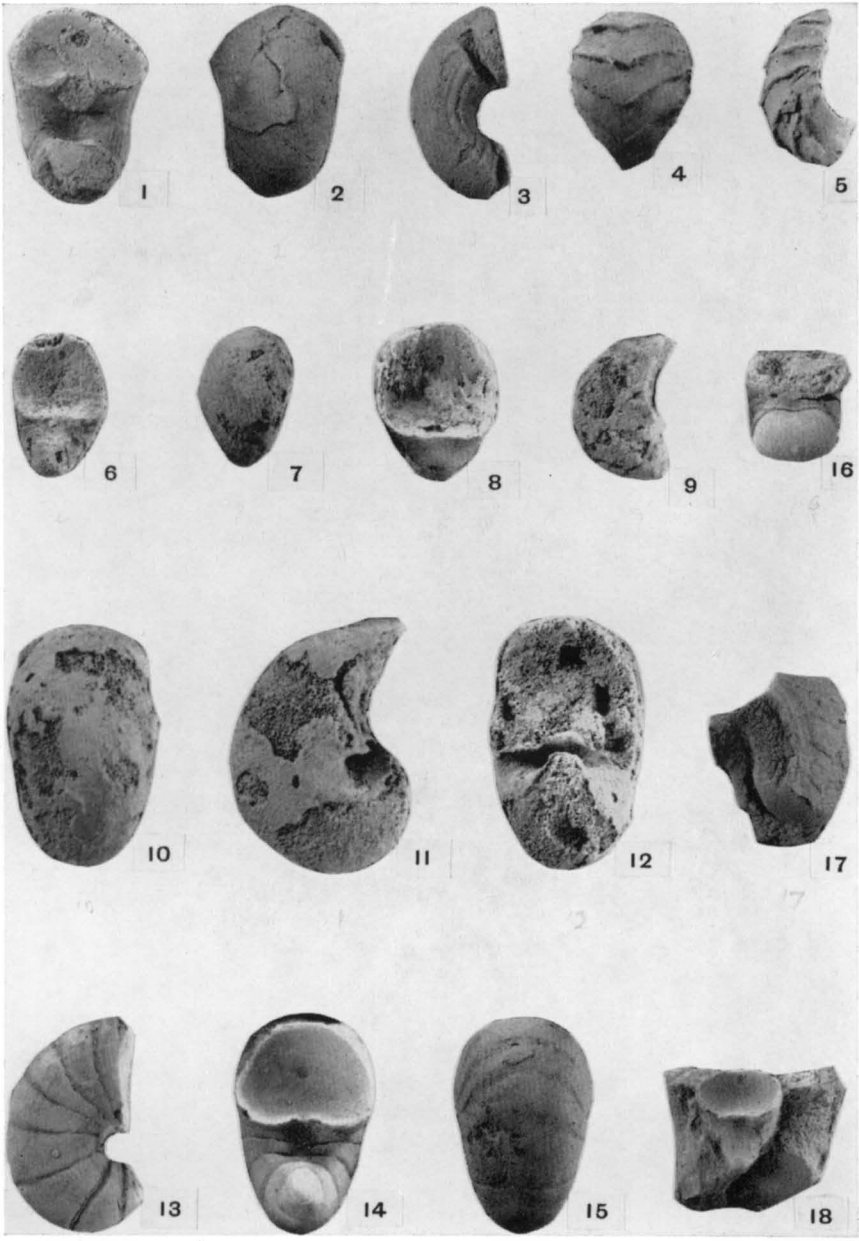

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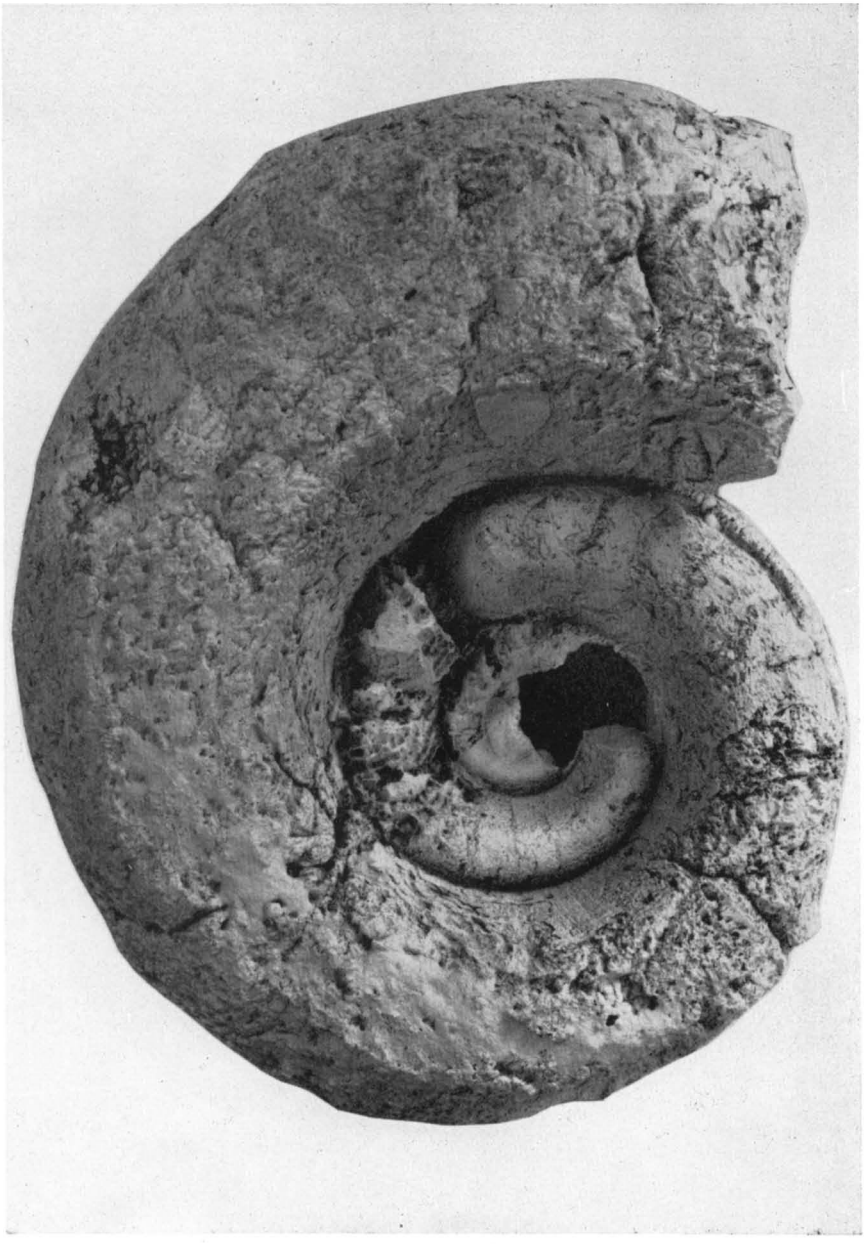
| 1 | *Thrincoceras kentuckiense* Hyatt ..... Holotype, from Franklin County, Kentucky, MCZ 8811, X 1. | 347 |



## PLATE 21. THRINCOCERAS KENTUCKIENSE

| Figure | | Page |
|---|---|---|
| 1 | *Thrincoceras kentuckiense* Hyatt ..... Paratype from Franklin County, Kentucky. MCZ 8812, X 1. | 347 |

## PLATE 22. THRINCOCERAS

| Figures | | Page |
|---|---|---|
| 1, 2 | *Thrincoceras kentuckiense* Hyatt ..... Front view of holotype (Fig. 1) and of paratype (Fig. 2), X 1. | 347 |

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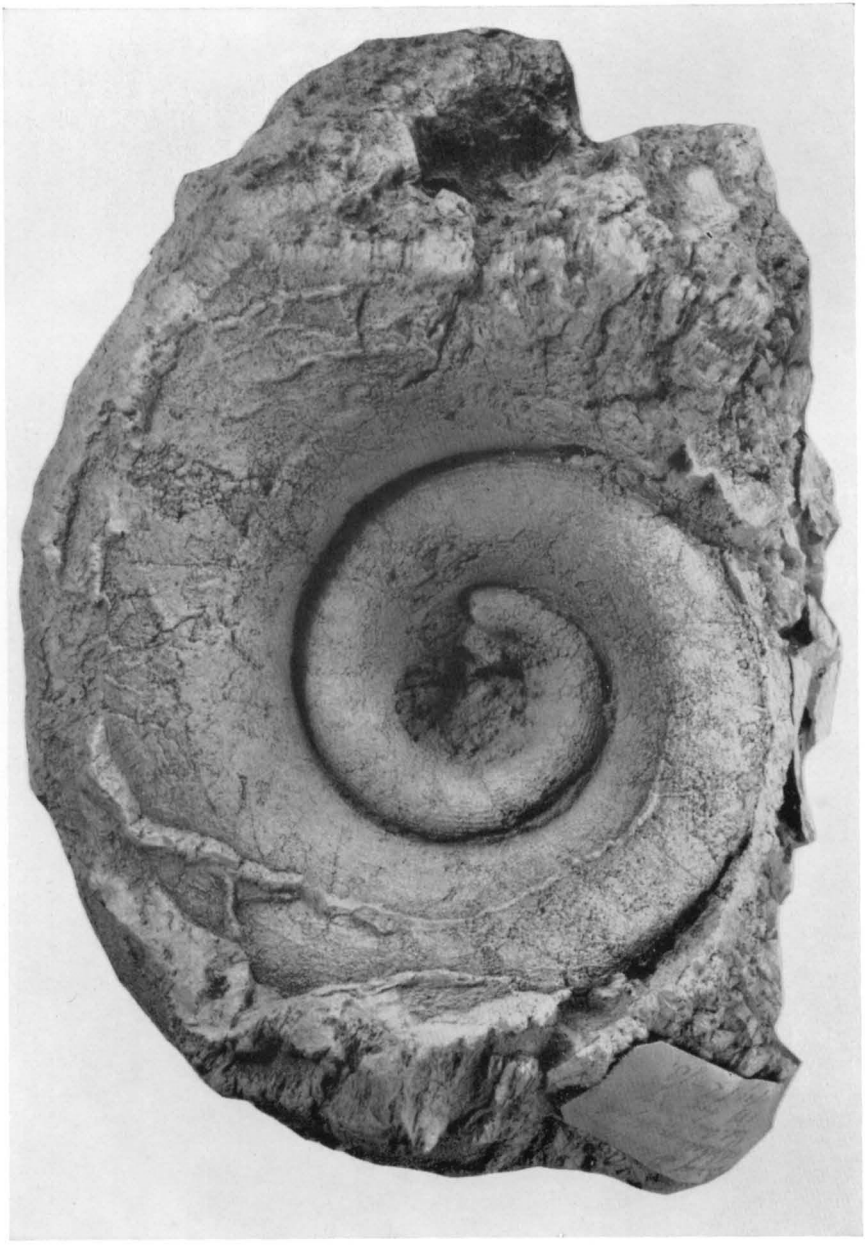
## PLATE 23. THRINCOCERAS DEPRESSUM

| Figure | | Page |
|---|---|---|
| 1 | *Thrincoceras depressum* Hyatt ..... Holotype from Bullitt County, Kentucky. MCZ 8813, X 1. | 347 |



## PLATE 24. LOPHOCERAS

| Figures | | Page |
|---|---|---|
| 1-3 | *Lophoceras pentagonus* (Sowerby) . . . . . One of the two syntypes studied by Sowerby from which he derived the septal surface and siphuncle at the aperture for his composite figure. From the Carboniferous Calcareous Sandstone, Closeburn, Dumfriesshire, Scotland. Sowerby collections, BMNH 43867a, X 0.5. | 331 |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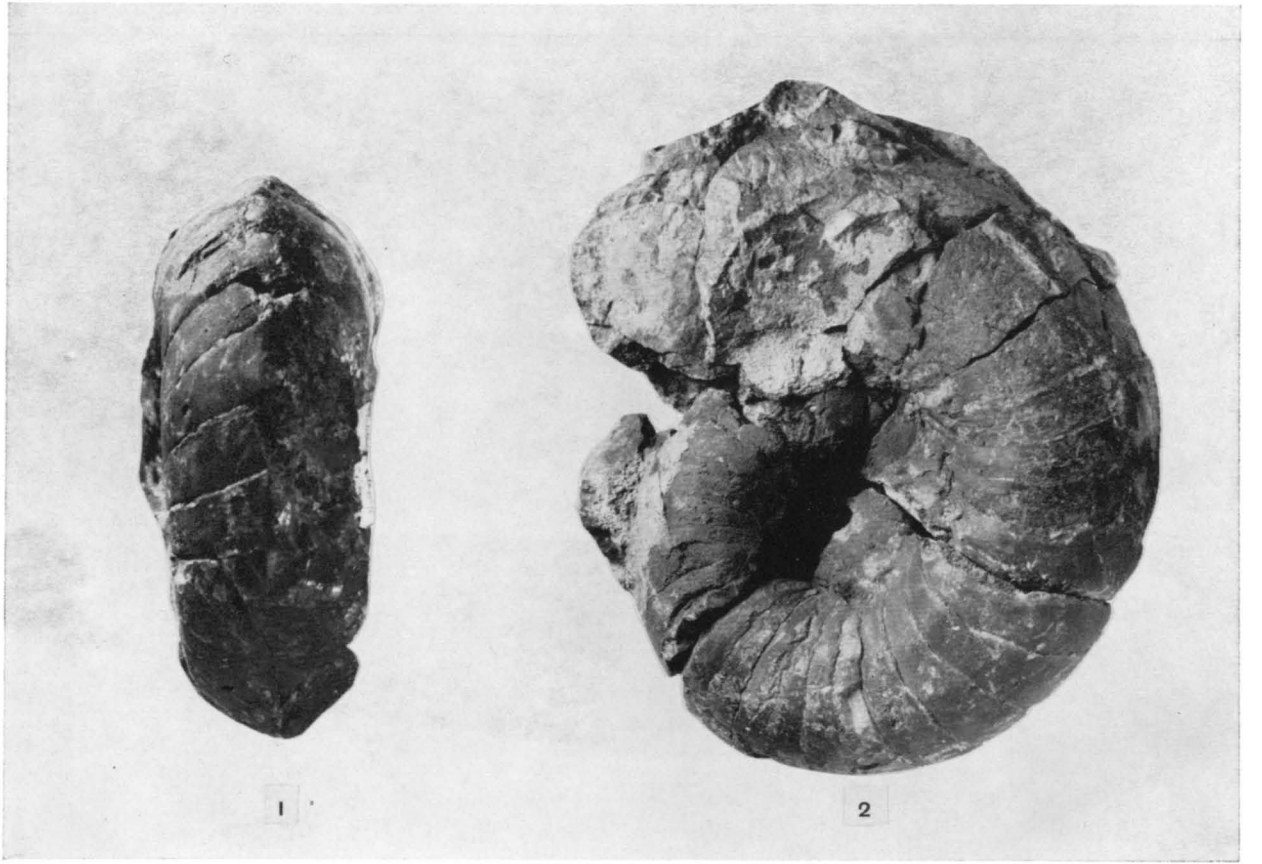
## PLATE 25. LOPHOCERAS

| Figures | | Page |
|---|---|---|
| 1, 2 | *Lophoceras pentagonus* (Sowerby) ..... One of the two syntypes studied by Sowerby from which he derived the general shape and the two patches of matrix for his composite figure. Here designated as lectotype. From Carboniferous Calcareous Sandstone, Closeburn, Dumfriesshire, Scotland. Sowerby Collection, BMNH 43865b, X 0.5. | 331 |



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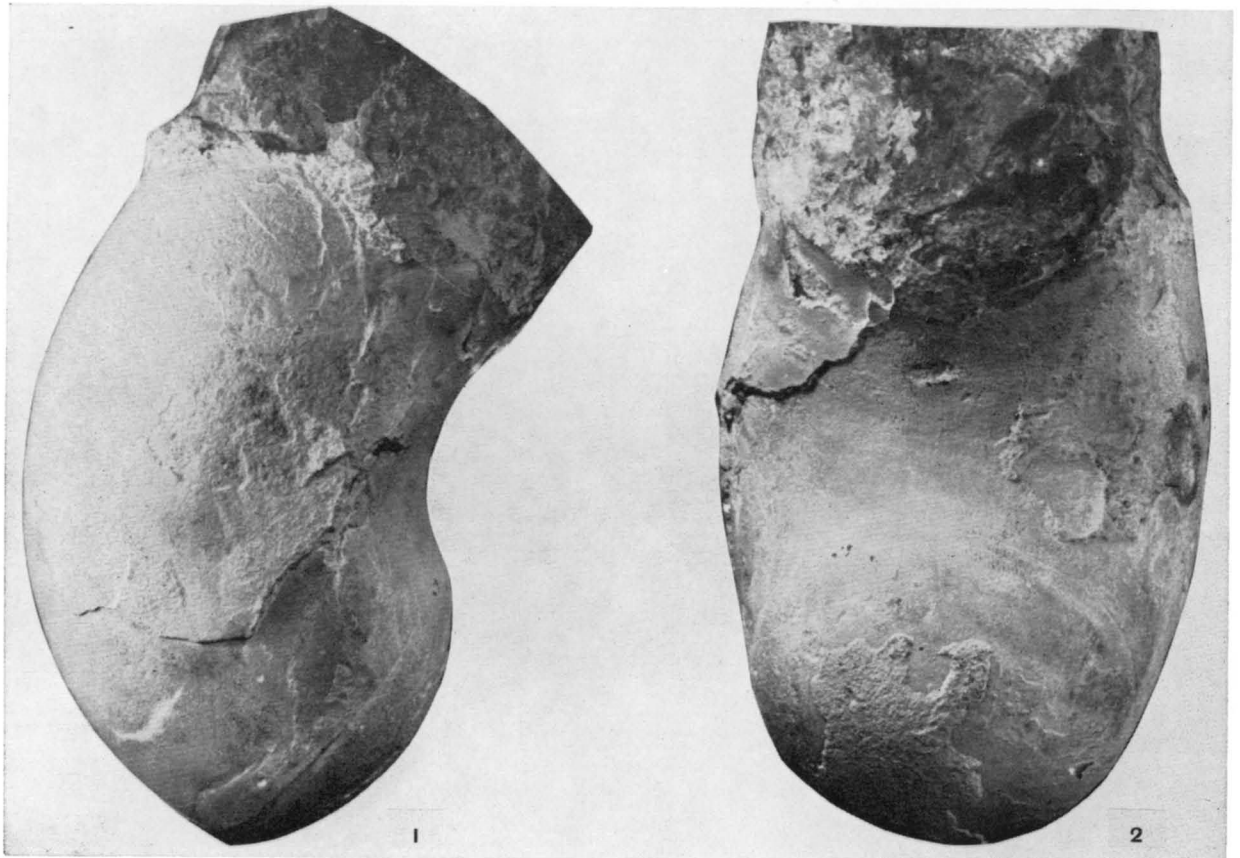
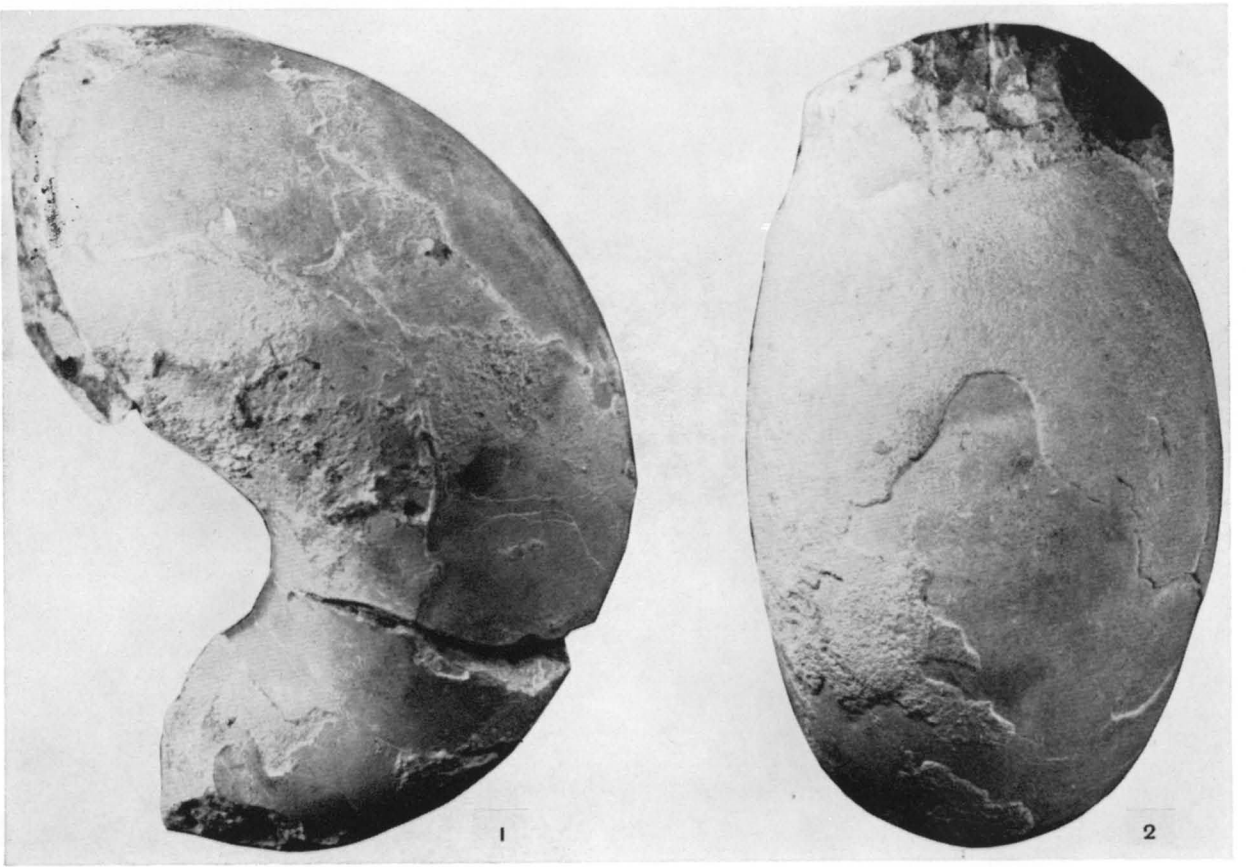
## PLATE 26. ONCODOCERAS FUSIFORME

| Figures | | Page |
|---|---|---|
| 1, 2 | *Oncodoceras fusiforme* Hyatt ..... Lateral and dorsal view of holotype from Lower Carboniferous, Kildare, Ireland. MCZ 5143, X 1. | 350 |



## PLATE 27. ONCODOCERAS FUSIFORME

| Figures | | Page |
|---|---|---|
| 1, 2 | *Oncodoceras fusiforme* Hyatt ..... 1. Ventral view of holotype from Lower Carboniferous, Kildare, Ireland. MCZ 5143, X 1; 2. Lateral view of paratype from Lower Carboniferous, Visé, Belgium. MCZ 5144, X 1. | 350 |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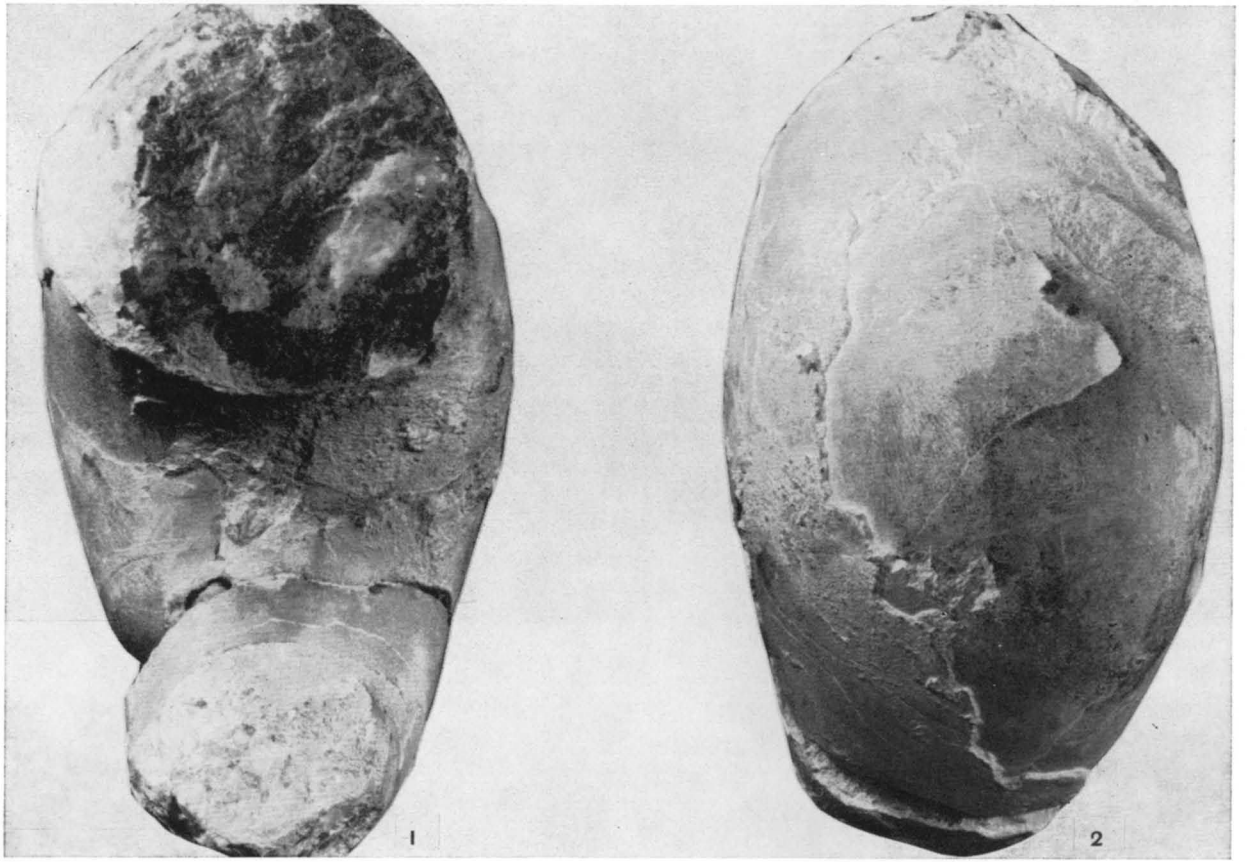
## PLATE 28. ONCODOCERAS FUSIFORME

| Figures | | Page |
|---|---|---|
| 1, 2 | *Oncodoceras fusiforme* Hyatt ..... Ventral and dorsal view of paratype from Lower Carboniferous, Visé, Belgium. MCZ 5144, X 1. | 350 |



## PLATE 29. ONCODOCERAS FUSIFORME

| Figures | | Page |
|---|---|---|
| 1, 2 | *Oncodoceras fusiforme* Hyatt ..... Lateral and ventral view of paratype from Lower Carboniferous, Kildare, Ireland. MCZ 5201, X 1. | 350 |

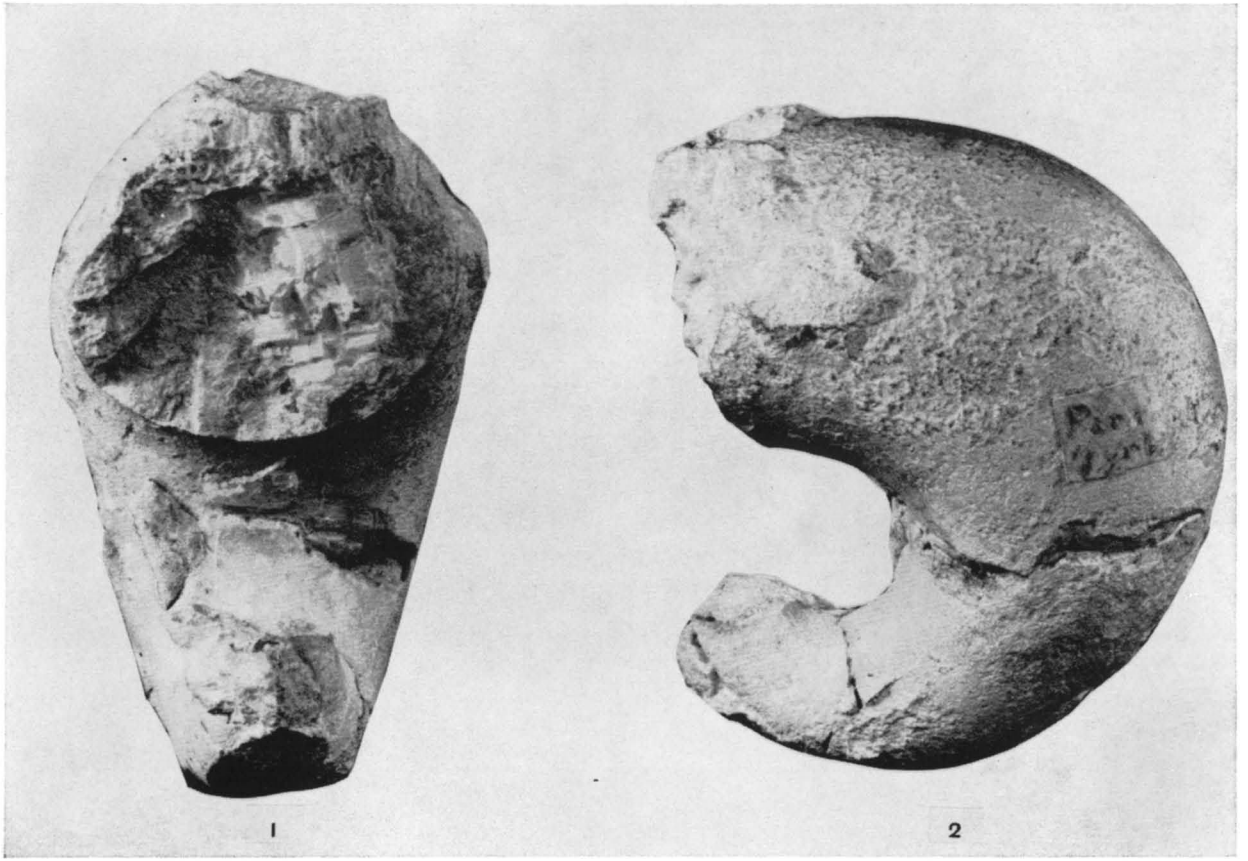



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PLATE 30. EUTREPHOCERAS, CENOCERAS, AND ONCODOCERAS

| Figures | | Page |
|---|---|---|
| 1-3 | *Eutrephoceras imperialis* (Sowerby) ..... 1, 2. Specimen from London clay, Isle of Wight, MCZ 8834a, X 1.5; 3, Plesiotype figured by Hyatt, 1894, pl. 13, fig. 13 from same locality and horizon. MCZ 8834b, X 1.5. | 358 |
| 4, 5 | *Cenoceras clausum* (d'Orbigny) ..... Plesiotype from Inferior Oolite, St. Vigor near Bayeux, figured by Hyatt, 1894, pl. 12, figs. 12-15. MCZ 8832, X 2. | 359 |
| 6 | *Oncodoceras fusiforme* Hyatt ..... Ventral view of paratype from Lower Carboniferous, Kildare, Ireland. MCZ 5201, X 1. | 350 |