

# AUSTRALIAN MUSEUM SCIENTIFIC PUBLICATIONS

Teichert, C., and Harold O. Fletcher, 1943. A Permian ammonoid from New South Wales and the correlation of the Upper Marine Series. *Records of the Australian Museum* 21(3): 156–163, plate xi. [28 June 1943].

doi:10.3853/j.0067-1975.21.1943.530

ISSN 0067-1975

Published by the Australian Museum, Sydney

nature culture **discover**

Australian Museum science is freely accessible online at  
<http://publications.australianmuseum.net.au>  
6 College Street, Sydney NSW 2010, Australia



# A PERMIAN AMMONOID FROM NEW SOUTH WALES AND THE CORRELATION OF THE UPPER MARINE SERIES.

By CURT TEICHERT AND H. O. FLETCHER.

(Plate xi, and Figures 1-3.)

*Abstract.*—References to alleged occurrences of ammonoids in the Permian of New South Wales are numerous. With the exception of the one specimen described in this paper they all seem to refer to bellerophontids identical with or related to *Warthia micromphala* (Morris). An abbreviated historical review of that species is, therefore, included. The only indubitable ammonoid from the Permian of New South Wales was found in the Branxton stage of the Upper Marine series of the Hunter River Valley. The specimen represents a new species which is described as *Adrianites (Neocrimites) meridionalis*. The evolutionary stage reached by that species indicates an Artinskian age for the Branxton beds.

A state of uncertainty has long existed regarding the occurrence of ammonoids in the Permian of New South Wales. A certain species, originally described as *Bellerophon micromphalus* by Morris in 1845, has subsequently been referred by different workers to such genera as *Goniatites*, *Agathiceras*, *Warthia*, *Prolecanites*, *Paralegoceras* and others, and it seems remarkable that no up-to-date description of any specimens to which any of these names has been attached should be available. The purpose of the present paper is to describe the only true ammonoid to which this specific name has ever been applied, and which, incidentally, is the only ammonoid ever secured from the Permian sequence in New South Wales. In order to clear the ground it will be advisable to go into the history of "*Bellerophon micromphalus*" and to demonstrate the many changes in the conception of that species.

## Historical Notes on "*Bellerophon micromphalus*".

"*Bellerophon micromphalus*" was originally described by Morris (1845, p. 288, pl. 18, fig. 7) from the Upper Marine series of the Permian in the Illawarra District, New South Wales, but the specimen figured by its author is quite unlike what was later to be considered as a typical shell of that species.

In 1847, McCoy (p. 308) recorded *Bellerophon micromphalus* from Wollongong and added that it was rare in the Muree sandstone of the Hunter River Valley. In the same year, Dana described *Bellerophon undulatus* from Harper's Hill and *B. strictus* from Illawarra. Two years later, Dana (1849, pp. 707-8) recorded and figured the same two species in addition to *Bellerophon micromphalus*, but his figure of the last-mentioned species is different from the figure published by Morris.

de Koninck (1877, p. 201) placed *B. undulatus* Dana in the synonymy of *B. micromphalus* and, although he had seen no traces of septa, transferred the species to the genus *Goniatites* because of its external appearance. He apparently overlooked the fact that as early as 1850 Römer had already described a species from the Upper Devonian of Germany which he had named "*Goniatites micromphalus*". de Koninck's description of the species was repeated unchanged in the English edition of his work published in 1898.

In the meantime, Etheridge (1878, p. 89) had listed "*Goniatites micromphalus*" as doubtfully related to *Aganides* Montfort, and (1880, p. 304) recorded the species from the Bowen River coalfield in Queensland. This reference was repeated by Etheridge in

1892 (p. 294). However, as early as 1880, Waagen had studied bellerophontids from the Productus limestone of the Salt Range in India and instituted a new genus *Warthia* for shells which showed no trace of a slit-band and were strongly involute and compressed, and (1880, p. 160) he stated his opinion that the Australian species *Bellerophon undulatus*, *B. strictus* and *B. micromphalus* undoubtedly belonged to this genus.

Foord (1890) recorded "*Goniatites micromphalus*" from the Kimberley district of Western Australia, but stated that his specimens were poor and showed no trace of septa.

Etheridge (1894) described and figured three specimens from the Upper Marine series which he called "*Goniatites (Prolecanites?) micromphalus*". Among his figures is one of a portion of a suture, but it is not stated from which of the specimens it was drawn. Etheridge discussed the possibility that the species might either belong to *Sandbergeroceras* Hyatt or to *Prolecanites* Mojsisovics. In the same year and having had access to Etheridge's paper, Foord and Crick noted the resemblance of Etheridge's specimens, particularly the suture, to *Agathiceras uralicum* Karpinsky from the Artinsk beds of Russia, and they therefore referred the species with reservation to the genus *Agathiceras*.

Frech, on the other hand, stated two years later (1896, p. 501) that the general form and spiral ornaments of this species agree with *Gastrioceras*, while its lobes agree with those of *Prolecanites* or *Pronorites*. At that time, of course, a complete suture was not known, as Etheridge had only figured a few of the lobes and saddles, and Frech thought that when this was known the species might possibly have to be referred to a new genus.

In 1904 Chapman recorded "*Goniatites micromphalus*" from the Irwin River district, Western Australia, without offering further comments, but in general the species was more or less confidently referred to *Agathiceras* as proposed by Foord and Crick. It is thus listed in many papers dealing with the Permian of Australia—as e.g. in David's monograph of the Hunter River coal fields, to mention only one of the most notable contributions—right up to 1924, when Chapman listed "*Agathiceras micromphalum*" from the "Carbo-Permian" of Port Keats in the Northern Territory.

Of foreign references to the Australian species during this period might be mentioned Haug, who (1898, p. 33) included it in the list of then known species of *Agathiceras*, and Haniel, who in his description of Permian cephalopods from Timor (1915) compared "*Goniatites (Agathiceras?) micromphalum*" with his own *Agathiceras sundaicum* and *A. cancellatum*.

Girty (1908, p. 482) favoured the bellerophontid affinities of the species when he stated that in all probability it would prove to be a *Warthia*. In Australia its true affinities were first recognized by Whitehouse in 1926, who listed "*Bellerophon (Warthia) micromphalus*" among Permian species from eastern Australia. No further observations were, however, communicated, and in 1928 "*Agathiceras micromphalum*" was again mentioned from the Permian of Australia in a comprehensive review published by Schuchert.

Some further progress was made in the following year, 1929, when Thomas reported that he and Dr. Spath had examined specimens of alleged *Agathiceras micromphalum* from Australia, but found that they could equally well be bellerophontids. In the same year Reid (1929, p. 80) published a communication received from Dr. Whitehouse to the effect that "two similarly coiled species, a common gastropod and a rare cephalopod, have been referred to this one species by earlier writers", in particular by Etheridge in 1894. This is the first suggestion that the specimens which had been given the specific name *micromphalus* might not necessarily all be conspecific, and that the name had been applied to gastropods as well as to a cephalopod.

In the following year Reed (1930, p. 43) described some fossils from the Permian of Brazil, which closely resembled Morris's species, as "*Bellerophon? cf. micromphalus*", stating that the true position of the species must remain an open question. Two years later, however, he (1932, p. 69) unreservedly identified "*Warthia micromphala (Morris)*" from the Agglomeratic Shales of Kashmir; he comments on the remarkable

fact that Etheridge was the only author who had ever observed any traces of septa in any specimens that had ever been referred to that species and that nobody else had been able to confirm such observations.

David and Süssmilch (1931, p. 500) helped to solve some of the mystery surrounding the species by stating that "the only specimen of an *Agathiceras* found in Australia and showing a suture, and referred by Etheridge to *Agathiceras micromphalum*, was obtained from a shaft sunk in the Upper Marine Series, at a horizon a few hundred feet above the top of the Greta Coal Measures". Furthermore, the authors state that the Ravensfield sandstone is particularly rich in a fossil classed as *Agathiceras micromphalum*, but now considered to be a *Bellerophon*. On the same page Whitehouse is quoted as questioning the affinities of the ammonoid with *Agathiceras*; he considered it to be nearer to *Paralegoceras*.

There have been no more recent contributions to the solution of the problem. Miller and Furnish (1940, p. 119) included Australia in the list of countries from which species of *Agathiceras* were known, and Teichert (1942, p. 223) stated that the only ammonoid ever reported from eastern Australia was an alleged *Paragastrioceras* from Queensland, implying that all references to "*Agathiceras*" or other ammonoid genera in eastern Australia were erroneous.

These historical notes, which are, it is hoped, complete in essentials, show that the specific name "*micromphalus*" has by different authors been more or less loosely attached to the following generic names of ammonoids: *Goniatites*, *Aganides*, *Sandbergeroceras*, *Prolecanites*, *Agathiceras*, *Gastrioceras*, *Pronorites*, and *Paralegoceras*. Moreover, it shows that the only pertinent observations that have ever been made are those published by Etheridge in 1894; that most authors who speculated on the affinities of the species relied on Etheridge's not very comprehensive descriptions and had never seen his original specimens; and that all other authors who had ever studied specimens of "*Bellerophon micromphalus*" had failed to find any traces of septa.<sup>1</sup>

Since Whitehouse had indicated that Etheridge had referred a gastropod as well as a cephalopod to the same species, and since David and Süssmilch had stated that only one single specimen showing suture lines had so far been found, a restudy of Etheridge's original specimens was apparently needed.

#### Occurrence of *Adrianites* and its Stratigraphical Significance.

An examination of the specimens on which Etheridge based his description of "*Goniatites (Prolecanites?) micromphalus*, Morris, sp." in 1894 revealed the fact that Etheridge had before him two specimens. One specimen served as original for figs. 9, 12 and 14 on pl. vii of his paper; the second specimen is represented by figs. 10, 11 and 13. The second specimen is a bellerophonid and belongs without doubt to the genus *Warthia*, although it may not be conspecific with *Bellerophon micromphalus* of Morris. It will not be further considered in this paper.

The first specimen is an ammonoid and must be the one referred to by David and Süssmilch as having been obtained from a shaft sunk in the Upper Marine series, at a horizon a few hundred feet above the Greta Coal Measures; therefore, this specimen comes from the Branxton beds of the Upper Marine series of the Hunter River Valley.

This ammonoid cannot be referred to any of the genera with which it has ever been compared; it clearly belongs to the family Adrianitidae. It might still fall within the range of the genus *Adrianites*, taken in its broader sense, although some Russian workers would undoubtedly include it in a group of early species to which they have recently applied the generic name *Neocrimites*. The species will be described below as *Adrianites (Neocrimites) meridionalis*, n. sp.<sup>2</sup>

<sup>1</sup> Whether or not all aseptate specimens are in fact conspecific with Morris's holotype of *Bellerophon micromphalus* is a question that cannot be discussed in this place.

<sup>2</sup> While the genus *Agathiceras* must for the present be removed from the list of Permian fossils in New South Wales, it may be noted that a representative of that genus has recently been found in Western Australia (Teichert, *Jour. of Paleontology*, in press).

The stage of development reached by this species indicates fairly clearly that the beds from which it was obtained must be either of Artinskian age or only slightly younger, of an age corresponding to that of the Sosio beds of Sicily or of the Basleo beds of Timor. In other words these beds must be correlated with some part of the *Perrinites* zone or of the *Waagenoceras* zone of the Permian (= Leonard + Word formations of Texas, = Artinskian + Kungurian of Russia). In the terminology of American authors they would be definitely of "Middle Permian" age, although earlier writers would have classified them as Lower Permian, as also do most contemporaneous Russian geologists.

As will be explained below, certain features of the suture of *Adrianites meridionalis* suggest affinities to earlier rather than to later species within this time interval and the evidence of the ammonoid is thus distinctly more in favour of an Artinskian age of the Branxton stage. Conclusions reached earlier in a more indirect way by Teichert (1939, 1941) have thus been essentially substantiated.

In view of the great importance which is attached to this species for the correlation of the Upper Marine series, a somewhat more detailed account of the development and distribution of the family Adrianitidae is here included.

#### The Family Adrianitidae.

It is only in very recent years that the structure of the genus *Adrianites* and its various sections has been properly understood, particularly since Schindewolf, in 1931, established definite criteria for the distinction between *Adrianites* and *Agathiceras*, two genera which are externally very similar, but which Schindewolf suggested should be placed in different families on account of differences in the position of their siphuncles in early ontogenetical stages. Schindewolf's conclusions were not accepted by Plummer and Scott in 1937; however, they were strongly supported by studies of the ontogenetical development of the suture of the two genera which were published independently in the same year (1939) by Ruzhencev and by Miller and Furnish. Substantial additions to the knowledge of the Adrianitidae have also been made by Toumansky in papers published in 1937, and in additional papers by Ruzhencev (1940) and by Miller and Furnish (1940).

When Schindewolf established the family Adrianitidae, he included in it the genera *Adrianites* Gemmellaro, *Doryceras* Gemmellaro, *Pseudagathiceras* Schindewolf, and *Epadrianites* Schindewolf. Toumansky, in 1937, added *Hoffmannia* Gemmellaro and the new genera *Crimites*, *Sizilites*, and *Palermites* to the list. Miller and Furnish (1939, 1940) were critical of the validity of most of these genera. They concluded that "there is considerable variation within the genus *Adrianites*" and that "little if anything is to be gained by subdividing the genus".

In 1940, however, Ruzhencev added a new genus, *Neocrimites*, to the family and at the same time he also discussed the broader relationships of the group. It seems to us that Ruzhencev has established some definite evolutionary trends within the family Adrianitidae and his results lead to satisfactory correlations as far as the Australian species is concerned. The study of Russian faunas led Ruzhencev to the establishment of a phylogenetical series which is documented by the following genera: *Emilites*—*Crimites*—*Neocrimites*—*Adrianites*. He expressed doubt as to the proper taxonomic position of the other genera that have been referred to the same family, viz. *Epadrianites*, *Pseudagathiceras*, *Doryceras*, *Sizilites*, and *Palermites*. In this place there is no need to enter into a discussion of any of these genera, because the Australian species described in this paper is unrelated to all of them.

Ruzhencev's phylogenetical series of the Adrianitidae, s. str., however, deserves closer examination from the Australian point of view. It begins with *Emilites* in the Upper Carboniferous of North America and the Urals. The external suture of this genus has two fully developed pairs of lateral lobes, in addition to numerous indistinct umbilical lobes, and a fully developed ventral lobe subdivided by a ventral saddle. As Miller and Furnish, and Ruzhencev have shown, new lobes during the ontogenetical

development of *Adrianites* originate in the umbilical region and migrate towards the external as well as the internal side. In conformity with ontogenetical observation is the phylogenetical evidence; in the Sakmarian there appear species which have four pairs of external lobes. Such species are almost indistinguishable from species of *Agathiceras* and have in the past often been confused with them. In 1937 Toumansky established the genus *Crimites* for species of the Adrianitidae which had reached this or an only slightly more advanced stage. The genotype, *Crimites pamiricus*, possesses four external lobes (Fig. 1), three on the flanks and one on the umbilical wall, but

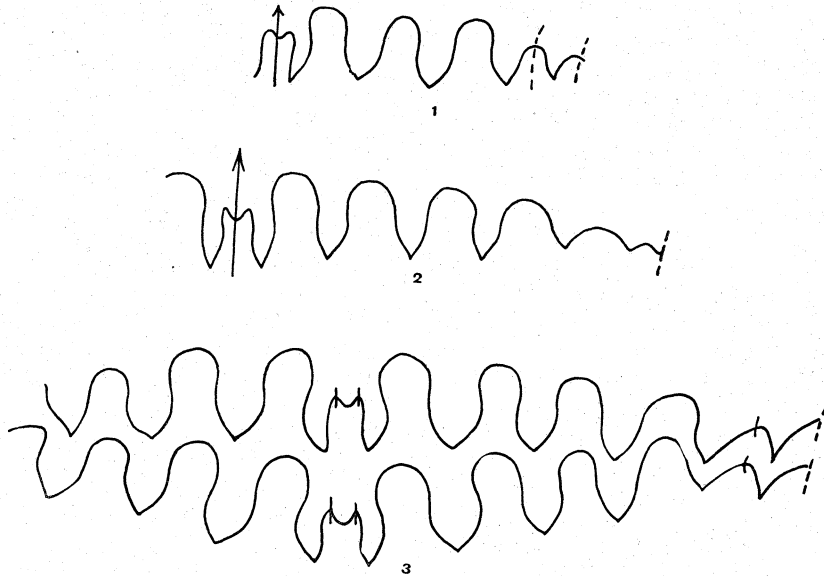


Fig. 1.—External suture of *Crimites pamiricus* Toumansky. (Adapted from Toumansky, 1937a, p. 377.)  $\times 1.7$ .

Fig. 2.—External suture of *Neocrimites fredericksi* (Emilianzev). (Adapted from Ruzhencev, 1940, p. 838.)  $\times 1.7$ .

Fig. 3.—External sutures of *Adrianites (Neocrimites) meridionalis*, n. sp. Holotype.  $\times 4$ .

Toumansky included in the genus a number of species from Timor and Sicily which have four lateral lobes in the external suture. This generic name was later restricted by Ruzhencev (1940) to species resembling the genotype in the number of lobes; for forms with an additional lateral lobe he introduced the generic name *Neocrimites*, with *Adrianites fredericksi* Emilianzev as genotype (Fig. 2). Whereas species of the *Crimites* stage as restricted by Ruzhencev have apparently not been found outside Russia, the *Neocrimites* stage is also found outside Russia in Timor, Sicily and in Texas. According to Maximova and Ruzhencev (1940), "*Crimites*" appears in the Sakmarian and ranges upward into the Artinskian, whereas "*Neocrimites*" does not make its appearance before the Artinskian. It is rather typical of Artinskian time, but apparently survived until later, if the occurrence in the Sosio beds of Sicily is genuine. However, species with five external lateral lobes also appeared in the Artinskian and it seems that four- and five-lobed species coexisted throughout Artinskian and the following Sosio time, but that on the whole they were more characteristic of the earlier period. The Sosio beds and their equivalents elsewhere characteristically contain species with more than five external lobes. This indeed is the group of species for which the genus *Adrianites* was originally established by Gemmellaro and to which also belong such extra-Sicilian species as *Adrianites adamsi* Miller and Furnish from the Word formation of Texas and *Adrianites dunbari* from the *Timorites* zone of Coahuila in Mexico. The genus was later made to include species with a more primitive suture, but already Schindewolf, in his first treatment of the Adrianitidae

(1931, p. 200), suspected that such species might have to be separated as an independent generic group. Although on the other hand Miller and Furnish's warning that the genus *Adrianites* includes many variable elements which apparently are connected by transition stages should not go unheeded, it seems to be advisable for the present to preserve as subgenera some of the names that have been proposed for distinct phylogenetical stages. *Emilites* will undoubtedly constitute a distinct genus from which *Adrianites* arose in three distinct stages which may be known as three subgenera: *Adrianites* (*Crimites*)—*Adrianites* (*Neocrimites*)—*Adrianites* (*Adrianites*).

The suture of *Adrianites meridionalis* from the Upper Marine series of New South Wales corresponds most closely to the *Neocrimites* stage of the adrianitid suture and from the uncomplicated nature of the umbilical portion of the suture of the Australian species it seems possible to conclude that it is contemporaneous with earlier rather than with later species of this stage. The evidence of the species, while definitely indicating a "Middle Permian" age of the strata, is perhaps slightly more in favour of an "early Middle Permian", Artinskian, than of a Kungurian age.

#### Description of the Species.

Genus *Adrianites* Gemmellaro.

Subgenus *Neocrimites* Ruzhencev.

*Adrianites* (*Neocrimites*) *meridionalis*, n. sp.

(Plate xi, figs. 1-4.)

*Goniatites* (*Prolecanites*?) *micromphalus*, Morris, R. Etheridge, Jr., Rec. Geol. Surv. N.S.W., iv, 1894, pp. 36-37, pl. vii, figs. 9, 12, 14 (not 10, 11, 13).

The holotype and only known specimen seems to be septate throughout so that no portion of the living chamber is preserved. The shell is involute, moderately compressed, subdiscoidal, with evenly rounded venter and only slightly converging sides. The following measurements have been taken from the specimen:

Greatest diameter .....	31.1 mm.
Greatest width .....	19.7 mm.
Greatest height of last whorl .....	15.5 mm.
Height of last whorl above venter of preceding whorl ...	about 8.0 mm.
Width of umbilicus .....	3.6 mm.

The surface of the test which is preserved in some places bears transverse lirae. Near the adoral end of the last whorl there are about 15 of these lirae in a distance of 5 mm. The lirae are slightly sinuous and form two shallow lateral lobes and saddles and an equally shallow ventral lobe. They are crossed by still finer longitudinal lirae so that the surface on close examination appears to be reticulate. The spacing of the longitudinal lirae is about the same as that of the transverse ones.

Only the external portion of the sutures has been studied (Fig. 3). This consists of the ventral lobe which is subdivided by the ventral saddle, four pairs of lateral lobes, one pair of umbilical lobes, and four pairs of lateral saddles, in addition to one pair of umbilical saddles. The saddle subdividing the ventral lobe is approximately one-half as high as the adjacent first lateral saddle. The two prongs of the ventral lobe are narrow and slightly curved ventrad. Each prong is only about half as wide as the adjacent first lateral lobe. All the lateral lobes are obtusely pointed. They decrease gradually in size from the ventro-lateral sides to the umbilicus. The first two lateral lobes are somewhat tongue-shaped and slightly constricted in the adoral part, the third lateral lobe is unconstricted, and the fourth is wide open adorally. All the saddles are rather narrowly rounded. The general course of the sutures is directly transverse to the long axis of the conch.

*Occurrence*: Maitland Colliery Company's shaft, near Farley, New South Wales. Collected at a horizon a few hundred feet above the Greta Coal Seam.

*Horizon*: Branxton Stage of the Upper Marine Series.

*Holotype*: F 35732, Australian Museum, Sydney.

*Remarks:* *Adrianites meridionalis* is remarkable on account of its compressed whorl section. The only comparable species in this respect is *Adrianites discoidalis* (Haniel) from the Basleo beds of Timor (Haniel, 1915, pl. 5, figs. 2a-c), but that species has a more advanced suture with five external lateral lobes and was included in *Adrianites* s. str. by Ruzhencev (1940, p. 839). The only other species with which *Adrianites meridionalis* can be compared is *Adrianites newelli* Miller and Furnish from the Leonard formation (Artinskian) of the Glass Mountains, Texas (Miller and Furnish, 1940, p. 117). This species has an external suture which closely resembles that of the Australian species, and the degree of involution is also very similar in both forms. The Texas species is, however, somewhat broader and the longitudinal ornamentation of its conch is much more prominent.

#### References.

- Chapman, F., 1904.—On a collection of Upper Palaeozoic and Mesozoic fossils from West Australia and from Queensland, in the National Museum, Melbourne. *Proc. Roy. Soc. Victoria*, Vol. 16 (n.s.), Pt. ii, pp. 307-334, pls. 27-30.
- , 1924.—*The Wade Collection of Fossils*. By Authority: Melbourne. 10 pp.
- Dana, J. D., 1847.—Description of fossil shells of the Exploring Expedition under the command of Charles Wilkes, U.S.N., obtained in Australia from the lower layers of the Coal Formation in Illawarra, etc. *Amer. Jour. Sci.*, Vol. iv, p. 151.
- , 1849.—*Geology of the United States Exploring Expedition during the years 1838-1842, under the command of Charles Wilkes, U.S.N.*, New York, p. 708, pl. 10, fig. 6.
- David, T. W. E., 1907.—The Geology of the Hunter River Coal Measures, New South Wales. *Mem. Geol. Surv. New South Wales, Geol.*, No. 4, 372 pp., 43 pls.
- and Sussmilch, C. A., 1931.—Upper Palaeozoic glaciations of Australia. *Bull. Geol. Soc. Amer.*, Vol. 42, pp. 481-522.
- Etheridge, R., Jr., 1878.—*A Catalogue of Australian Fossils*. 232 pp., Cambridge University Press.
- , 1880.—Report on a collection of fossils from the Bowen River Coal Field and the limestone of the Fanning River, Queensland. *Proc. Roy. Phys. Soc. Edinburgh*, Vol. 5, pp. 263-328, pls. 7-17.
- and Jack, R. L., 1892.—*The Geology and Palaeontology of Queensland and New Guinea*, 768 pp., 68 pls. (Palaeontology by R. Etheridge).
- , 1894.—Palaeontology Novae Cambriae Meridionalis: Occasional descriptions of New South Wales fossils, No. 1. *Rec. Geol. Surv. New South Wales*, Vol. iv, Pt. 1, pp. 32-37, pl. vii.
- Foord, A. H., 1890.—Description of fossils from the Kimberley District, Western Australia. *Geol. Mag.*, Dec. iii, Vol. 7, pp. 2-20.
- and Crick, G. C., 1897.—*Catalogue of the fossil Cephalopoda in the British Museum (Natural History)*. Part iii. xxxiii, 303 pp.
- Frech, F., 1896. Review of R. Etheridge, Palaeontologia Novae Cambriae Meridionalis, *Rec. Geol. Surv. New South Wales*, Vol. iv, 1894. *Neues Jahrb. f. Min., Geol., Palaeont.*, p. 501.
- Girty, G. H., 1908.—The Guadalupian Fauna. *U.S. Geol. Surv.*, Prof. Pap. 58, 651 pp., 31 pls.
- Haniel, C., 1915.—Die Cephalopoden der Dyas von Timor. *Paläont. v. Timor*, Lief. iii, 153 pp., 11 pls.
- Haug, E., 1898.—Études sur les Goniatites. *Mém. Soc. Géol. France*, Vol. 7, 112 pp., 1 pl.
- Koninck, L. G. de, 1877.—*Recherches sur les fossils paléozoïques de la Nouvelle-Galles du Sud (Australie)*, Pt. 3, p. 339, t. 24, f. 5
- , 1898.—Descriptions of the Palaeozoic fossils of New South Wales (Australia). *Mem. Geol. Surv. New South Wales, Palaeont.*, No. 6, p. 269, pl. 25, f. 5.
- McCoy, F., 1847.—On the fossil botany and zoology of the rocks associated with the coal of Australia. *Ann. Mag. Nat. Hist.*, Vol. 20, p. 308.
- Maximova, S. V., and Ruzhencev, V. E., 1940.—On the distribution of ammonites in the Lower Permian of the Urals and the resulting stratigraphic conclusions. *C.R. (Doklady) Acad. Sci. U.R.S.S.*, Vol. 28, pp. 160-163.
- Miller, A. K., and Furnish, W. M., 1939.—The Late Paleozoic families Adrianitidae and Agathiceratidae. *Palaeont. Zeitschr.*, Vol. 21, pp. 297-303.
- , 1940.—Permian ammonoids of the Guadalupe Mountain Region and adjacent areas. *Geol. Soc. Amer., Spec. Pap.*, No. 26, 242 pp. 44 pls.
- Morris, J., 1845.—Fossil Fauna. Mollusca. In P. E. de Strzelecki, *Physical Description of New South Wales and Van Diemen's Land*. London. Pp. 270-291, pls. 10-18.
- Plummer, F. B., and Scott, G., 1937.—Upper Paleozoic ammonites in Texas. *Univ. Texas Bull.*, No. 3701, pp. 1-516, 41 pls.
- Reed, F. R. C., 1930.—A new Permo-Carboniferous fauna from Brazil. *Mon. Serv. Geol. Miner. Brasil*, Vol. 10, 45 pp. 8 pls.
- , 1932.—New fossils from the Agglomeratic Slate of Kashmir. *Palaeont. Indica*, N.S., Vol. xx, Mem. 1, 79 pp. 12 pls.



- Reid, J. H., 1929.—Geology of the Bowen River Coal Field. *Queensland Geol. Surv. Publ. No. 276*, 107 pp.
- Römer, F. A., 1850.—Beiträge zur geologischen Kenntniss des nordwestlichen Harzgebirges. *Palaeontographica*, Vol. 3, pp. 1-67, pls. 1-10.
- Ruzhencev, V. E., 1939.—The significance of the ontogenesis for the natural classification of ammonites. *Bull. Acad. Sci. U.R.S.S., 1é ser. biol.*, pp. 13-22.
- , 1940.—On the family Adrianitidae. *C.R. (Doklady) Acad. Sci. U.R.S.S.*, Vol. 26, pp. 837-840.
- Schindewolf, O. H., 1931.—Ueber den Ammoniten-Sipho. *Sitzungsber. Preuss. Geol. Landesanst.*, Heft 6, pp. 197-209.
- Schuchert, Ch., 1928.—Review of the Late Paleozoic formations and faunas, with special reference to the ice-age of Middle Permian time. *Bull. Geol. Soc. Amer.*, Vol. 39, pp. 769-886.
- Teichert, C., 1939.—Review of Western Australian Upper Palaeozoic: Correlation, Palaeogeography, Tectonics. *Rep. 24th Meet. Austral. New Zeal. Ass. Adv. Sc.*, pp. 92-93.
- , 1941.—Upper Palaeozoic of Western Australia: Correlation and Palaeogeography. *Bull. Amer. Ass. Petrol. Geol.*, Vol. 25, pp. 371-415.
- , 1942.—Permian ammonoids from Western Australia. *Jour. Paleontol.*, Vol. 16, pp. 221-232, pl. 35.
- Thomas, H. D., 1929.—The Late Palaeozoic glaciation. *Nature*, cxxiii, p. 947.
- Toumansky, O., 1937a.—About the representatives of the family Adrianitidae Schindewolf. *Bull. Soc. Nat. Moscou, Sér. Géol.*, Vol. 15, pp. 375-378.
- , 1937b.—Sur des représentants d'un nouveau genre permien Crimites. *Ann. Soc. Paléont. Russie*, Vol. 11, pp. 146-147.
- Waagen, L., 1880.—Salt-Range Fossils. Vol. 1. Productus Limestone Fossils, Pt. ii, pp. 73-183. *Palaeont. Indica.*, Ser. xiii.
- Whitehouse, F. W., 1926.—Notes on the Upper Palaeozoic marine horizons in eastern and western Australia. *Rep. Austral. Ass. Ad. Sci. (Perth Meet.)*, Vol. 18, pp. 281-283.

EXPLANATION OF PLATE XI.

*Adrianites (Neocrimites) meridionalis* Teichert and Fletcher, n. sp.

Fig. 1.—Lateral view, × 2.

Figs. 2 and 3.—Two ventral aspects, × 2.

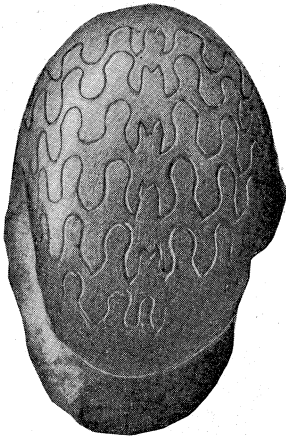
Fig. 4.—Portion of surface of the conch enlarged, × 3.



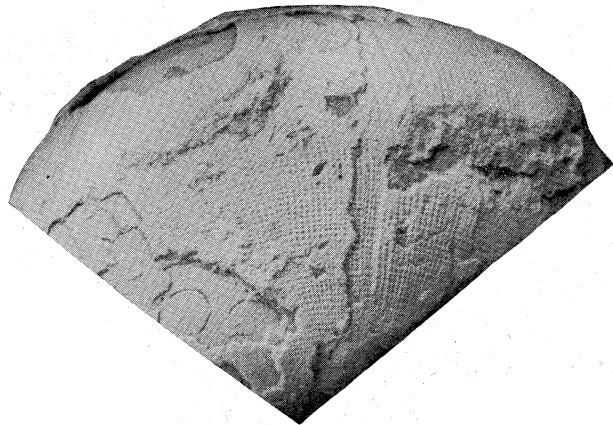
1



2



3



4