

## SOME GONIATITES FROM WESTPHALIAN D (UPPER MOSCOVIAN) STRATA IN NORTHERN PALENCIA, SPAIN

C. H. T. WAGNER-GENTIS\*

### ABSTRACT

Five goniatites are described from Westphalian D strata in northern Palencia, N. W. Spain. These are: *Eoparalegoceras inflatum* DELÉPINE, *Glaphyrites micromphalus* sp. nov., *G. angulatus* (GIRTY) PLUMMER & SCOTT, *Aktubites trifidus* RUZHENCEV, *Boesites eotexanus* sp. nov. Previous records of the same and comparable species are from Westphalian C rocks in North Africa, Upper Pennsylvanian strata in North America and Upper Moscovian deposits in the South Urals, U. S. S. R. This is the first record of these species in western Europe.

### RESUMEN

Se describen cinco especies de goniátidos del Westfaliense D de Palencia, noroeste de España. Son *Eoparalegoceras inflatum* DELÉPINE, *Glaphyrites micromphalus* sp. nov., *G. angulatus* (GIRTY) PLUMMER & SCOTT, *Aktubites trifidus* RUZHENCEV, *Boesites eotexanus* sp. nov. Estas especies y elementos comparables fueron ya reconocidos del Westfaliense C de África del Norte, del Pennsylvaniense Superior de América del Norte y del Moscoviense alto de los Urales Meridionales en la Unión Soviética. Están señaladas ahora por primera vez de Europa Occidental.

### INTRODUCTION

Upper Westphalian goniatites are rare in Northwest Spain. DELÉPINE (1943) figured and described *Anthracoceras cambriense* BISAT and *Homoceratoides kitchini* BISAT from lower Westphalian C deposits at Lieres, Asturias. VAN GINKEL (1965, p. 209) mentioned that KULLMANN identified a specimen of *Bisatoceras* (*Phanoceras*) cf. *williamsi* = «*Pseudoparalegoceras kesslerense* (MATHER)», i. e. a late Morrowan goniatite, from a locality in limestone of Podolskian age. This occurrence was quoted as near Las Brañas, in the province of León. Finally, VAN LOON (1971) figured cf. *Politoceras politum* (SHUMARD) and *Pseudoparalegoceras* sp. (det. KULLMANN) from the

---

\* «Mayfield», Cross Lane, Calver, via Sheffield S30 1XS, England.

Pando Formation of Westphalian C age in north-eastern León (near Prioro). These three occurrences represent the sum total of published records of Upper Westphalian goniatites in the Cordillera Cantábrica. Three further occurrences are now reported from Westphalian D strata in the northernmost part of the province of Palencia.

In 1953, Mr. ISMET, then a student at the University of Leiden, found two well preserved goniatites in ironstone nodules near Peña Tremaya in northern Palencia. The locality was given only in general terms but it seems likely that these specimens were obtained from bands of ironstone nodules which occur in mudstones near the southern bank of the Río Pisuegra in the Redondo Valley. The mudstones strike at approximate right angles to the riverbank and seem to form part of the same succession as an important limestone formation in the mountain of Peña Tremaya. No independent dating of the mudstones is available, but the Peña Tremaya Limestone is given as Westphalian D by VAN GINKEL (1960, fig. 4). Since his dating is based on fusulinid faunas, this should probably be read as Upper Moscovian\*. A visit by the present writer to the locality indicated by ISMET produced several large orthoconic nautiloids, but no further goniatite remains. The type of preservation of the orthocones closely matches that of the goniatites found by Mr. ISMET, and there is little doubt that the same locality was visited. The goniatites are here described as *Eoparalegoceras inflatum* DELÉPINE, a species recorded previously from Upper Westphalian strata in North Africa (DELÉPINE 1951).

More recently, in the summer of 1969, Dr. W. J. E. VAN DE GRAAFF (University of Leiden) took the writer to a locality some 2,750 metres east of Peña Abismo, at 4,300 m north-northeast of the village of Santa María de Redondo, where specimens of *Glaphyrites* and *Aktubites* were obtained from limestones which are equivalent to the basal beds of the Abismo Limestone. These specimens of the VAN DE GRAAFF Collection are described here as *Glaphyrites angulatus* (GIRTY) and *Aktubites trifidus* RUZHENCEV. Another outcrop of these basal beds, due west of Peña Abismo, and 3,750 m north of the village of San Juan de Redondo, yielded another goniatite to VAN DE GRAAFF, viz. *Glaphyrites micromphalus* sp. nov., as described in the present paper. The following description of the strata involved is provided by Dr. W. J. E. VAN DE GRAAFF (*in litt.* 15. VI. 1970): «The basal part of the Abismo Limestone Member and of its correlatives consists of irregularly bedded mudstones, wackestones and sometimes packstones (terminology after DUNHAM 1962), which have often a brecciated appearance. This may partly be due to the presence of originally irregular clasts of diverse origin, but intensive pressure solution has also occurred. These limestones are commonly very fossiliferous, especially if compared to the surrounding strata. Brachiopods, crinoids, echinoids, solitary rugose corals, gastropods, trilobites, sphinctozoan and other sponges, nautiloids, goniatites, radiolarians, algae and algal structures (oncolites) have been found. The stratigraphic position of the goniatite-bearing horizon can be established fairly accurately by

---

\* Note added when this paper was in press: VAN DE GRAAFF (1971)<sup>b</sup>, p. 193) recorded the presence of foraminifera belonging to VAN GINKEL's *Fusulinella* B<sub>1</sub> subzone in the limestone of Peña Tremaya. This may be read as Podolskian (compare VAN GINKEL 1965).

means of the data on fusulinid foraminifera and algae presented by VAN GINKEL (1965) and RÁCZ (1966). According to these data the Abismo Limestone belongs to the *Fusulinella* B<sub>2</sub> subzone and to the algal zone IV b. Samples collected by the writer confirm this. Field evidence places the Abismo Limestone below the Leonian disconformity in northern Palencia.» The *Fusulinella* B<sub>2</sub> subzone of VAN GINKEL straddles the upper Podolskian and the lower Myachkovian of the Moscovian. The subzone falls within Westphalian D in northern Palencia.

A third occurrence of Upper Westphalian goniatites in northern Palencia is recorded by WAGNER & VARKER (1971) in the immediately post-Leonian succession west of the village of Casavegas. A section measured along the Casavegas-Caloca road shows the Leonian disconformity at ca 1 km north-west of Casavegas. A basal conglomerate is followed here by a rhythmic succession of siltstones, mudstones and calcareous mudstones with faunal elements consisting mainly of lamellibranchs, orthoconic nautiloids, squashed goniatites, brachiopods, crinoids, trilobites, and bryozoa. At 20.50 m above the disconformity a single fragment of an undistorted goniatite with a well preserved suture was found by Dr. D. G. JONES (University of London). This specimen is described here as *Boesites cotexanus* sp. nov., a probable precursor of *Boesites texanus* (BÖSE) from the Virgilian of Texas. The sequence at Casavegas has been dated on fossil plants as upper Westphalian D. It also falls within the Myachkovian.

**Acknowledgements.**—The writer is greatly indebted to Mr. ISMET and to Drs. W. J. E. VAN DE GRAAFF, D. G. JONES, P. G. MORRIS and R. H. WAGNER for the provision of material. Dr. VAN DE GRAAFF has very kindly provided information on the localities in the Redondo area, and the writer is particularly grateful for permission to quote from unpublished information on the Abismo Limestone. Mr. M. VAN VOSKUYLEN (Geologisch Bureau, Heerlen), Mr. B. Pigott (University of Sheffield) and Dr. R. H. WAGNER (Sheffield) are thanked for the photographs illustrating this paper.

## SYSTEMATIC DESCRIPTIONS

Family Gastrioceratidae ARTHABER 1911

Subfamily Pseudoparalegoceratinae RUZHENCEV 1957

Genus *Pseudoparalegoceras* MILLER 1934

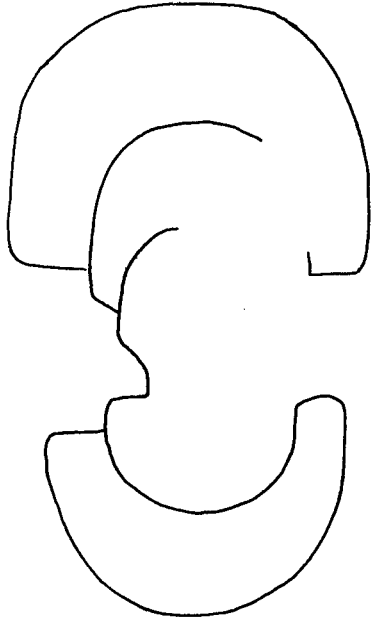
Subgenus *Eoparalegoceras* DELÉPINE 1939

*Eoparalegoceras inflatum* DELÉPINE

Pl. 1, figs. 1-2; text-figs. 1-3

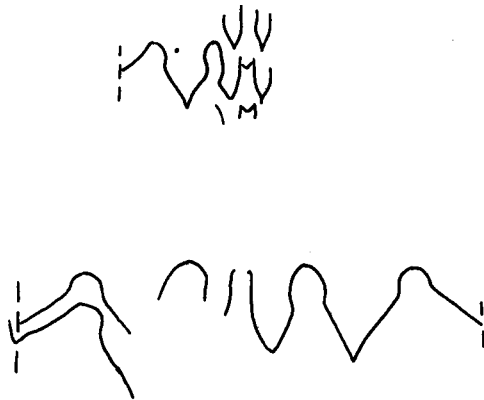
1951 *Eoparalegoceras inflatum* DELÉPINE: *Ann. Soc. géol. Nord*, LXX (1950), pp. 179-182, Pl. VI, figs. 1-6.

**Material.**—Two well preserved solid specimens in sideritic ironstone, showing sutures as well as the ornament.



Text-fig. 1.—*Eoparalegoceras inflatum* DELÉPINE, cross section,  $\times 1$ . RGM-St. 167502.

D e s c r i p t i o n .—Shell thick, discoid; whorl wider than high, with a broadly rounded venter and rounded sides; greatest thickness at umbilical edge; umbilical wall rather wide, nearly flat and almost perpendicular to the lateral sides; umbilicus 30 % of diameter.



Text-fig. 2.—*Eoparalegoceras inflatum* DELÉPINE, suture,  $\times 1$  (penultimate whorl above; last whorl below). RGM-St. 167501.

Ornament consisting of strong, single, asymmetrical transverse ribs which form a shallow sinus on the venter, swing well back on the ventro-lateral sides and, while becoming gradually finer, cross the lateral sides nearly straight but with a slight forward tendency towards the umbilicus.

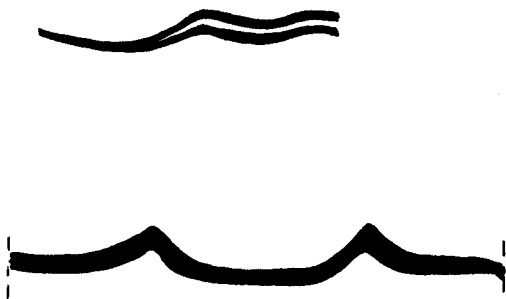
Constrictions wide, following the ornament on the lateral and ventral sides, and forming a sharp point forwards on the ventro-lateral sides.

Suture showing a bifid ventral lobe with ventral saddle reaching the same height as the top of the rounded ventro-lateral saddles at a whorl height of 15 mm; also possessing a short, broad lateral lobe with a hastate prong, a rounded lateral saddle and a pointed lobe on the umbilical edge (see text-fig. 2).

Diameter	Width	Umbilicus	Height	Opening
Pl. 1, fig. 2 : 80	47	24	30	17
Pl. 1, fig. 1 : 57	32	16.5	25	11

**Comparisons.**—The specimens in hand are similar in shape to *Pseudoparalegoceras williamsi* MILLER & DOWNS (which has been placed in synonymy with *Phanero-ceras kesslerense* MATHER by GORDON 1964), but are more globular. The suture differs in the position of the umbilical lobe which is on the umbilical wall in *Phanero-ceras kesslerense* and on the umbilical edge in *Eoparalegoceras inflatum*.

*Eoparalegoceras inflatum* is more globoid, winds more rapidly and has a smaller umbilicus than the discoidal *Eoparalegoceras clariondi*. They have the same suture.



Text-fig. 3.—*Eoparalegoceras inflatum* DELÉPINE, transverse ornament (above) and constriction (below),  $\times 1$ . RGM-St. 167501.

**Distribution.**—North Africa: Colomb-Béchar region in the Sud-Oranais (Algeria), at Sfaia; the horizon corresponds probably to Westphalian C (DELÉPINE 1951). *E. inflatum* occurs together with *Eoparalegoceras clariondi* DELÉPINE, *Gastrioceras kenadsae* DELÉPINE and *Anthracoceras aegiranum* SCHMIDT;—N. W. Spain: north of Peña Tremaya, on the southern bank of the Río Pisuerga, Redondo Valley, northern Palencia, in rocks of (probably lower) Westphalian D age (also Podolskian).

Family Homoceratidae SPATH  
 Subfamily Cravenoceratinae RUZHENCEV  
 Genus *Glaphyrites* RUZHENCEV  
*Glaphyrites micromphalus* sp. nov.

Pl. 2, figs. 5a, b; text-fig. 4

**Material.**—One specimen (holotype) preserved as a solid in dark grey, fetid limestone (Peña Abismo). It shows the sutures as well as the smooth shell.

**Repository of holotype.**—Rijksmuseum van Geologie en Mineralogie, Leiden, Cat. No. RGM-St. 167504 (Coll. W. J. E. VAN DE GRAAFF).

**Diagnosis.**—Shell globose and involute. Flanks and venter rounded. Umbilicus small; umbilical wall perpendicular to side and umbilical shoulder abrupt. Whorl wider than high. Shell smooth with faint transverse undulations. Constrictions shallow and nearly straight. Suture glaphyritic with high ventral saddle at a small diameter.

**Description.**—Shell is an involute sphaerocone with lateral and ventral sides widely rounded and passing into each other smoothly. Dimensions (in mm):

Diameter	Width	Height	Umbilicus
19	14	10	3

The umbilicus is very small, only  $1/6$  of the diameter. Umbilical wall perpendicular to lateral side. Whorl height increases rapidly from 5 mm to 10 mm in one volution. The whorl is wider than it is high; whorl width 11 mm at 5 mm height, and 14 mm wide at 10 mm height after half a volution — increase in height more rapid than the increase in width.

Ornamentation consists of faint transverse undulations; otherwise, the shell is smooth. The one constriction observed passes straight over the sides, is slightly pointed forwards on the latero-ventral sides, and crosses straight again over the venter.



*Text-fig. 4.*—*Glaphyrites micromphalus* sp. nov., suture ( $\times 3$ ) and cross section ( $\times 1$ ). RGM-St. 167504.

Suture: high ventral saddle with parallel sides; ventral lobes with parallel sides and base ending in a small v-shaped point; ventro-lateral saddles asymmetrically rounded; lateral lobes fairly wide with large v-shaped points, the sides of which are

slightly concave externally; lateral saddles wide and rounded, and ending in a small umbilical lobe on the umbilical wall, close to the umbilical edge. The sutures are close together (11 sutures in the last half whorl preserved).

Comparisons.—*G. micromphalus* differs from all other *Glaphyrites* by its extremely small umbilicus.

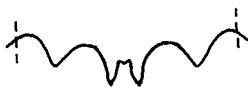
Occurrence.—N. W. Spain: basal beds of Abismo Limestone at Peña Abismo, 3,750 m north of San Juan de Redondo (northern Palencia); either late Podolskian or lower Myachkovian in age (also Westphalian D).

*Glaphyrites angulatus* (GIRTY) PLUMMER & SCOTT

Pl. 1, figs. 3a - c; text-fig. 5

- 1937 *Glaphyrites angulatus* (GIRTY) - PLUMMER & SCOTT: *Bull. Univ. Texas*, 3701, III-I, pp. 269-271, Pl. 16, figs. 1-9 (see this paper for earlier synonymy).  
 1950 *Glaphyrites angulatus* (GIRTY) - RUZHENCEV: *Trudy Palaeont. Inst., Akad. Nauk SSSR*, XXIX, pp. 152-154, text-fig. 61, Tab. X, figs. 6-7.  
 1962 *Eoasianites angulatus* (GIRTY) - UNKLESBAY: *Bull. Oklahoma Geol. Survey*, 96, pp. 76-79, text-fig. 7, Pl. 12, figs. 7-11.

Material.—A well preserved young specimen in dark fetid limestone (Peña Abismo), showing the living chamber, the ultimate sutures, and a faintly developed ornament.



Text-fig. 5.—*Glaphyrites angulatus* (GIRTY) PLUMMER & SCOTT, suture,  $\times 3$ . RGM-St. 167503.

Description.—Shell serpenticone with a very wide, rounded venter and an acute umbilical edge. Umbilical wall straight and at a narrow angle to the lateral side. Dimensions (in mm):

Diameter	Width	Height of whorl	Opening	Umbilicus
14	11	4	3	10

Ornamentation consists of faint, slightly sinuous transverse lirae and a little more distinct transverse grooves at every third or fourth lira. One longitudinal lira follows the mid-venter. Constrictions follow the same course as the transverse lirae. They are clearly developed near the umbilical edge and hardly visible at the mid-venter.

Suture with two narrow, rounded ventral lobes and a wide median saddle reaching halfway down the lobes; wide, rounded saddles; and v-shaped lobes which continue into rounded saddles near the umbilical edge.

**Remarks.**—The suture is exactly the same as that given by RUZHENCEV (1950, p. 153, text-fig. 61) for a shell at diameter 11 mm. showing an early stage of ontogenetic development. The specimen in hand was collected with the living chamber preserved for a little more than a volution. It evidently represents a young individual.

**Distribution.**—North America: Oklahoma, from Calvin Formation (Desmoinesian) to Vamoosa Formation (basal Virgilian) (UNKLESBAY 1962, Table 2), a range which may be interpreted as Westphalian D to Stephanian (cf. WANLESS 1969, Table 1); North-Central Texas, *Paraschistoceras reticulatum* Zone in the Graford Formation, Upper Pennsylvanian (upper Missourian, according to MOORE *et al.* 1944); —Russia: South Urals, Myachkovian to Orenburgian (RUZHENCEV 1950); —N. W. Spain: Northern Palencia, at Peña Abismo, north of San Juan de Redondo, in the Abismo Limestone of late Podolskian or early Myachkovian (Westphalian D) age.

Family Shumarditidae PLUMMER & SCOTT 1937

Genus *Aktubites* RUZHENCEV 1955

*Aktubites trifidus* RUZHENCEV

Pl. 2, figs. 6a-b; text-fig. 6

1955 *Aktubites trifidus* RUZHENCEV: *Dokl. Akad. Nauk*, 103, No. 6, pp. 1109-1110, figs. 1-2.

**Material.**—One, ventrally compressed specimen preserved in dark grey fetid limestone (Peña Abismo). It shows the suture, but lacks the ornamentation.

**Description.**—Although only half the specimen is visible, it is apparently evolute, with a large umbilicus, a very wide and rounded, nearly flat venter, and hardly any lateral sides. The opening is extremely low, a feature which has been emphasized by the ventral compression. Diameter *ca.* 20 mm. Width 17 mm. No ornament has been preserved.

Suture composed of a low ventral saddle with parallel sides; asymmetrical ventral lobes (lateral side inflated and ventral side straight); asymmetrical, rounded saddles, constricted at the base and nearly twice as high as the ventral saddle; a trifid lobe, constricted at the top, with the central secondary lobe protruding and narrowly pointed, whilst the flanking secondary lobes are hooked towards the centre; and a wide, rounded saddle.



*Text-fig. 6.*—*Aktubites trifidus* RUZHENCEV, suture,  $\times 3$ . RGM-St. 167506.

**Remarks.**—*Aktubites* is regarded as the forerunner of *Shumardites*, which shows the development of three lateral lobes where the characteristic trifid lateral



lobe occurs in the former. *Aktubites trifidus* is drawn at the base of a lineage which leads via *Aktubites* (*Postaktubites*) *cuyleri* (PLUMMER & SCOTT) to *Shumardites confessus* RUZHENCEV, the evolutionary changes taking place from Upper Moscovian to Orenburgian (RUZHENCEV 1955, fig. 2).

**Distribution.**—U. S. S. R.: South Urals, Aktubinsk Province, found together with *Pseudoparalegoceras tzvetayevae* RUZHENCEV in a limestone boulder of Moscovian age (RUZHENCEV 1955); —N. W. Spain: east of Peña Abismo, Redondo area of northern Palencia, in the Peña Abismo Limestone of late Podolskian or early Myachkovian age (Westphalian D).

Family Daraelitidae TCHERNOV 1907  
Genus *Boesites* MILLER & FURNISH 1940

*Boesites cotexanus* sp. nov.

Pls 1-2, figs. 4a, b; text-fig. 7

**Material.**—A fragment of two whorls showing the suture. This holotype has been preserved as a solid, probably in clay-ironstone, within a bluish-grey mudstone which may be slightly calcareous.

**Repository of holotype.**—Rijksmuseum van Geologie en Mineralogie, Leiden Cat. No. RGM-St. 167605 (Coll. JONES/MORRIS/WAGNER loc. 1890).

**Diagnosis.**—Conch discoidal with large umbilicus. Venter rounded, with the greatest width near the venter; lateral sides flat and parallel; latero-umbilical sides converging towards the umbilicus; umbilical wall perpendicular to the side of preceding whorl. Shell smooth. Suture with trifid ventral lobe flanked by two rounded saddles on the ventral side, wide serrated lobes on the ventro-lateral sides, and four lateral lobes on each lateral side (the latter are rounded and bent towards the umbilicus).



Text-fig. 7.—*Boesites cotexanus* sp. nov., cross section of two consecutive whorls ( $\times 3$ ), and suture ( $\times 6$ ). RGM-St. 167505.

**Description.**—Approximately one fourth of two consecutive whorls has been preserved, but it appears that the shell had a discoid shape, with a fairly large umbilicus. Dimensions: Height of outer whorl 7 mm; Width 5.5 mm; Opening 5 mm; Height of inner whorl 2.5 mm, corresponding to a width of 2.5 mm. Increase in whorl height is more rapid than the increase in width. Shell smooth.

Suture: A trifid ventral lobe which is constricted at the top and which passes into rounded ventral saddles, constricted at the base. The ventro-lateral sides show wide serrated lobes which are followed on the lateral sides by a series of four rounded lateral lobes, constricted at the top, and inclined towards the umbilicus.

C o m p a r i s o n.—The specimen in hand shows the same dimensions and shape as *Boesites texanus* (BÖSE) MILLER & FURNISH, but differs in possessing 4 lateral lobes instead of 5 at the same height of whorl. It therefore appears that *B. eotexanus* is less highly evolved than *B. texanus* which also occurs in younger strata. The name of the new species has been selected accordingly.

O c c u r r e n c e.—N. W. Spain: at 20.50 m above the Leonian disconformity in the Casavegas/Caloca road section near Casavegas, La Pernía, northern Palencia, in strata of upper Westphalian D age (WAGNER & VARKER 1971) *N. B.* The comparable species *B. texanus* is recorded from the *Uddenites serratus* Zone of the late Pennsylvanian (Virgilian) in Texas (PLUMMER & SCOTT 1937).

#### REFERENCES

- DELÉPINE, G. (1939).—Goniatites nouvelles du Carbonifère des Confins algéro-marocains du Sud. *Ann. Soc. géol. Nord*, LXIV, pp. 28-38, pl. I.
- DELÉPINE, G. (1943).—Les faunes marines du Carbonifère des Asturies (Espagne). *Mém. Acad. Sci. Inst. France*, 66, pp. 1-122, pls I-VI.
- DELÉPINE, G. (1951).—Description d'une goniatite nouvelle du Westphalien du Sud-Oranais, *Eoparalegoceras inflatum*. *Ann. Soc. géol. Nord*, LXX (1950), pp. 179-184, pl. VI.
- DUNHAM, R. J. (1962).—Classification of carbonate rocks according to depositional texture. In HAM, E. D. (ed.) «Classification of Carbonate rocks». *Amer. Ass. Petr. Geol., Mem.* 1, pp. 108-121.
- GINKEL, A. C. VAN (1960).—The Casavegas section and its fusulinid fauna. *Leidse Geol. Meded.*, 24, 2, pp. 705-720, text-figs 1-5.
- GINKEL, A. C. VAN (1965).—Carboniferous fusulinids from the Cantabrian Mountains (Spain). *Leidse Geol. Meded.*, 34, pp. 1-225, text-figs 1-13, pls I-LIII, Appendices 1-4, 2 enclosures.
- GORDON, M. (1964).—Carboniferous Cephalopods of Arkansas. *U. S. Geol. Survey, Prof. Paper* 460, pp. 1-322, text-figs 1-96, pls. 1-30.
- GRAAFF, W. J. E. VAN DE (1971<sup>a</sup>).—Facies distribution and basin configuration in the Pisuergra area before the Leonian Phase. *Trabajos de Geología. Fac. Ci. Univ. Oviedo*, 3, pp. 161-177, text-figs 1-5.
- GRAAFF, W. J. E. VAN DE (1971<sup>b</sup>).—Three Upper Carboniferous, limestone-rich, high-destructive, delta systems with submarine fan deposits, Cantabrian Mountains, Spain. *Leidse Geol. Meded.*, 46, pp. 157-235, text-figs 1-16, pls. I-IX, Encl. 1-5.
- LOON, A. J. VAN (1971).—The stratigraphy of the Westphalian C around Prioro (Prov. León, Spain). *Trabajos de Geología, Fac. Ci. Univ. Oviedo*, 3, pp. 231-266, text-figs 1-7, pls 1-8.
- MILLER, A. K. (1934).—*Pseudoparalegoceras*, a new genus of Carboniferous ammonoids. *Jl. Paleontology*, 8, pt. 1, pp. 18-20, pl. 2.
- MILLER, A. K. & DOWNS, H. R. (1948).—A cephalopod fauna from the type section of the Pennsylvanian «Winslow Formation» of Arkansas. *Jl. Paleontology*, 22, pt. 6, pp. 672-680, text-figs. 1-3, pls. 101-103.
- MILLER, A. K. & FURNISH W. M., (1940).—Studies of Carboniferous ammonoids. *Jl. Paleontology*, 14, pt. 4, pp. 356-377, text-figs 1-17, pls. 45-49; *Ibid.*, 14, pt. 6, pp. 521-543, text-figs. 1-7, pls 62-65.

- MOORE, R. C. *et al.* (1944).—Correlation of Pennsylvanian formations of North America. *Bull. Geol. Soc. America*, 55, pp. 657-706, 1 chart.
- PLUMMER, F. B. & SCOTT, G. (1937).—Upper Paleozoic Ammonites in Texas. In «The Geology of Texas» III, pt. 1. *The Univ. of Texas Bull.* 3701, pp. 1-516, text-figs 1-88, pls 1-41.
- RÁCZ, L. (1966).—Late Palaeozoic calcareous algae in the Pisuerga Basin (N-Palencia, Spain). *Leidse Geol. Meded.*, 31 (1965), pp. 241-260, text-figs 1-5, pls I-VIII.
- RUZHENCEV, V. E. (1950).—Upper Coal Measure Ammonites of the Urals (in Russian). *Akad. Nauk SSSR, Trudy Paleont. Inst.*, XXIX, pp. 1-223, figs 1-84, pls I-XV.
- RUZHENCEV, V. E. (1951).—About the presence of the genus *Pseudoparalegoceras* in the Aktubinsk region of Kazakhstan SSR (in Russian). *Dokl. Akad. Nauk SSSR*, (New Series), LXXVIII, 4, pp. 769-772, figs. 1-2.
- RUZHENCEV, V. E. (1955).—Concerning the question of lineage in the family Shumarditidae (in Russian). *Dokl. Akad. Nauk SSSR*, 103, No. 6, pp. 1107-1110, figs 1-2.
- RUZHENCEV, V. E. (1960).—Principes de systématique, système et phylogénie des Ammonoidés paléozoïques. *Trudy Paleont. Inst., Akad. Nauk SSSR*, LXXXIII, pp. 1-330, figs. 1-128 (en Russe, et Traduction 3279 du B. R. G. M., *Serv. Inf. géol.*).
- UNKLESBAY, A. G. (1962).—Pennsylvanian Cephalopods of Oklahoma. *Oklahoma Geol. Survey, Bull.*, 96, pp. 1-150, text-figs 1-16, pls 1-19.
- WAGNER, R. H. & VARKER, W. J. (1971).—The distribution and development of post-Leonian strata (upper Westphalian D, Cantabrian, Stephanian A) in northern Palencia, Spain. *Trabajos de Geología, Fac. Ci. Univ. Oviedo*, 4, pp. 533-601, text-figs 1-13, pls 1-2.
- WANLESS, H. R. (1969).—Marine and non-marine facies of the Upper Carboniferous of North America. *C. R. 6e Congrès Carbonifère, Sheffield 1967*, I, pp. 293-336, figs. 1-15.

#### REPOSITORY OF SPECIMENS

All the specimens described in the present paper have been deposited in the collection of the Rijksmuseum van Geologie en Mineralogie, at Leiden, the Netherlands (National Museum of Geology and Mineralogy), R. G. M. Catalogue numbers are quoted with the specimens figured.

PLATE 1

Fig. 1a.—*Eoparalegoceras inflatum* DELÉPINE,  $\times 0.9$ . Ventro-lateral view, showing the ornamentation and a constriction.

Locality: Ironstone nodule bands in mudstones north of Peña Tremaya, Redondo Valley (northern Palencia). Age: lower Westphalian D (Podolskian). Coll. ISMET. Rijksmuseum van Geologie en Mineralogie, Leiden, RGM-St. 167501.

Fig. 1b.—Same specimen,  $\times 0.9$ . Ventral view, showing the suture.

Fig. 1c.—Same specimen,  $\times 1$ . Lateral view, showing the umbilicus, the ornamentation and, on the lower part, the sutures.

Fig. 2.—*Eoparalegoceras inflatum* DELÉPINE,  $\times 1$ . Ventro-lateral view, showing the ornamentation. Locality as for fig. 1. Coll. ISMET. RGM-St. 167502.

Fig. 3a.—*Glaphyrites angulatus* (GIRTY) PLUMMER & SCOTT,  $\times 3$ . Ventral view, showing the low opening and the suture.

Locality: Abismo Limestone exposure at 4,300 m. N. N. E. of Santa María de Redondo, in basal beds of the limestone, Redondo area of northern Palencia. Age: Westphalian D, late Podolskian or early Myachkovian. Coll. W. J. E. VAN DE GRAAFF. RGM-St. 167503.

Fig. 3b.—Same specimen,  $\times 3$ . Lateral view, showing the umbilicus.

Fig. 3c.—Same specimen,  $\times 3$ . Ventral view, showing the fine transverse lirae of the ornament.

Fig. 4a.—*Boesites eotexanus* sp. nov.,  $\times 6$ . Holotype. Ventral view, showing the suture.

Locality: 1 km north-west of Casavegas, at 20.50 m above the Leonian disconformity in the Casavegas/Caloca road section, La Pernía area of northern Palencia. Age: upper Westphalian D (Myachkovian). Coll. JONES/MORRIS/WAGNER loc. 1890. RGM-St. 167505.



1<sup>a</sup>



1<sup>b</sup>



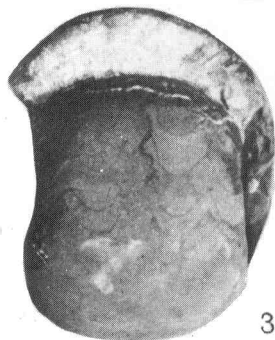
1<sup>c</sup>



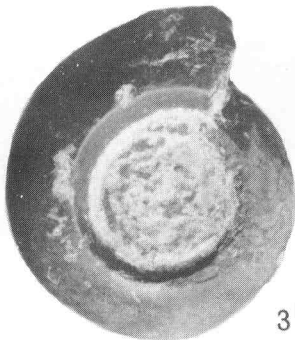
2



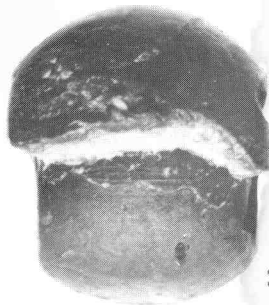
4<sup>a</sup>



3<sup>a</sup>



3<sup>b</sup>



3<sup>c</sup>

PLATE 2

Fig. 4b.—*Boesites cotexanus* sp. nov.,  $\times 3$ . Holotype. Lateral view, showing part of two consecutive whorls with the suture line. Same specimen as shown on Pl. 1, fig. 4a.

Fig. 5a.—*Glaphyrites micromphalus* sp. nov.,  $\times 3$ . Holotype. Lateral view, showing the small umbilicus and the suture.

Locality: Peña Abismo, at 125 m west of the top, in basal beds of the Abismo Limestone, Redondo area of northern Palencia. Age: Westphalian D, late Podolskian or early Myachkovian. Coll. W. J. E. VAN DE GRAAFF. RGM-St. 167504.

Fig. 5b.—Same specimen,  $\times 3$ . Ventral view, showing the suture.

Fig. 6a.—*Aktubites trifidus* RUZHENCEV,  $\times 3$ . Latero-ventral view, showing low opening and suture with characteristic trifid lobe.

Locality: Abismo Limestone exposure at 4,300 m N. N. E. of Santa María de Redondo, in basal beds of the limestone, Redondo area of northern Palencia. Age: Westphalian D, late Podolskian or early Myachkovian. Coll. W. J. E. VAN DE GRAAFF. RGM-St. 167506.

Fig. 6b.—Same specimen,  $\times 3$ . Ventral view, showing the suture.

