

**Invertebrate Paleontology
Earth Sciences Division
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Devonian goniatites from Nevada

By

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With plate 32

Abstract: Several goniatites recently found in the Nevada Limestone and Pilot Shale Nevada are described. A new species, *Erbenoceras erbeni*, is erected for specimens from Lower Nevada Limestone in the Cortez Mountains and is thought to be of Emsian age. From higher in the Nevada Limestone in the southern Roberts Mountains, but below the unknown *Stringocephalus*-bearing level, occurs *Cabrioceras* aff. *crispiforme*, which would appear to indicate a basal Givetian horizon. A poorly preserved *Imitoceras* is recorded from the Pilot Shale in the Pahrangat Range. All these three genera are recorded from Nevada for the first time. Comments are made on the palaeogeographic significance of the occurrence of these distinctively European forms in the western United States.

Introduction

Through the kindness of Dr. J. G. JOHNSON of the University of California at Los Angeles, several Devonian goniatite faunas have been submitted for study and are reported on here. They include the first Middle Devonian goniatites known from the western United States, and these serve to give a tentative placing of the Eifelian/Givetian boundary in the Nevada Limestone. Also there are two particularly interesting Lower Devonian specimens which must be from near the level which has yielded the holotype of *Agoniatites nevadensis* MILLER, which has recently been considered to be a *Teichertoceras* (HOUSE 1962, p. 262) and that which yielded *Goniatites desiderata* WALCOTT which Dr. H. K. ERBEN would refer to *Teichertoceras*. The specimen of *Imitoceras* recorded from the Pilot Shale is of no great stratigraphical significance and does not help in the delineation of the Devonian/Carboniferous boundary, but is apparently the first record of the genus in the state.

Systematic Descriptions

Order Ammonoidea

Suborder Anarcestina MILLER & FURNISH 1954

Family Mimoceratidae STEINMANN 1890

Genus *Erbenoceras* BOGOSLOVSKI 1962

Type species by original designation, *Anetoceras advolvens* ERBEN 1960.

Erbenoceras erbeni HOUSE sp. n.

(Pl. 32, figs. 6, 7)

Material: Two specimens preserved as moulds showing one surface only, matrix of shelly grey limestone.

Diagnosis: A serpenticonic *Erbenoceras*, advolute, and ornamented with retracted ribs and growth line striae. The holotype is UCLA. 3497 (figured pl. 32, fig. 6).

Description: Dimensions in millimetres:

	UCLA. 34971		UCLA. 34972
	(Holotype)		(Paratype)
Diameter	87	70	ca. 82
Whorl height	17.4	14.5	ca. 19
Whorl width	—	ca. 13.3	—
Umbilical width	54	44.5	48.5

Shell form serpenticonic, compressed, with a very wide, open umbilicus. Coiling advolute, the earliest stages not seen. Whorl form apparently compressed and subrectangular, with tabular venter, convex flanks and narrow, compressed area. Suture not seen. Growth lines show as fine raised striae, variable in separation in the outer whorls of the holotype from 0.5 to 2.0 mm. on the mid-flanks. The growth lines slope rectilinearly back from the umbilicus on the outer flanks and then sweep markedly back to a deep, presumably uniform ventral sinus. Ribbing is formed parallel to the growth lines on the flanks (pl. 32, figs. 6, 7) and it is very variable in strength and frequency throughout ontogeny, as far as can be seen.

Comparison: The new species is clearly distinct from the two previously described Lower Devonian goniatites from Nevada. It differs from *T. nevadense* (MILLER 1938, p. 46, pl. 16, fig. 1; HOUSE 1962, text-fig. 1) in the more serpenticonic coiling and significantly pronounced ribbing. It is similar in ornament, as far as can be discerned, to the holotype of *Teichoceras desideratum* (WALCOTT *non* TEICHERT), but that specimen became uncoiled at about 54 mm. diameter, and this is not shown by *E. erbeni*. Further, in *T. desideratum* the ribbing appears to be quite regular while that of *E. erbeni* is irregular. Comparative dimensions in millimetres of these species are given below.

• Holotype of *T. nevadense* (MILLER), USNM. 96544

Diameter	87	66
Whorl height	40	27
Whorl width	15	10
Umbilical width	28	17

• Holotype of *T. desideratum* (WALCOTT), USNM. 13983

Diameter	35
Whorl height	20
Umbilical width	ca. 21

The new species is distinguished from species of *Anetoceras* ss. by the pentaconic form with whorls in contact, at least above 18 mm. diameter. *E. advolvens* ERBEN, however, shows an ornament very similar to *E. erbeni* sp. but becomes unrolled in the outer whorls, and this is not shown by the new species which in this character is closer to *Teichertoceras*. But there is an important distinction between the new species and the type species of *Teichertoceras*, *Gyroceratites desideratus* TEICHERT (1948 p. 65), for that species forms only weak surface ornament, and evidence of biconvex growth lines. Similarly the type species of *Convoluticeras*, *T. lardeuxi* ERBEN, shows the development of a lateral sinus in the growth lines by the third whorl. It could be stressed that the suture in *E. erbeni* is not known, but it is presumed to have no dorsal lobe. A fragment referred to *Teichertoceras* (?) n. sp. has been described by ERBEN (1960 p. 67, text-fig. 14) from the Lower Devonian of the Harz Mountains is particularly close to *E. erbeni* in ornament and apparently in degree of coiling.

When the combined evidence of *E. erbeni*, *T. nevadense* and *T. desideratum* (WALCOTT) is considered, it seems clear that the horizons yielding them in the Lower Nevada Limestone should be referred to the Lower Emeryan. This confirms the opinion of COOPER (1942) based on the brachiopod evidence which has been farther strengthened by studies by JOHNSON (1962).

Horizon and Locality: UCLA. 34971 and 34972, both from UCLA. locality number 4468 (field no. 7—1—49) from an elevation of 7550 feet in Canyon "V", 400 feet north, 600 feet west of the southeastern corner of sec. 4, T. 26 N., R. 48 E. (Cortez 15 min. road), Cortez Mountains, Eureka County, Nevada.

Family Anarcestidae STEINMANN 1890

Genus *Cabrieroceras* BOGOSLOVSKI 1958

Type species by original designation, *Goniatites rowillei* VON KOENEN 1886.

Cabrieroceras aff. *crispiforme* (KAYSER)

(Pl. 32, figs. 1, 3, 4, 5)

Material: Eight specimens, three partly silicified, ranging from 17 to 67 mm. in diameter.

Description: Dimensions in millimetres: —

	(i)		(ii)
Diameter	18.4	15.5	15.8
Whorl width	ca. 11	9.9	ca. 10
Umbilical width	9.5	7.1	7.3

Inner whorls not seen. Shell form at about 15 mm. diameter later compressed, with markedly depressed whorl section with a broad, shallow venter. The umbilicus is widely open with an angle of just under 90 degrees, and opening regularly even up to 67 mm. diameter. Sutures not seen. Growth lines on the umbilical wall pass slightly backwards with a weak concavity (pl. 32, fig. 3) at median diameters, but at earlier diameters this is scarcely discernible. Periodically certain striae are strengthened. On the venter the growth lines have not been well seen, but on the outer part the bases of crescentic flares forming a slight sinus. These flares are linked to the stronger striae of the umbilical wall. At about 28 mm. diameter, one specimen shows two adnate polyp cups of *Aulopora* (or perhaps „*Serpax devonica* PASCH). The larger is outwardly and rather aperturally directed with respect to the venter.

Remarks: In general proportions these specimens are very close to *C. crispiforme* (KAYSER 1879, p. 301, pl. 5, fig. 1; SCHMIDT 1950, figs. 1-3; PETTER 1959, p. 102 *et. seq.*). One even shows the curious crescentic flares such as were illustrated by SCHMIDT (*op. cit.* fig. 2C). The only significant difference appears to lie in the course of the growth lines out from the umbilical seams. In the type specimen of *C. crispiforme* this feature is well preserved, but PETTER remarks (1959 p. 103) that in her specimens the growth lines leave the umbilical seam obliquely, and this is also seen in *C. karpinskyi* (HOUSE & PEDDER 1963, pl. 72, fig. 6). In the Nevada specimens the growth lines in this position are not markedly oblique. One later specimen in the collection shows that the umbilical angle is constant, or nearly so, up to 67 mm. diameter, and that the depressed reniform cross-section is maintained to this diameter. This is a character of *C. crispiforme* and *C. plebeiforme* (HALL, see HOUSE 1962, p. 253, fig. 2A, B), but a specimen of the latter in the author's collection from the *Werneroceras* Bed, New York State shows growth lines on the umbilical wall which are markedly rectiradial.

This fauna so closely resembles the lower Givetian *Cabrieroceras* fauna of the *Crispiforme* Zone that there seems little doubt as to the correlation. Thus some light is shed on the Eifelian/Givetian boundary in Nevada, which should probably be drawn just below the occurrence of this fauna.

Horizon and Locality: Eight specimens (all UCLA. W 28—59) from the Nevada Formation about mid-way in the section between the *Stringocephalus* level above and the „*Spirifer*” *pinyonensis* zone below. From an elevation of 8,640 feet on the eastern slope of a saddle 500 feet north of Hill 8788, approximately three miles west and three miles south of Roberts Creek Ranch, T. 22 N., R. 50 E., southern Roberts Mountains (Roberts Mountain quadrangle), Eureka County, Nevada.

Suborder Goniatitina HYATT

Family Imitoceratidae RUZHENCEV

Genus *Imitoceras* SCHINDEWOLF

Type species by original designation *Ammonites rotatorius* DE KONINCK 1844

Imitoceras sp.

(Pl. 32, fig. 2)

Material: One quarter whorl of a crushed phragmocone preserved in pyrite and shale.

Description. Shell form and ornament not seen. Suture gives evidence of a parallel sided ventral lobe with no trace of a division at its base. The ventro-lateral saddle is slightly asymmetric and is tilted towards the center. The lateral lobe is finely V-shaped and the umbilico-lateral saddle broadly arched.

Remarks: The specimen is too poorly preserved for an attempt at specific determination, and it cannot conclusively contribute to the determination of the Devonian/Carboniferous boundary position with respect to the Pilot Shale.

Horizon and Locality. Collected by Dr. A. Reso from 10 feet below the top of the Pilot Shale at Bactrian Mountain, Pahrangat Range, Lincoln County, Nevada.

Comments on Palaeogeographic Distribution

The European affinity of the Middle Devonian of the Rocky Mountains and immediately adjacent areas has long been recognised. It is attested especially by the occurrence of *Stringocephalus* in Nevada and numerous localities northward into Canada (COOPER 1942, p. 1784). *Stringocephalus* is absent from the New York/Pennsylvania embayment and the Appalachians. The occurrence of a goniatite fauna in Nevada which has distinct European affinity now gives confirmatory evidence that connection with Europe was established by the Emsian although the distribution of *Halysites* would suggest that contact was well established in the Silurian. The occurrence in western Canada of *Teichertoceras* and *Cabrieroceras* (HOUSE & PEDDER 1963), although in both cases of different species to those recorded here from Nevada, confirms that the marine contact with Europe was from the north, that it is trans-Arctic, around the northern margin of the Old Red sandstone continent (for a general discussion of the distribution of Devonian goniatites see HOUSE 1964). It is also of interest that the earliest ammonoids of the Lower Devonian should be found to have so wide a geographic distribution. Faunas including the genus *Teichertoceras* are now known from Nevada, Australia (TEICHERT 1948, ERBEN 1960), France, Czechoslovakia and Germany.

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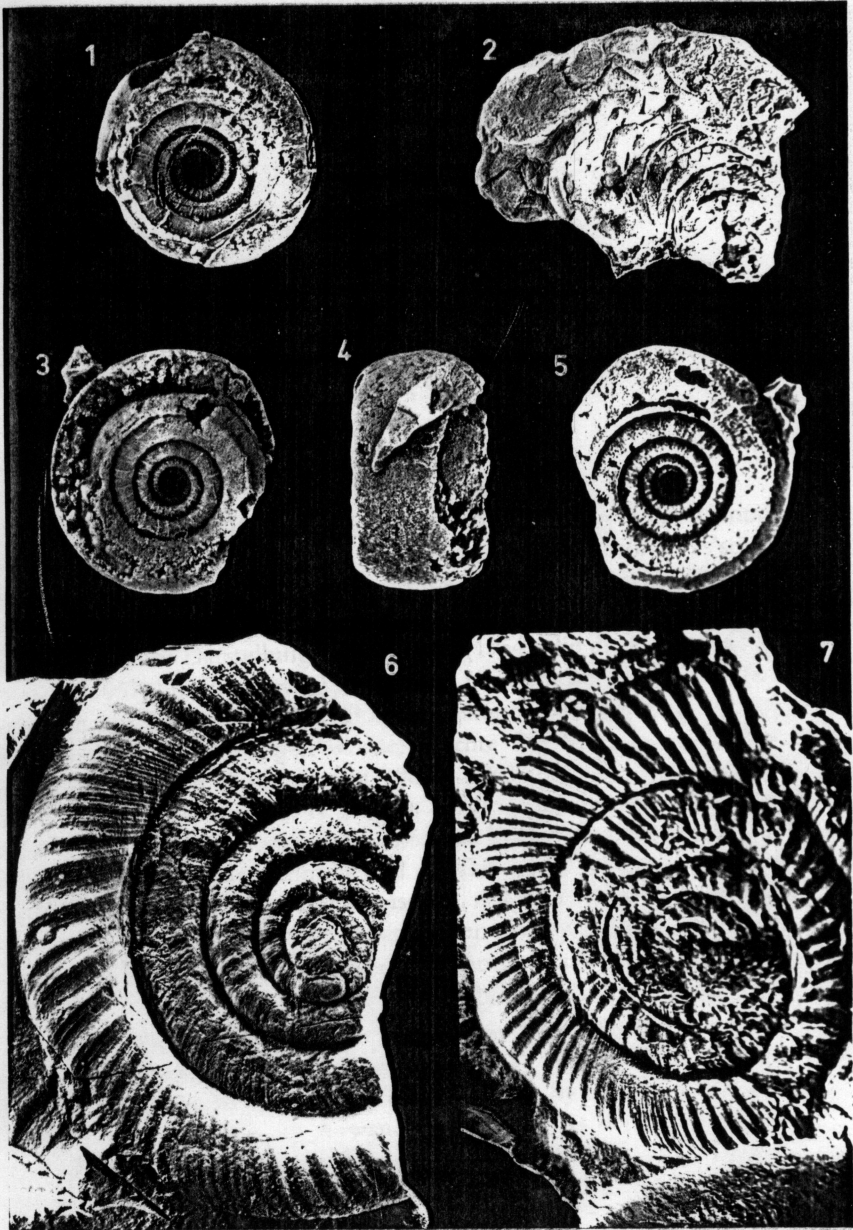
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Explanation of Plate

Plate 32

- Fig. 1, 3—5. *Cabrieroceras* aff. *crispiforme* (KAYSER); 1.8 X; UCLA. W 28—59; from the Nevada Limestone in the southern Roberts Mountains, Eureka County, Nevada
- Fig. 2. *Imitoceras* sp.; 1.35 X; UCLA.; from 250 feet below the top of the Pile Shale on Bactrian Mountain, Lincoln County, Nevada
- Fig. 6, 7. *Erbenceras erbeni* n. sp.; 0.9 X; from the Lower Nevada Limestone in the Cortez Mountains, Eureka County, Nevada
6. Holotype (UCLA. 34971)
7. Paratype (UCLA. 34972)



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