

***Gyroconulina columellifera* n. gen., n. sp., a complex ataxophragmiid foraminifer from the Aqra limestone (Maastrichtian) of Northern Iraq**

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ABSTRACT — A new genus of larger foraminifera, *Gyroconulina* (type: *Gyroconulina columellifera* n. gen., n. sp.) from the Aqra limestone (Upper Maastrichtian) of Northern Iraq is described and figured. This new form belonging to the Ataxophragmiidae SCHWAGER, 1877 represents the most complex genus of this family known up to now.

ZUSAMMENFASSUNG — Eine neue Foraminiferen-Gattung, *Gyroconulina* (Typ: *Gyroconulina columellifera* n. gen., n. sp.) aus dem Aqra-Kalk (oberes Maastricht) von Nord-Iraq wird beschrieben und abgebildet. Diese zu den Ataxophragmiidae SCHWAGER, 1877 gehörende neue Form hat den kompliziertesten Bauplan aller bisher bekannten Gattungen dieser Familie.

RIASSUNTO — Viene descritto e illustrato un nuovo genere di foraminifero, *Gyroconulina* (tipo: *Gyroconulina columellifera* n. gen., n. sp.), proveniente dal Maastrichtiano superiore dell'Iraq settentrionale. Questa nuova forma che appartiene agli Ataxophragmiidae SCHWAGER, 1877 rappresenta il più complesso genere di questa famiglia finora conosciuto.

KEY WORDS — Systematic; foraminifera; Maastrichtian; Iraq.

INTRODUCTION

This study is based on some samples collected at Sarsenk along Mosul - Dohuk - Amadia motor-road during one of the writer's (S.A.D.) recent three visits to northern Iraq. The last visit was in March 1973, on a geological excursion sponsored and conducted by Dr. S. Z. Jassim of the Sciences College, University of Baghdad, who kindly presented the summary of the stratigraphy of the sequences along both sides of the Dohuk - Zawita - Sarsenk motor-road.

Acknowledgment is made for generous assistance by Dr. S. Z. Jassim and Mr. P. Yokhana (Department of Geology, Science College, University of Baghdad) for field assistance and for valuable comments concerning Cretaceous/Tertiary sequences in this region.

Some samples collected in Maastrichtian *Loftusia* limestone (Aqra formation) contain numerous specimens of a new ataxophragmiid foraminifer which is described in the present paper as *Gyroconulina columellifera* n. gen., n. sp.

Unfortunately it was not possible to get isolated specimens for the preparation of oriented thin sec-

tions. Therefore the following description of the new form is based exclusively on specimens which were found in rock sections.

All thin sections containing the specimens described and figured in this paper and the rock samples are deposited at the Institute of Geology and Paleontology of Frankfurt University (SCHROEDER collection).

GEOLOGICAL AND STRATIGRAPHICAL POSITION

Sarsenk, the type-locality of *Gyroconulina columellifera* n. gen., n. sp. is a small summer resort in northern Iraq, about 40 km northeast of Dohuk city (Fig. 1). The samples are taken at Gara mountain easterly bordering the Sarsenk summer resort.

This area is a part of the Upper Miocene or Pliocene foldings which have affected the northern Iraq. The Gara mountain is situated in the center of a large anticline which is essentially composed of limestones and marls of Maastrichtian - Eocene age.

The samples with *G. columellifera* are collected in the oldest member of this sequence. They consist

of grey marly limestones, partly dolomitized and rich in *Loftusia elongata* COX. The samples contain also *Omphalocyclus macroporus* (LAMARCK), *Dictyoconella complanata* HENSON, *Cuneolina* sp., *Rhapydionina* sp., Rotaliidae, Miliolidae, etc.

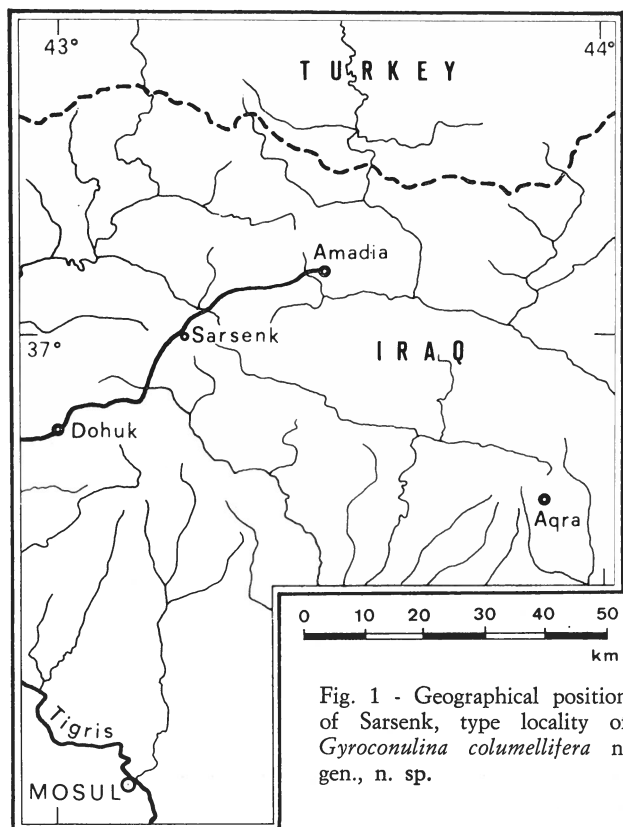


Fig. 1 - Geographical position of Sarsenk, type locality of *Gyroconulina columellifera* n. gen., n. sp.

This fauna is vastly identical with the foraminifera reported by DUNNINGTON, WETZEL & MORTON (1959, p. 37-38) from the Maastrichtian Aqra formation whose type-locality is situated about 60 km to the west of Sarsenk. After these authors, «the Aqra limestone in its type-area is a massive, cliff-forming limestone unit, much dolomitized, and generally characterized by rudist, *Omphalocyclus* - *Loftus-*

tusia - *Orbitoides*, and gastropod fauna». The following foraminifera were reported by them:

(top): *Elphidiella multiscissurata* SMOUT, *Loftusia persica* BRADY, *Omphalocyclus macroporus* (LAMARCK), ?*Chrysalidina* sp.

(base): *Omphalocyclus macroporus* (LAMARCK), *Monolepidorbis* sp., *Orbitoides media* (d'ARCHIAC), *Dicyclina schlumbergeri* MUNIER-CHALMAS, *Cuneolina cylindrica* HENSON, *Dictyonella complanata* HENSON, *Elphidiella* sp., *Loftusia* cf. *coxi* HENSON, *L.* spp., ?*Chrysalidina* sp., *Globotruncana stuarti* (DE LAPPARENT).

The possibility may not be excluded that *Gyroconulina columellifera* is identical with «?*Chrysalidina* sp.» mentioned by DUNNINGTON, WETZEL & MORTON.

DESCRIPTION OF *GYROCONULINA COLUMELLIFERA* N. GEN., N. SP.

Fam. Ataxophragmiidae SCHWAGER, 1877
Subfam. Ataxophragmiinae SCHWAGER, 1877
Gen. *GYROCONULINA* n. gen.

Derivato nominis — Name composed of *gyrus* (lat.) = coil and *conulina* (lat.) = small cone.

Type-species — *Gyroconulina columellifera* n. sp.

Diagnosis — Test conical, becoming cylindrical during the late ontogeny. All chambers arranged in a trochospiral (triseriate?). The globular proloculus is followed by flat cuneiform chambers in which a marginal and a central zone structurally can be differentiated, with the exception of the first undivided postembryonic chambers. The arched marginal zone is subdivided by vertical septula into rectangular chamberlets whose outermost part shows a layer of subepidermal cells. Irregularly distributed thick pillars are present within the central zone.

EXPLANATION OF PLATE 1

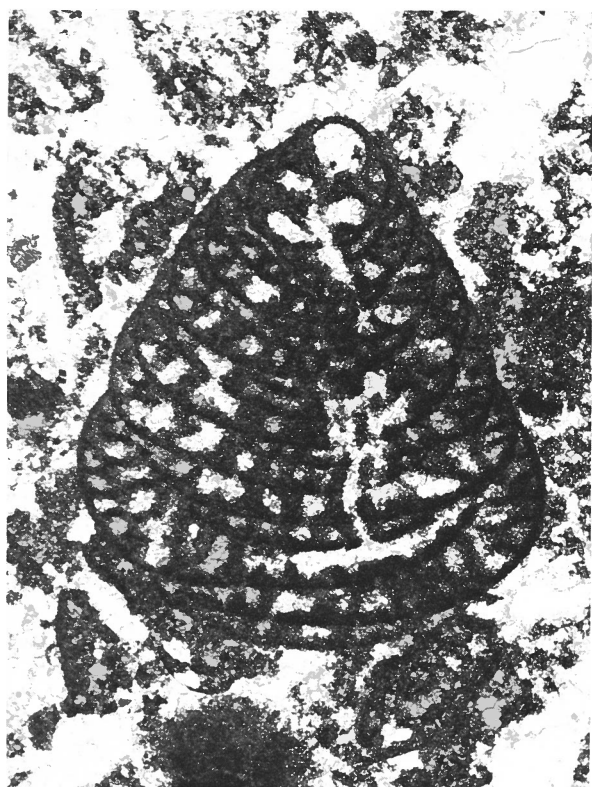
Gyroconulina columellifera n. gen., n. sp. - Sarsenk (Northern Iraq).

Fig. 1 - Axial section through the holotype showing the proloculus and spiral arrangement of the following chambers within the conical part of the test. 88/1. x 55.

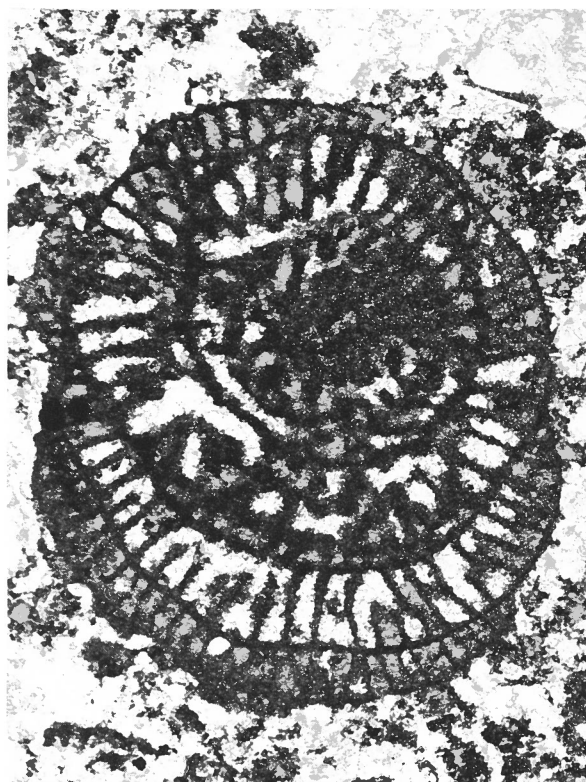
Fig. 2 - Oblique horizontal section showing radial septula of the marginal zone. 88/3. x 55.

Fig. 3 - Oblique subaxial section through the central zone. 88/21. x 55.

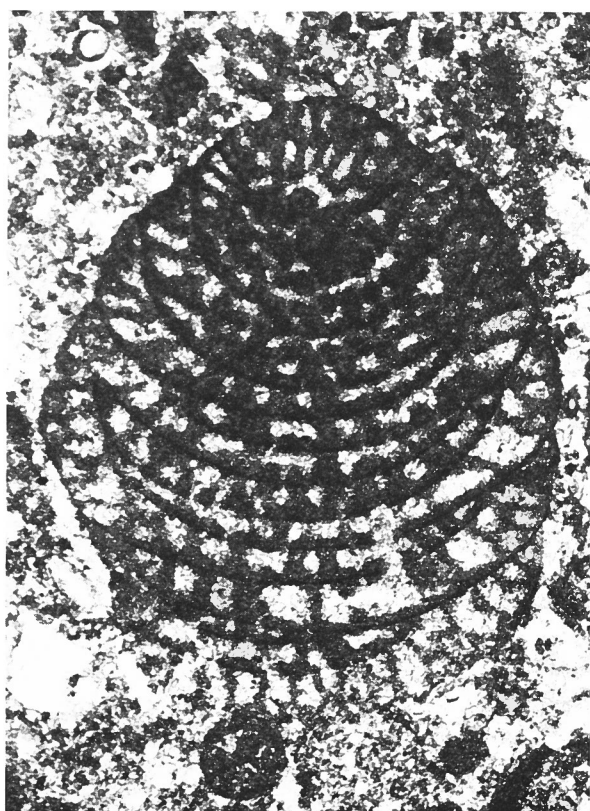
Fig. 4 - Subaxial section. 88/23. x 55.



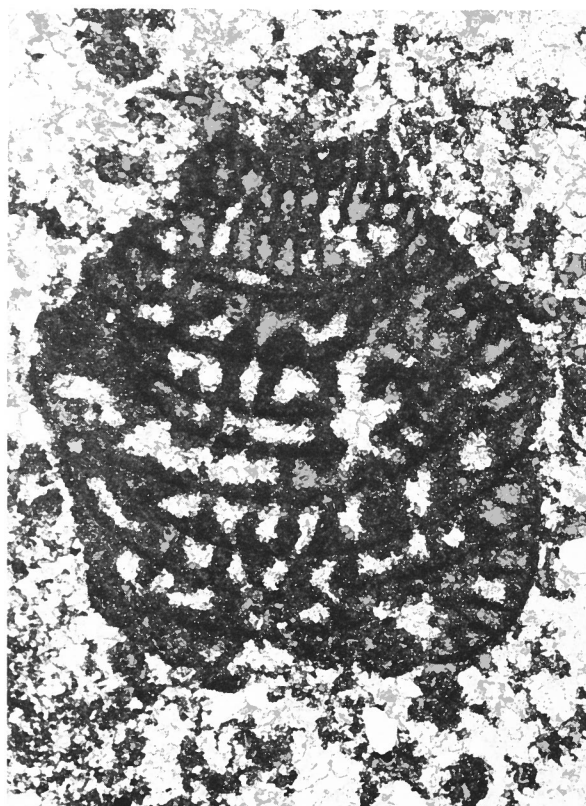
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2



3



4

Gyroconulina columellifera n. sp.

Pl. 1, Figs. 1-4; Pl. 2, Figs. 1-7

Derivatio nominis — Columella (lat.) = small pillar; ferre (lat.) = to bear.

Holotype — Axial section, figured on pl. 1, fig. 1; coll. SCHROEDER 88/1.

Locus typicus — Sarsenk (Northern Iraq).

Stratum typicum — Upper Maastrichtian.

Material — About sixty random thin-sections.

Diagnosis — See diagnosis of the genus.

External form

The test of adult specimens of *Gyroconulina columellifera* is in the form of a small turret with a height of ca. 1.7 mm (max. 2.0 mm) and a diameter of ca. 1.1 mm (max. 1.4 mm; pl. 2, fig. 7). The older part is conical with an apical angle of 60°-70°, but towards the middle of ontogenesis the test becomes more or less cylindrical (pl. 2, figs. 1, 2). Sometimes the conical part seems to be inclined (pl. 2, fig. 2).

Internal structure

Vertical or tangential sections show clearly that all chambers of the test of *Gyroconulina columellifera* are arranged in a trochospiral (pl. 1, figs. 1, 3; pl. 2, figs. 1-3). The presence of three chambers within one whorl of the older part of a specimen (pl. 2, fig. 5) and the regular arrangement of the chamber sutures in the tangential section figured on pl. 2, fig. 3 indicate a triserial early-ontogenetical stage. During the late ontogenesis, the cylindrical part of the test may become biserial as a consequence of increase in size of chambers. Uniserial arrangement seems never be reached.

The globular, not subdivided embryonic chamber is situated in the tip of the test and has a diameter of 0.13 mm (pl. 1, fig. 1; pl. 2, fig. 4).

The post-embryonic chambers are very flat and cuneiform. They increase in diameter in the course of ontogenesis.

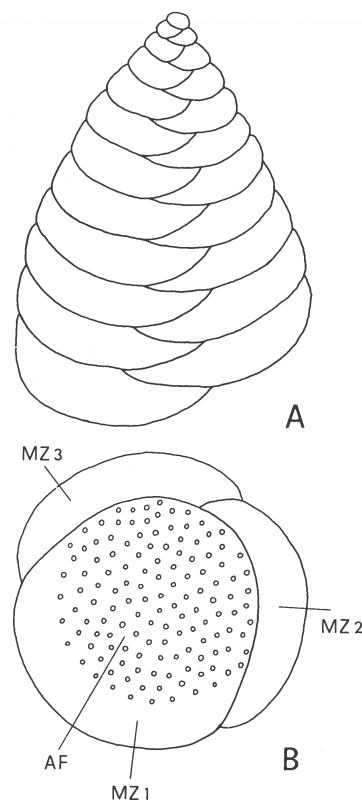


Fig. 2 - *Gyroconulina columellifera* n. gen., n. sp.

A: lateral view, B: basal view.

AF: apertural face of last chamber, MZ1: marginal zone of last chamber, MZ2: marginal zone of penultimate chamber, MZ3: marginal zone of antepenultimate chamber.

EXPLANATION OF PLATE 2

Gyroconulina columellifera n. gen., n. sp. - Sarsenk (Northern Iraq).

Fig. 1 - Oblique tangential section showing in the lower part the irregularly arranged subepidermal cells of the marginal zone. 88/12. x 55.

Fig. 2 - Oblique tangential section showing the inclined initial conical part. 88/3. x 55.

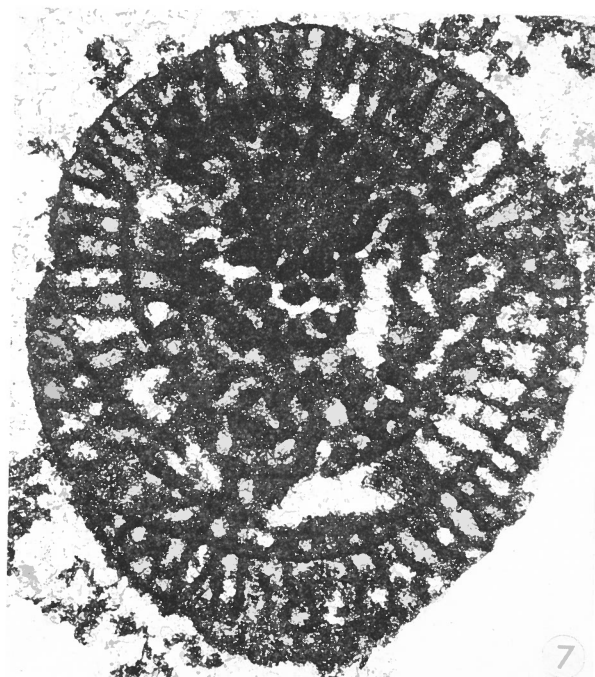
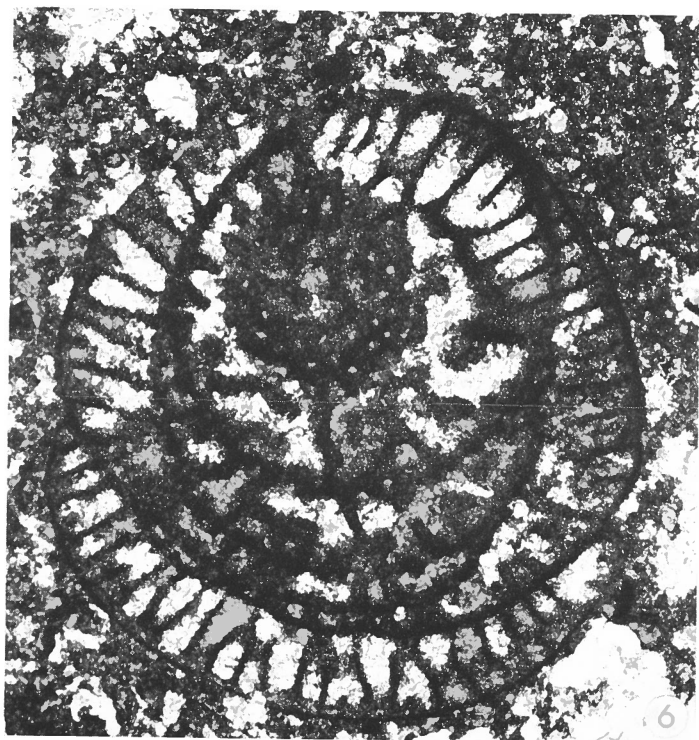
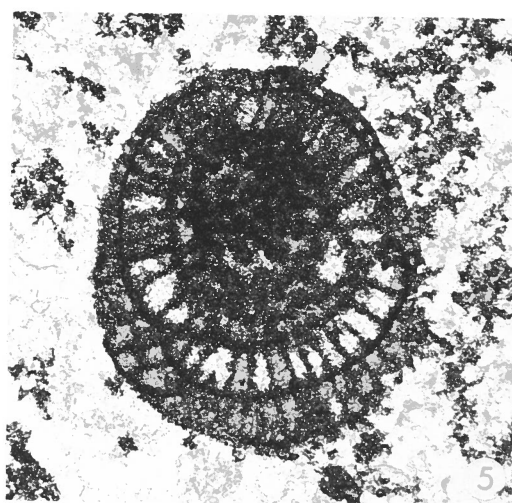
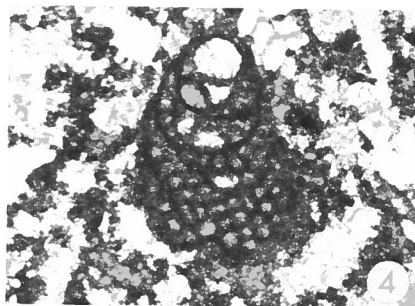
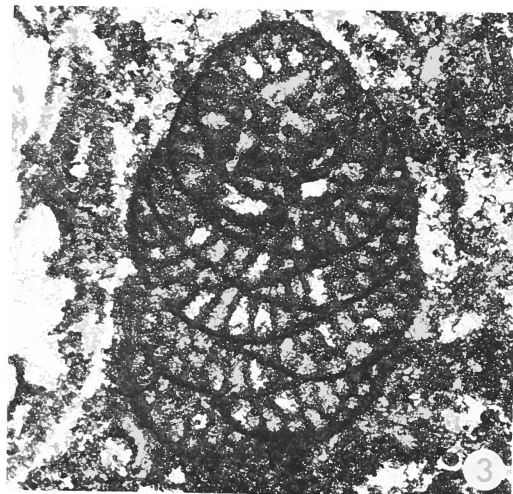
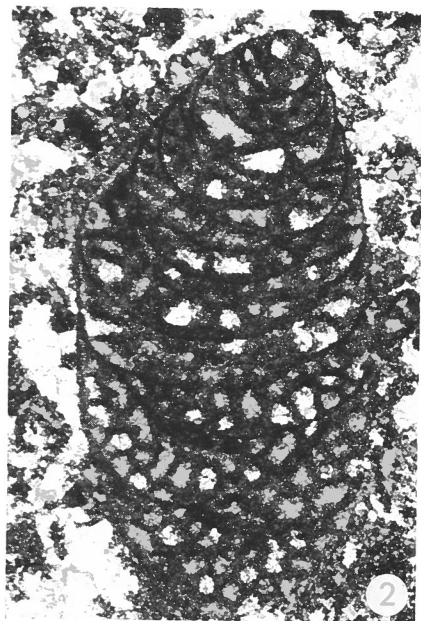
Fig. 3 - Oblique tangential section showing regularly arranged chamber sutures within the marginal zone. 88/21. x 55.

Fig. 4 - Tangential section through a young specimen showing the proloculus followed by some not subdivided chambers. 88/16. x 55.

Fig. 5 - Oblique horizontal section indicating triserial arrangement of the chambers and showing pillars within the central zone. 88/18. x 55.

Fig. 6 - Oblique horizontal section showing in the center a part of a septum perforated by numerous irregularly arranged apertures. 88/3. x 55.

Fig. 7 - Oblique section showing pillars within the central zone. 88/16. x 55.



Tangential sections through the oldest whorl of the test (pl. 2, fig. 4) show clearly that the first post-embryonic chambers are not subdivided, but in the following chambers internal structures are always present and allow a differentiation into a marginal and a central zone.

We define as marginal zone the arched outermost part of each chamber, whose diameter increases up to 0.25 mm during the ontogenesis. This zone is regularly subdivided by thin vertical septula into rectangular chamberlets which are placed perpendicularly to the test surface (pl. 2, figs. 5-7). These septula normally extend from the surface of the test to the limit between marginal and central zone, but sometimes shorter vertical septula are interposed. Marginal septula of two adjacent whorls are arranged one upon the other. The outermost parts of the marginal chamberlets are subdivided by irregularly arranged small plates (perpendicular to the surface of the test). They form a layer of minute pentagonal cells which are closed externally by the epidermis, but are open towards the interior of the test. Tangential sections immediately below the surface of the test (pl. 2, figs. 1, 2; lower part) show clearly the irregular arrangement of these subepidermal cells.

The central zone, which covers the major portion of each chamber, is characterized by the presence of relatively thick pillars.

Horizontal sections through the test (pl. 2, figs. 5, 7) show that the pillars are irregularly distributed within the central zone, but the distances among themselves are equal. Vertical sections (pl. 1, figs. 1, 3, 4) show that the pillars thicken towards the base and the roof of each chamber. Sometimes one of the peripheral pillars of the central zone is connected with the inner end of a septulum of the marginal zone.

Numerous small irregularly distributed apertures join the central zones of two adjacent whorls of the test. Their arrangement within a part of a septum is visible in the center of pl. 2, fig. 6.

PHYLOGENETICAL POSITION OF GYROCONULINA N. GEN.

Within the family Ataxophragmiidae only the subfamily Ataxophragmiinae SCHWAGER, 1877 contains forms, whose chambers are characterized by the presence of internal pillars and partitions (cf. LOEBLICH & TAPPAN 1964, p. 283).

The genus having the greatest structural affinities with *Gyroconulina* is *Pseudochrysalidina* COLE, 1941 (type: *P. floridana*) which was described for the first time from the Eocene of Florida. Its trochospiral test begins with 4-5 chambers per whorl. Below that the arrangement of chambers is triserial (cf. COLE 1956, pl. 24, figs. 1-2), with the last portion tending to become biserial. Each chamber consists of an external, not subdivided part and an internal part which is subdivided by pillars.

HENSON (1949, p. 174) referred a species from the « Infravalanginian » of Qatar Peninsula (Arabia) which he had described a year before (1948, p. 616) as *Dukhanina arabica* n. sp. to the genus *Pseudochrysalidina* COLE. The description of that species (height: 1.6-2.3 mm; diameter of base: 1.4-1.8 mm) is as follows: « Test calcareous, imperforate, finely arenaceous with much cement; form acutely conical, cylindrical in the later stages, varying to low-conical; oral face with a smooth marginal band and a convex « central shield » containing relatively large, widely-spaced perforations; sutures slightly depressed averaging about 6 to 7 per millimeter measured along

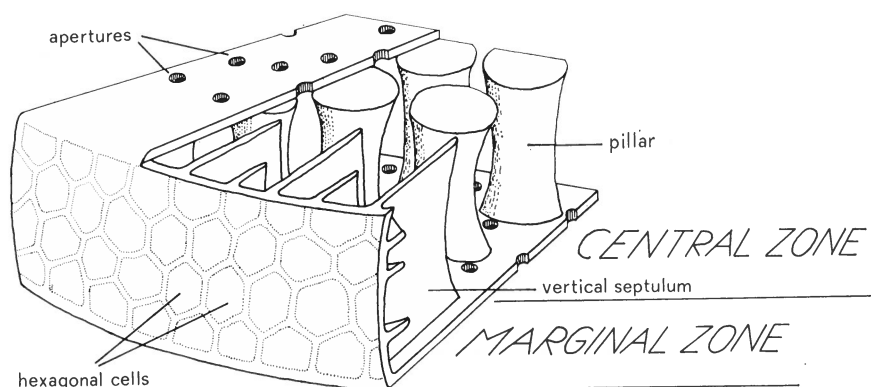


Fig. 3 - Part of a chamber of *Gyroconulina columellifera* n. gen., n. sp. showing structural nomenclature.

the axis and excluding the apical chambers; the latter probably have several chambers per whorl, but throughout most of the test the chambers are in triserial arrangement, each septum covering the previous chambers; interseptal pillars numerous ».

An axial and a subaxial section through topotypes of *Pseudochrysalidina arabica* were figured by SCHROEDER, GUELLAL & VILA (1975, pl. 2, figs. 1, 2). Although a detailed revision of this species is necessary, the original description given by HENSON could be confirmed.

Very interesting is a remark of HENSON (1948, p. 615) that « a small form, probably of this genus [= *Dukhanina*] but too badly preserved for accurate study, has been observed in the Maastrichtian of Dohuk, N. Iraq, with *Orbitoides media* (d'ARCH.), *Omphalocyclus macropora* (LMK.), etc. » This form is very probably our *Gyroconulina columellifera*, whose affinities with *Pseudochrysalidina* HENSON has already supposed.

One may indeed imagine that *Gyroconulina columellifera* has developed from a form similar to *Pseudochrysalidina arabica* by the formation of rectangular chamberlets and subepidermal cells within the marginal zone of the chambers. These two structural ele-

ments are the main distinctive features between the two genera. *Gyroconulina columellifera* represents the most complex form of the family Ataxophragmiidae known up to now.

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