

GONIOLINOPSIS, A NEW PERMIAN GENUS OF THE FAMILY  
DASYCLADACEAE

*With 3 plates and 3 text figures*

The new genus of the family *Dasycladaceae* from the tribus *Triploporelleae* was discovered in Permian sediments of Velebit Mountain.

The samples of Upper Paleozoic rocks in which the new genus was discovered come from the north-eastern slopes of Velebit Mountain. They were collected on the occasion of geologic and paleontologic explorations.

I am much indebted to professors Dr. V. Kochansky-Devidé and Dr. M. Herak for the advice and literature placed at my disposal, and to M. Scī. B. Sokač and L. Nikler for their suggestions during the work and the most interesting material made available to me.

Family *Dasycladaceae* Kützing 1843  
Tribus *Triploporelleae* Pia 1927  
Genus *Goniolinopsis* n. gen.

Cross-sections in the slides resemble to large *Mizzia* or small *Goniolina*. Secondary branches exclude a similarity with the former, while the form of the alga suggests a possible belonging to the genus *Goniolina* d'Orb. I tried hard to classify the newly discovered alga into the genus *Goniolina*. In this connection I went through the whole existing literature on the genus *Goniolina* (chiefly Saporita 1785, 1891, Saporita & Marion 1881, Quenstedt 1867). However, finally I became convinced that the differences in primary, and especially, secondary, branches were too great to make this possible.

The form of the primary and secondary branches place the genus into the tribus *Triploporelleae*.

The name of the genus is after the genus *Goniolina*, which it resembles.

The diagnosis of the genus: The thallus is in the form of a handle with a spherical continuation at the distal end. Primary branches are probably arranged in whorls. Secondary branches are not clearly distinguishable on the surface, they are closed like buds.

The type of the genus is the species *Goniolinopsis hexagona* n. sp.

*Goniolinopsis hexagona* n. sp.

Plates I-III

**Origin of the name:** After the hexagonal-prismatic shape of branches of the first order.

**Description:** The thallus of the alga is composed of a handle and a spherical continuation at its top. The handle is only rarely preserved with the head in a fossil. In smaller and younger specimens sometimes one can find a part of the handle with the head, but this never happens in larger specimens. It would seem that the diameter of the handle near its link with the head narrows in older specimens (pl. II, fig. 4), so that also this fact may be the reason for its most rare preservation. The external diameter of the handle usually amounts to  $1/3-1/4$  of the diameter of the head.

The head is most frequently regular and spherical in shape, the size varying to a great extent. The main stem is big, ellipsoid in form. Primary branches are situated in whorls and originally they must have been cylindrical in form, assuming a polygonal shape owing to their being pressed to each other later (in cross-section six-sided). Primary branches then resemble to six-sided prisms, whose borders are sometimes rounded, which are continued by similar pyramids. The size of branches within one individual varies. The biggest branches are to be found in the equatorial part of the head, while those at the top or at the base are considerably smaller. This ratio of the size of branches varies from 1 : 2 to 1 : 2.5. Because of such the different sizes of branches, the main stem assumes an ellipsoid form, while through optical delusion the head also appears ellipsoid, although it is regularly spherical (round) in shape (pl. I, figs. 1, 2, 3).

The connection between the main stem and primary branches went through small openings or canals. These canals were minute, so that they are rarely visible. They could be noticed only in the central cross-section of branches, also in the longitudinal and transversal cross-sections of the head (pl. I, figs. 2, 6; pl. II, fig. 2). It is well possible and even probable that the small canals were circular in form.

In view of the cross and longitudinal sections, it is probably, that each primary branch is continued by 3 secondary branches (text fig. 1; pl. I, figs. 2, 3, 5, 6). They were even more strongly pressed against each other, the polygonal forms must have been even more evident, and frequently all of them were grown together and formed a thicker layer of »crust« above primary branches (pl. I-III). It was only on rare occasions – in the better preserved specimens – that the structure and shape of branches were visible. On the text fig. 1. are presented – in view of the plane of section – various forms of longitudinal sections of secondary branches.

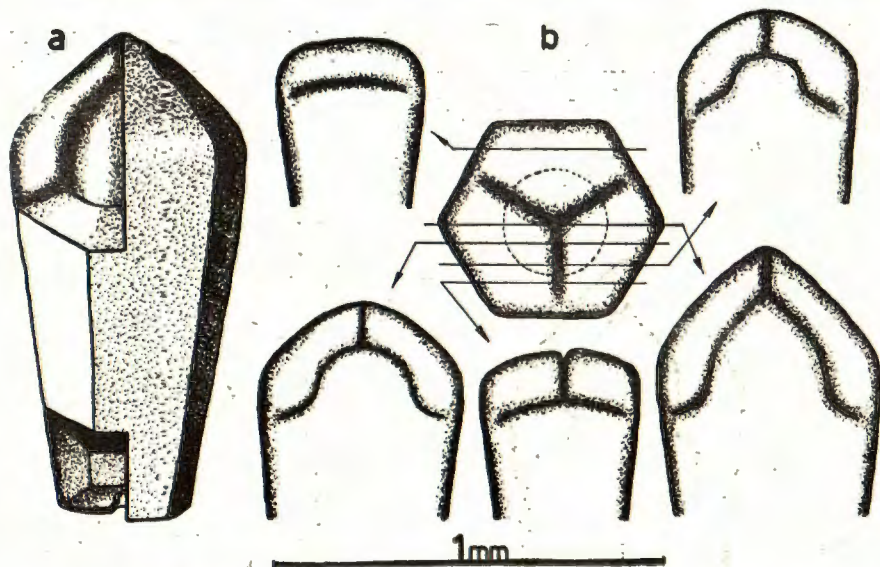


Fig. (sl.) 1. a) *Goniolinopsis hexagona* n. sp. Reconstruction of primary and secondary branches with diagrammatic sections. Rekonstrukcija ogranaka I i II reda sa dijamatskim presjecima.  
 b) Idealized cross-tangential section of primary branch and various longitudinal sections of secondary branches in view of the section planes. Idealizirani poprečno tangencijalni presjek ogranaka I reda i različiti uzdužni presjeci ogranaka II reda obzirom na ravninu presjeka.

The external surface of secondary branches was bulging (pl. II, figs. 1, 5, 6; pl. III, fig. 5). Most interesting is the continuation of secondary branches. It is unclear, visible only in rare, well preserved specimens. It is not top branching. Secondary branches are sometimes only marked at the sides of primary branches and resemble to the petals of a partly closed bud.

Table of Sizes

Diameter of head:	0.68-3.35 mm.	usually 2.00 mm.
Length of main stem:	0.50-1.80 mm.	usually 1.30 mm.
Width of main stem:	0.30-1.35 mm.	usually 0.80 mm.
Length of primary branches:	0.36-0.90 mm.	usually 0.70 mm.
Width of primary branches:	0.22-0.42 mm.	usually 0.30 mm.
Length of secondary branches:	0.15-0.30 mm.	usually 0.20 mm.
Width of secondary branches:	0.10-0.28 mm.	usually 0.15 mm.
Thickness of wall of main stem:	0.03-0.045 mm.	
Thickness of wall of primary branches:	0.0015 mm.	
Diameter of canals:	0.045-0.075 mm.	
External diameter of handle:	0.22-0.40 mm.	
Thickness of wall of handle:	0.03-0.07 mm.	

The gametangia was probably in primary branches.

The holotype is figured in plate I, fig. 2. Inv. Nr. U-4012/1.

Occurrence and age: The described species has been found so far on the north-eastern slopes of Velebit Mountain near Raduč, Medjuvodje, Okić and Brezik. The accompanying fossils are as follows: *Mizzia velebitana* Schubert, *Velebitella triplicata* Kochansky - Davidé, *Salopekiella velebitana* Milanović, *Likanella spinosa* Milanović, *Neoschwagerina craticulifera* (Schwag.)

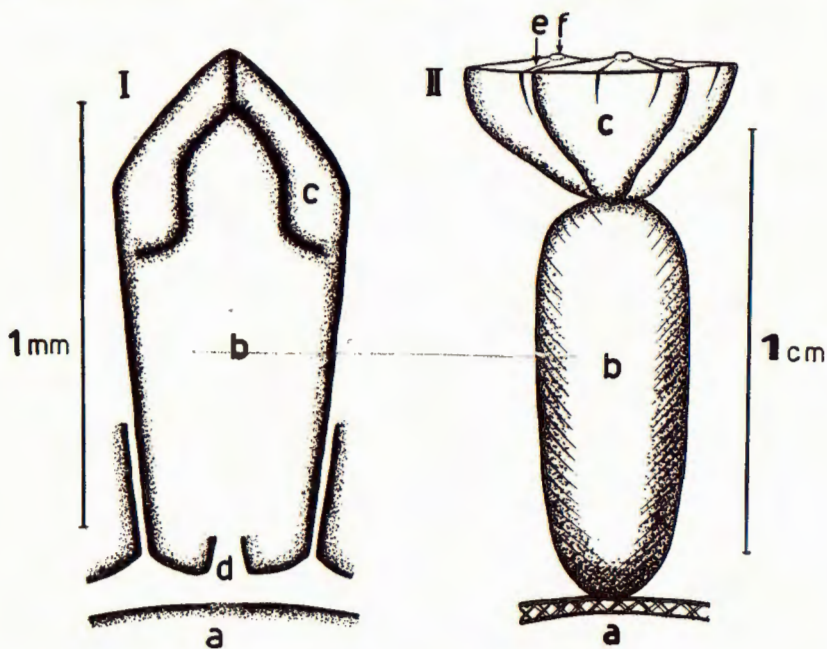
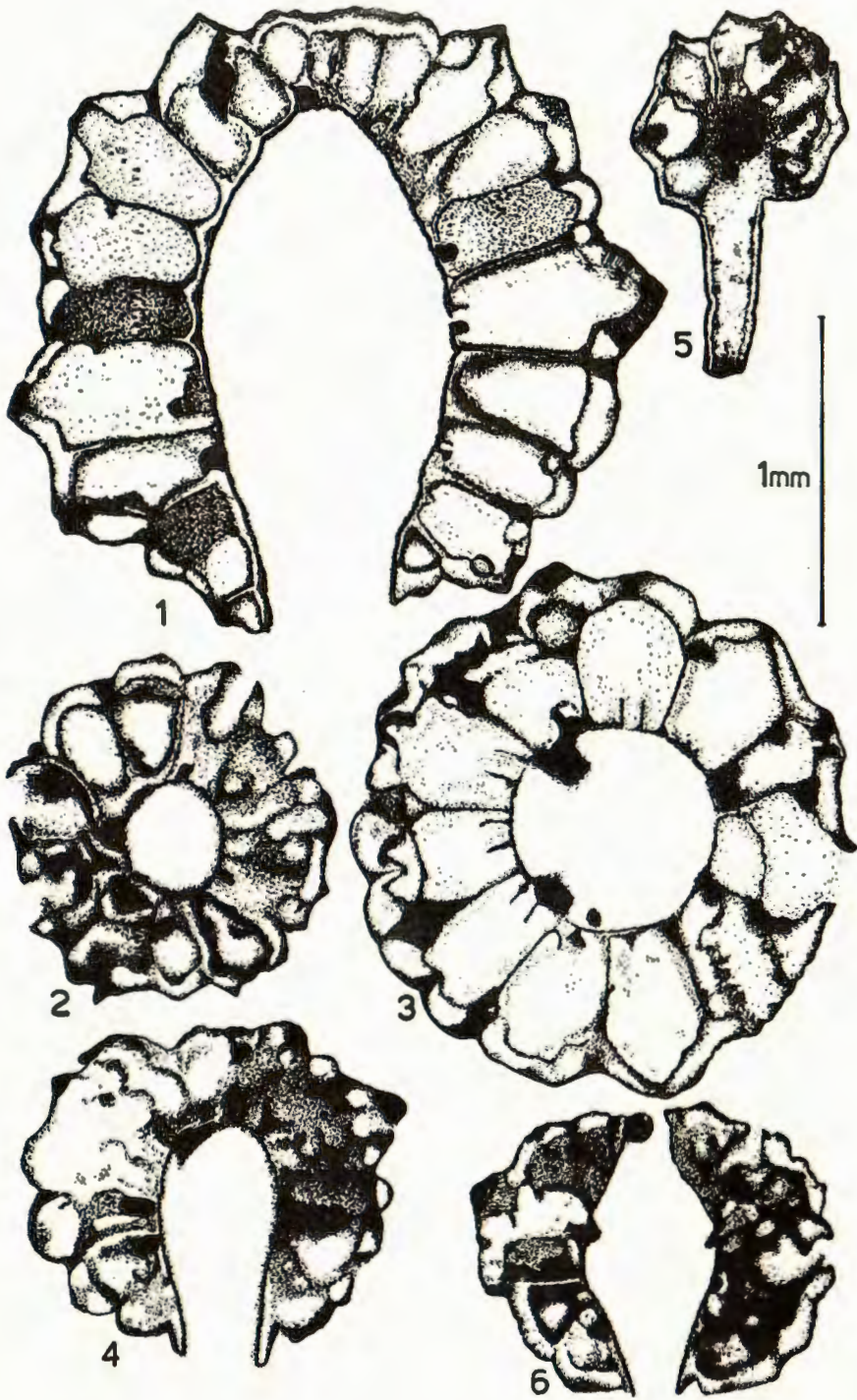


Fig. (sl.) 2. Comparison of primary and secondary branches in:  
 Usporedba ogranaka I i II reda kod:  
 I *Goniolinopsis hexagona* n. sp. and  
 II *Goniolina geometrica* Roemer (after Pia)  
 a) Main stem. Matična stanica.  
 b) Primary branch. Ogranak I reda.  
 c) Secondary branches. Ogranaci II reda.  
 d) Opening for communication with main stem. Otvor za komunikaciju sa matičnom stanicom.  
 e) Furrow. Brazgotina.  
 f) Bulging out with umbilicus. Ispupčenje sa umbilikusom.

Fig. (sl.) 3. *Goniolinopsis hexagona* n. sp.  
 Equivalents: Plates I-III  
 Ekvivalenti: Table I-III

- 1 - pl. (tab.) I, fig. 2. (holotypus).
- 3 - pl. (tab.) I, fig. 6
- 5 - pl. (tab.) II, fig. 6.
- 2 - pl. (tab.) I, fig. 4.
- 4 - pl. (tab.) I, fig. 4.
- 6 - pl. (tab.) III, fig. 2.



Age: Middle-Upper Permian, equivalents of Upper Artinskian to Lower Kazanian.

Remarks: The described species is by its external form similar to the species *Goniolina geometrica* Roemer. It differs from it in the spherical form of the head, the size (one-fifth or one-tenth its size), the shape of the lumen, and especially in the structure of primary and secondary branches. In the species *Goniolina geometrica* secondary branches ramify clearly from the top part of primary branches. The outer surfaces of secondary branches are moderately concave and with furrows, bulgings and umbilici, which were the bases of hairs. All these characteristics of secondary branches could not be noticed in the described species. These differences are clearly presented in fig. 2.

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#### GONIOLINOPSIS, NOVI PERMSKI ROD FAMILIJE DASYCLADACEAE

U mnogim preparatima permskih stijena sa Velebita, nalazio sam alge slične velikim *micijama*, odnosno malim *goniolinama*. Pokazalo se kasnije da je to novi rod.

Zahvalan sam profesorima dr V. Kochansky-Devidé i dr M. Heraku na savjetima i pozajmljenoj literaturi, a mag. geol. B. Sokaču i L. Nikleru na sugestijama i ustupljenom, veoma interesantnom materijalu.

Nastojao sam da novo otkrivenu algu uvrstim u rod *Goniolina* d'Orb. U tu svrhu proučena je postojeća literatura o rodu *Goniolina*, napisan je i rad, ali sam na kraju uvidio da su razlike ogranaka I reda, a osobito II reda, prevelike da bi to bilo moguće.

*Goniolinopsis* n. gen. je relativno velika alga, čiji se talus sastoji od držka i kuglastog nastavka na vrhu. Matična stanica je velika. Ogranci I reda vjerojatno su smješteni u pršljenove. Na njima se nastavljaju ogranaci II reda, koji se nejasno granaju. Tipus roda je vrsta *Goniolinopsis hexagona* n. sp.

*Goniolinopsis hexagona* n. sp. Skelet alge sastavljen je iz tankog držka i kuglaste glavice na njegovom vrhu. Matična stanica je velika, clipsoidnog oblika. Ogranci

I reda smješteni su vjerojatno u pršljenove. Oni su razmjerno veliki. Stješnjeni su među sobom te su poprimili prizmatski oblik (šesterokutni poprečni presjeci). Na donjem dijelu su otvori za vezu sa matičnom stanicom, a na gornjem se nastavljaju ogranaci II reda. Ovi su još jače stješnjeni te često nalikuju na »koru« koja prekriva ogranke I reda. Obzirom na poprečne i uzdužne presjeke, pretpostavljam da se svaki ogranak I reda nastavlja u 3. ogranak II reda. Njihovo grananje je nejasno, više je bočno nego vršno i ogranaci II reda nalikuju »laticama« neprocvtalog pupoljka. Vanjska površina ogranaka II reda, koja je konveksna, ili čak i ušiljena, nije skulpturirana. Slika 1. u tekstu dopunjuje opis grade nove alge.

*G. hexagona* nađena je za sada samo na NE padinama Velebita kod Raduča, Međuvoda, Brezika, Okića i drugdje. Prateći fosili su *Mizzia velebitana* Schubert, *Velebitella triplacata* Kochansky-Devide, *Salopekiella velebitana* Milanović, *Likanella spinosa* Milanović, *Neoschwagerina craticulifera* (Schwag.) i dr.

Starost: srednji-gornji perm, ekvivalent gornji artinsk-donji kazan.

Opisana vrsta slična je samo vanjskim oblikom jurskoj vrsti *Goniolina geometrica* Roemer. Međutim razlike u građi ogranaka I i II reda su prevelike (kao što je to prikazano na sl. 2.), da bi eventualna zamjena bila moguća.

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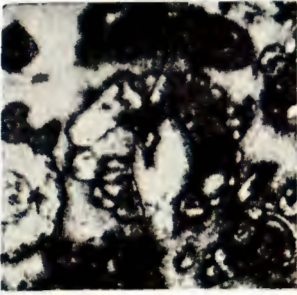
PLATE – TABLA I

1–6. *Goniolinopsis hexagona* n. sp.

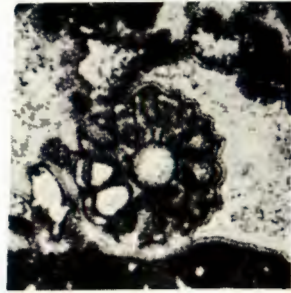
1. Longitudinal section. Uzdužni presjek. (U-4012/9)  $\times$  18.
2. Holotype. Longitudinal section. Pores in secondary branches.  
Holotip. Uzdužni presjek. Pore u ograncima II reda. (U-4012/1)  $\times$  20.
3. Longitudinal oblique section. Uzdužno-kosi presjek. (U-4001)  $\times$  19.
4. Cross section. Poprečni presjek. (U-4012/)  $\times$  19.
5. Slightly oblique transverse section. Poprečni malo kosi presjek. (U-40001/1)  $\times$  18.
6. Cross section. Canals in primary branches. Poprečni presjek. Kanalići u ograncima I reda. (U-4012/4)  $\times$  20.

Foto: U. Matz

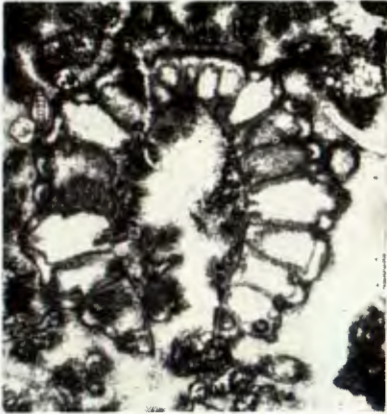




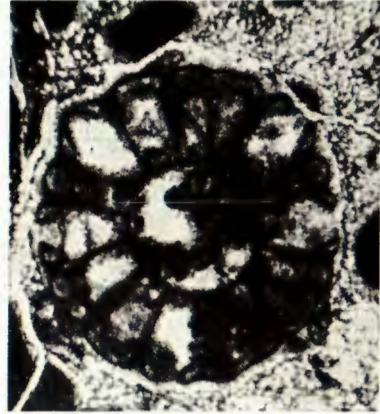
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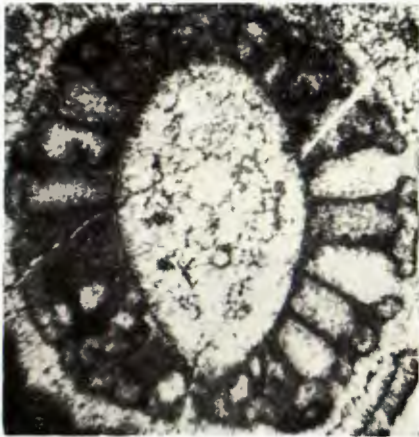
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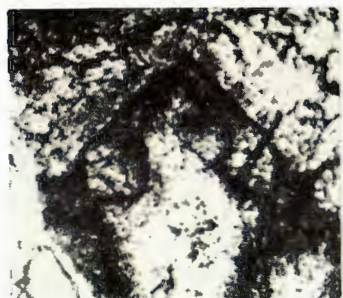
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PLATE - TABLA II

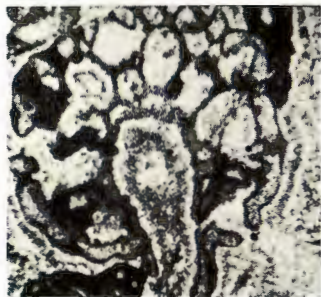
1-6. *Goniolinopsis hexagona* n. sp.

1. Detail of the primary branch with the secondary branches. Detalj ogranka I reda s ograncima II reda. (U-4000/1)  $\times$  50.
2. Detail of structure of primary branches with canals. Detalj grade ogranaka I reda sa kanalićima. (U-63/4)  $\times$  50.
3. Tangential section. Tangencijalni presjek. (U-330/9)  $\times$  18.
- 4-6. Longitudinal sections of specimens with handle. Uzdužni presjeci primjeraka s drškom. (U-590, U-4001/3, U-4012/5)  $\times$  18, 56, 58.

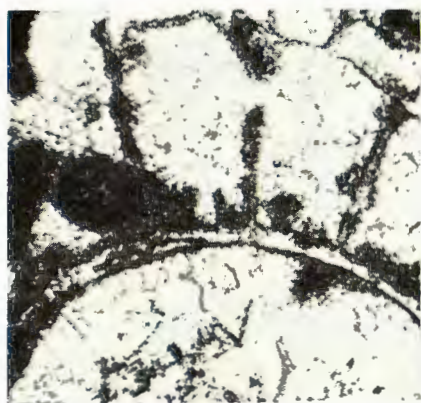
Foto: U. Matz



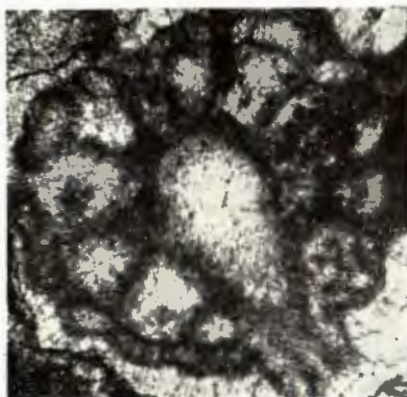
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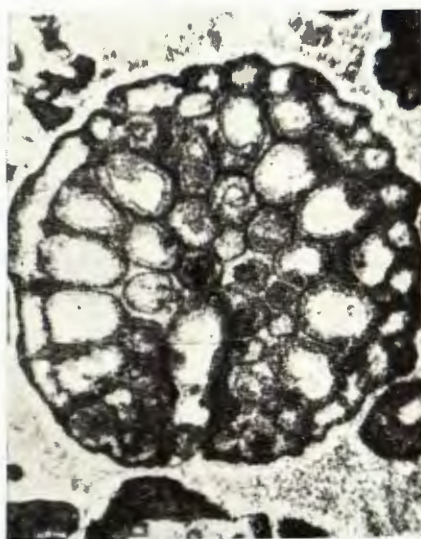
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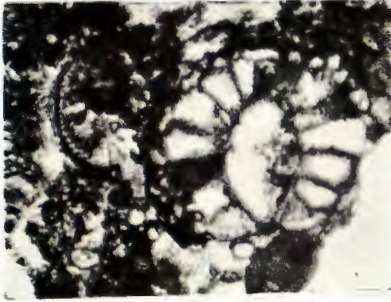
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PLATE - TABLA III

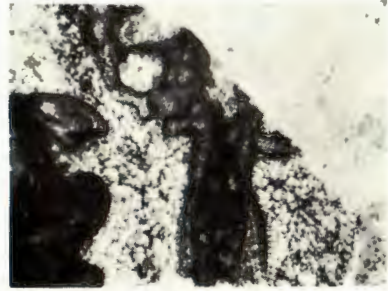
1-6. *Goniolinopsis hexagona* n. sp.

1. Oblique longitudinal section. Uzdužno-kosi presjek. (U-4012/5)  $\times$  19.
2. Longitudinal section of damaged? specimen. Left over *Mizzia* sp., left down *Salopekiella* Milanović. Uzdužni presjek oštećenog? primjerka. Lijevo gore *Mizzia* sp., lijevo dolje *Salopekiella* Milanović. (U-4012/3)  $\times$  20.
3. Tangential section. Over *Uelebitella triplicata* Kochansky-Devidé. Tangencijalni presjek. Gore *Uelebitella triplicata* Kochansky-Devidé. (U-4001/7)  $\times$  18.
4. Fragment with handle, which becomes thinner at the site of link with head. Fragment s drškom koji se istanjuje na mjestu spoja s glavicom. (U-4001/9)  $\times$  19.
5. Tangential section. Sharpened form of secondary branches. Tangencijalni presjek. Ušiljeni oblik ogranaka II reda. (U-4012/8)  $\times$  18.
6. Longitudinal and transverse section. Uzdužni i poprečni presjek. (U-4012/6)  $\times$  19.

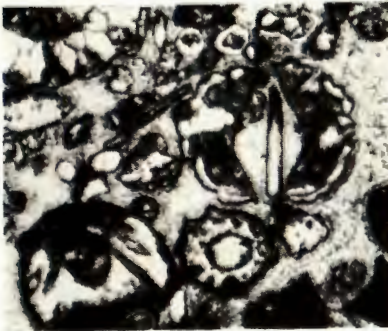
Foto: U. Matz



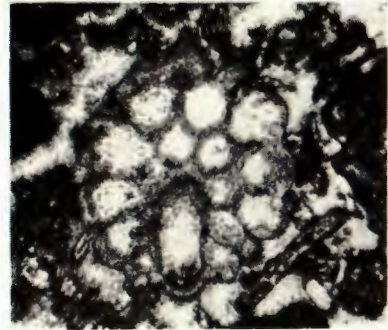
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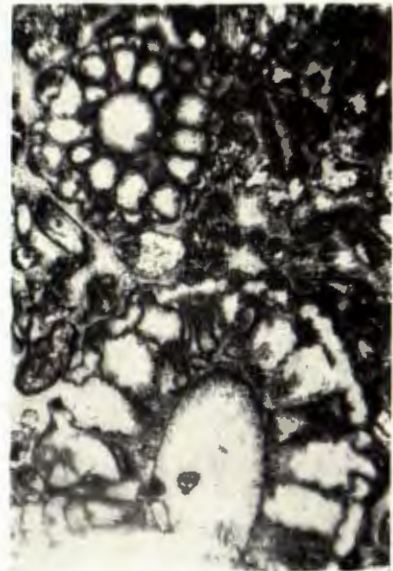
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